TEXILA AMERICAN UNIVERSITY

TEXILA INTERNATIONAL JOURNAL
New Frontiers in Research



TEXILA INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH

ISSN: 2520-3088

VOLUME AND ISSUE: VOLUME 11, ISSUE 3

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art001

Assessment of the Hindrance of Private Construction Projects Completion in Tanzania: A Case of Dar Es Salaam

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Abstract

The study has intended to assess the hindrance for the completion of private construction projects in Tanzania. The study was guided by specific objectives that aimed to establish the extent to which top management support, procurement process and communication determines completion of private construction projects in Tanzania. The quantitative research approach and cross-section research design were employed to collect data from the 5 construction companies implementing the private construction project in Dar es salaam, Tanzania. The relative relevance index (RII) was used to rank several factors in terms of their significance for timely completion of road building projects.The findings shows that, top management support, procurement process and communication found to be major determinant for the timely completion of the private construction project. majority responses stated that good communication and control is major determinant for the top management to support the completion of the private construction project in Tanzania. The study has found that timely availability of project materials has been ranked as the number one procurement process which influences successful completion of private construction projects. Furthermore, the findings rank the communication channel which agreed and accepted by all players influences successful completion private construction projects. The study concluded that, top management-related factors showed a significant impact on the timely completion of private construction projects in Tanzania; the factors thought to be most important for promoting timely completion of private construction projects can improve performance in the private construction sector, reduce time and cost overruns, and raise the caliber of deliverables.

Keywords: *Construction Project, Completion of Construction Project, Hindrace.*

Introduction

A significant foundation underpinning a country's economic development is the construction sector. The growth of the construction industry influences the development of the country's economy [1]. As shown in developed countries, construction is unusual in that it may promote the growth of other economic sectors. Building and construction are also essential to provide a range of work opportunities that would help Tanzania and other countries with their high unemployment rates [2]. This industry employs many people who would otherwise be unemployed since many projects need labour. Building, water, and civil works projects fall under construction projects. They start with identifying the project meant to meet a particular need, then go on through planning, designing, implementing, closing, and eventually handing over [3]. Consultants, such as architects, engineers, quantity surveyors, and social and environmental specialists, are in charge of the design stage. Existing bylaws, site restrictions, labour and material availability, material pricing, and building timetables are just a few variables considered throughout the design stage.

Received: 21.03.2024 ***Accepted: 23.04.2024*** ***Published on: 30.07.2024***
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Projects may be implemented in a variety of ways, such as Design Built Finance Operate (DBFO), Public Private Partnership (PPP), Built Operate Transfer (BOT), or leasing-type projects. Some of the most frequent, expensive, complicated, and unsafe issues in construction are projects that stall [4]. Because of increasing interest rates, inflation, and commercial demands, players in the construction business are worried about how long it takes to complete projects. The administrators may get embroiled in conflicts due to these delays, which might lead to legal action, money demands, and jail time[3], [5]. Most building projects often experience delays and incur more costs than initially anticipated (World Bank, 2014). A project may occasionally be abandoned as a consequence of such overspending. Studies show that money is created when construction projects are completed, society advances, and living standards improve [2], [6].

The project's sustained, uninterrupted functioning is directly the responsibility of the project manager and other stakeholders on a relative level. Within the project team, there should be a precise, strict method to prevent parties from becoming lax, which might result in stalling or delays. An earlier school of thought saw a project as a football hit from one goal-line point meant to score once it reached the opponent's goal. They continue by describing Construction Project Management (CPM), a crucial element of project execution, as a method used in the road construction sector to increase performance in the management and coordination of a project throughout its course [7]. According to [8] the building process is often sequential, and some contractors focus on particular regions rather than the whole project. A challenge arises as projects become more complex and stakeholders begin to worry. Contractors are given various construction projects based on how well they can manage certain dangers.

A study of at least 3000 projects with quality issues found that the cost of poor work accounted for about 20% of total costs and that 70% of problems were discovered early on in the project, with the likelihood of this happening dropping to 3%, or a decrease of at least 60%. Problems were also more likely to be identified early on in projects when they were smaller [9]. Construction projects in Asian countries take longer to complete due to a lack of skilled labour, ineffective leadership, inexperienced management, unorganized site supervision, and poor tool and equipment upkeep. Another study in South Africa investigated why homeowners were unhappy with the nation's construction sector. A shortage of competent workers, disputes between employees and contractors, and unethical activity led to poor project efficiency Research conducted by [10] also revealed that South Africans are not driven by outstanding project performance in the construction sector or by good outlook on project delivery.

Ref. [11] looked at the causes of project delivery delays and discovered that project failure is common in many construction projects, resulting in significant stakeholder losses. They disclosed that projects take longer to complete, cost more than expected, generate less profit, resulting in many claims from subcontractors and unhappy customers, and have unfinished works, end-of-life projects, and expired contractor agreements. All of these leave customers feeling discouraged. Given the many obstacles impeding such endeavours' efficiency and the frequent and significant project delays they inevitably cause, briefings on the phases of development are a better approach to influence the action and completion of construction projects [12]. Clients fund initiatives only in order to profit from their investments. Due to the complexity and volatility ofvarious demands, desires, and preferences, the construction sector is renowned for taking much time and using many resources. Most investors would not

fund a project that seems to go on forever, has an unknown cost, or has an unknown budget. Thus, the length of time and project cost are directly related [4], [13].

Delays in construction projects further have a disastrous impact on all parties involved (contractor, owner, and consultant). Therefore, research on the variables influencing construction project completion would interest all parties. According to research on reclassifying housing delivery delays in Malaysia, "time is money" and "time is of the essence" are ways to capture the connection between project delays and revenue losses. They say that meeting building project deadlines is a crucial benchmark for owners, executors, and home purchasers. Finally, they claim that identifying the causes of delays is important for classifying and analyzing them to anticipate a more flexible response.

According to similar studies conducted in Saudi Arabia, 30% of construction projects are completed by the projected dates, and the typical overrun is typically between 10% and 30% [14]. Furthermore, [15] came to a similar result, concluding that timely project delivery to the degree of the quality standard established by the customer and within budget is an indicator of successful project delivery. However, it seems that numerous investigations have come to this conclusion. Studies on the causes, practices, delays, impacts of risks, and disruptions in construction projects, as well as management and environmental variables leading to project cost and schedule overruns, have been conducted in South Africa, Tanzania, Nigeria, Uganda, and Mozambique.

It was argued that the primary reasons for interruptions and delays were payment delays to contractors, design modifications, financial challenges, poor project management, information delays, etc. compensation issues, and discrepancies in the assessment of work completed. According to the research, seven out of ten projects in Nigeria have delays throughout their execution [16]. Cost overruns are the main issue this scenario presents for the construction sector. Due to this, projects must be finished at costs over the agreed-upon value, which disrupts the developer's or client's cash flow. In Tanzania's construction sector, political instability brought on by armed militias is also a significant problem [2]. This causes both a sluggish completion rate and a low level of national absorption.

According to [17] in the United Kingdom, favorable economic conditions, government guarantees, competent procurement, and project execution skills are all critical success factors (CSFs) for public-private partnership projects. The most crucial success factors for construction projects in Lithuania are project management experience, project value, project manager experience, contractor experience, project size, team member competence, clear and realistic goals, decision-making effectiveness of project management, and technical capability of project management.

Similar research has been done in Kenya, where a variety of success criteria have been found. Managerial support, design requirements, contractor capability, and supervisory capability are all factors that affect whether roads projects in Kenya are successfully completed [18]. According to Upper Echelons Theory also known as top management team the senior management group can contribute to the company's competitive edge and play a significant role in determining the firm's financial and nonfinancial success. Organizations are a mirror of their top managers since the characteristics of the TMTs determine a firm's strategic decisions, which in turn determine the performance of the organization[19], [20]. The Resource dependency theory (RDT) is concerned with how an organization'sperfromance is impacted by the external resources it uses, such as raw materials [21]. The hypothesis is significant because a company's capacity to obtain,

transform, and use raw resources more quickly than rivals may be crucial to success.

Statement of the Problem

A nation's growth is fundamentally influenced by the building sector, which also aids in providing one of society's necessities for shelter. This industry may increase the nation's gross national product by up to 10%. The majority of third-world nations have severe, persistent building issues that are of concern on a national and international level. However, an increasing number of incomplete government building projects in Tanzania tend to eclipse the efforts and raise many concerns about why such a much-needed good is not being produced. One wonders whether such a failure can be pinned on the economic structure of the society or if it has anything to do with the people's architecture, attitudes, and behaviours [22].

Despite its importance, this industry faces various challenges, including delays in completing construction projects. The management of stakeholders, financing, planning, lack of supervision, and other issues have all been mentioned as impacting the completion of construction projects in Tanzania in numerous research studies[2], [6], [23]. This raises a troubling issue of which component could be the most responsible for the success of building construction projects, meaning that it is necessary to assess the highlighted aspects critically. According to [6], 70 percent of construction projects in Tanzania are not completed on time. [2] argued that, due to detrimental variations, construction projects often undergo scenarios such as cost overruns, time overruns, project abandonment, rework, disruption and conflicts.

Therefore, understanding the driving forces behind such problems is necessary if the performance of the construction projects is to be enhanced. Various studies have been carried out to assess the factors to consider for the timely completion of construction projects [3], [4], [5], [6], [13], [23], [24], [25]. There is limited study in Tanzania, Most of the studies have been taken abroad, and fewer have been taken in Tanzania [2], [6], [23]. Also, most studies concentrated on factors affecting the public construction project without considering the private sector. Therefore this study filled the gap by assessing the hindrance of private construction projects completion in Tanzania. The general objective was to assess these hindrances comprehensively and the specific objectives included determining the impact of top management support on project completion, evaluating the influence of the procurement process on successful project outcomes, and analyzing how communication practices affect the successful completion of private construction projects in Tanzania.

Methodology

Research Philosophy

The positivism philosophy has been used in this study as the research philosophy. [26] defined research philosophy as a viewpoint on collecting, analyzing, and applying data regarding a topic. The positivism philosophy views reality as something that can be seen and described objectively. This research approach favors working with phenomena and producing generalizations that resemble laws [27]. Research philosophy is connected to assumptions, knowledge, and the nature of the investigation. It deals with a certain method of knowledge development. This issue has to be addressed because different researchers may hold different beliefs on the nature of knowledge and truth, and philosophy enables us to comprehend these beliefs.

Research Approach

The study employed a quantitative research approach. The approach hase been chosen due to the facts that, does not consume a lot of time, costly effectively and lastly, it allow the researcher to measure and analyze the

dependent variable and the independent variable of the study [28].

Research Design

The study employed analytical, cross-sectional research designs. According to [29] the cross-sectional research design is undertaken for a particular phenomenon at a particular time [30] highlights that cross-sectional design has the advantage of measuring current attitudes or practices and provides information in a short amount, such as the time required for administering and collecting information.

Study Area

The study was conducted in Dar es salaam Tanzania The study has been chosen because Dar es Salaam is the biggest city in Tanzania which the big private construction project . The study concentrated with five private construction project in Dar es salaam, implemented by 5 construction company namely Morekazi Company Ltd, Backlite Company Ltd, Hematec Company Ltd, Logistics Engineering Limited and Advent Construction Limited. The companies implemented the private construction project in Kinondoni, Ilala, Ubungo, Temeke and Kigamboni districts.

Population

A population is the complete set group of individuals, whether that group comprises a nation or a group of people with a common characteristic According to [31] population means a group of items that samples were drawn. The targeted population for this study were 5 construction companies who implemented the private construction project in Dar es salaam.

Sampling Techniques

The study involved both probability and non-probability sampling techniques. Probability sampling is simple random sampling, while non-probability sampling involves a purposive sampling technique.

Simple Random Sampling

Simple random sampling is a technique in which every possible combination of subjects in the population to be studied has an equal chance of being selected [28]. This technique used to select employees in the study. This technique is appropriate in the study because it is free from classification error; also, the sample were free from Bias.

Purposive Sampling

Purposive sampling involves the deliberate selection of a particular unit of the universe for constituting a sample representing a universe[28]. Preference to this technique is because it is cheap and quick to choose a sample, and the results obtained from analysis of a deliberately chosen sample are tolerably reliable.

Sample Size

Sample size refers to the number of items selected from the universe to constitute a sample. A large sample increases the variability and strength of the revealed information and the reliability of test results[29].This study took a sample size of 50 respondents.

The sample size was obtained using the formula proposed by [32].

$$n \geq 50 + 8M$$

where

M = is the number of predictor variables

N = is the required sample size.

The study assumed there non predictor therefore, have a minimum of 50 +8(0) = 50 respondents.

Sources of Data

There are two sources of data: primary and secondary data. Primary data are the first-hand information a researcher collects directly from the respondents through interviews,

observation, and survey methods [28]. Secondary data are secondhand information researchers collect through reading various written documents relating to the study's problem. These include published and unpublished documents like books, journals, reports, newspapers, articles, and online sources. Both primary and secondary data collection methods were applied during the study.

Data Collection Methods

The data collection method refers to the technique used to collect data . The methods for collecting primary data include questionnaires, interviews, observation, Focus Group Discussions, and surveys [28]. The primary data were collected by using a questionnaire. Moreover, secondary data were collected using the documentary review method, which includes published and unpublished documents like books, journals, reports, newspapers, articles, and online sources. The tools for data collection that the researcher employed questionnaires and documentary reviews. However, the researcher has chosen to use a questionnaire because the study is quantitative and has used the documentary review to get other information.

Questionnaire

Questionnaire defined as is an instrument that consists of a number of questions printed in a definite order that involve a set of questions to collect information from the respondents on their attitudes, feelings, or reactions to the problem under study [28]. The questionnaire used for this study was developed by the researcher and checked by an expert. The closed ended questionnaires were used to collect data for research objective number 1 up to 3.

Documentary Review

Documentary review is the process of reading various extracts found in books, magazines, newspapers, and the contents of all other verbal materials which can be either spoken or printed [28]. The advantage of using this method is that the information is free or nearly free and thus serves a considerable amount of the researcher's budget in terms of finance and time [33].

Data Analysis

The data collected using the questionnaire were coded and processed using the Statistical Package for Social Sciences (SPSS) application. The SPSS software helps the researcher to make the research work more scientific and reliable. Information from the data obtained for each of the four specific objectives was listed and employed in conclusions on the research questions in the study. Relative Importance Index (RII) was computed for each determinant to identify which ones were most significant. The hindrances variables were ranked based on based on RII values. From the ranking assigned to each determinant, the most important determinants for timely completion of private construction projects in Tanzania were identified. According to Fugar and Agyakwah-Baa, (2018) the formula for calculating the relative importance index (RII) for factors determining construction success is similar to that of Bhirud and Vasant (2015) as indicated in equation bellow[34], [35].

Equation 1:

$$RII = \frac{\Sigma PiUi}{N(n)} \quad (1)$$

Where,

RII = relative importance index

Pi = respondent‘s rating of factors for timely completion of private construction projects.

Ui = number of respondents placing identical weighting/rating on factors for timely completion of private construction projects.

N = sample size

n = the highest attainable score on factors for timely completion of road construction projects.

[22] claim that the use of RII provides a direct descriptive interpretation for the variables affecting the performance of building projects and that, as a result, it is well suited to be used as the technique of analysis in studies of a similar kind [36].

Reliability and Validity

Validity

Validity was accomplished in this research with various methods. The first step is to carefully craft the questions and pre-test the questionnaires to ensure that they are understandable and that any potential issues are discovered early on, allowing for the easy identification of remedies. Second, the data were edited to find and correct any mistakes or omissions made while recording the data. The goal is to achieve consistency, precision, and completeness.

Reliability

When data collecting and analysis technologies are utilized consistently, on the same individuals, and under the same settings, they provide the same findings. This suggested that the more reliable a research instrument, the more accurate it would be. A Cronbach Alpha test is a statistical study that determines the internal consistency of the questionnaire questions by using SPSS software to assess the reliability of the research instrument. The reliability test shows that the findings of this research are trustworthy for the survey respondents, with a reliability rating of Cronbach's Alpha of 0.874. The items' strong internal consistency is shown by this alpha coefficient. It should be noted that a reliability coefficient of 0.70 or more is regarded as appropriate in the majority of social science research settings. [37] found a factor loading greater than 0.50 to be highly significant. Every factor loading value was more than 0.76 in the confirmatory factor analysis of the measurement model. The composite construction reliability ranged from 0.87 to 0.94 as well. The composite interpretation is analogous to that of Cronbach's alpha, except that it considers the actual factor loadings instead of assuming that each item in the composite load determinant is equally weighted. The average retracting variance was much higher than the proposed threshold of 0.50, ranging from 0.69 to 0.82, suggesting that the hypothesized factors accounted for more than half of the variation in the items.

Ethical Issues

In this study, ethical issues were considered by obtaining permission from the relevant authorities Anonymity and secrecy, the two driving concepts, were used in this. By asking permission from the relevant authorities, this inquiry took ethical considerations into account. The research's purpose, significance, and benefits were explained to each respondent. To protect their privacy and confidentiality, the names of the respondents were not included in the surveys. In line with this, the researcher respected the principle of self-determination, which means that each respondent has the right to decide whether to participate in the research voluntarily.

Results

Demographic Profile of the Respondents

The background characteristics of the respondents are shown in this part, along with their range of profiles. This part aimed to investigate the demographics of respondents in terms of age, marital status, gender, and educational attainment. Knowledge employees from three construction companies provided a total of 50 usable replies, and the response rate was 100%. The sample is broken down by age, gender, highest degree earned, and total number of years of experience in the Table 1.

Gender

Table 1 shows that, 80% of the total respondents were males and 20% females. This gender status implied that the information

collected was represented from both genders. Grouping respondents according to their gender had a great influence on the information provided by the respondents. Also the gender distribution shows how much the construction industry has been dominated by more men than women. Construction industry is accompanied by difficult manual work that is mostly done by men, although in recent days there is a large increase in women unlike before.

Table 1. Demographic Characteristic of the Respondent

	Description	**Frequency**	**Percent**
Gender	Male	40	80
	Female	10	20
Age group	18-30 years	15	30
	30-41 years	20	40
	41-55 years	8	16
	55 years and above	7	14
Education	Secondary Education	3	6
	Certificate	12	24
	Ordinary diploma	12	24
	Bachelor Degree	15	30
	Masters	8	16
Working Experience	0-5 years	15	30
	5 -10 years	29	58
	Above 10 years	6	12
		50	100

Source: Field data, (2023)

Age

Table 1 also reveals the finding that 40% of the respondents were aged 31- 41. It also shows that 14% of the respondents was beyond the age of 55, while 30% were between the ages of 18 -30 and 16% were between the ages of 41-55. The findings suggest that the majority of construction industry personnel were of a mature and productive age, which enabled them to work hard to advance their company swiftly and comprehend the factors that determine whether private construction projects are successfully completed.

Education Level

According to Table 1, the respondents' educational attainment was typically high. The fact that the majority of the participants have university education is indicated by their highest degree. 30% of the respondents had a bachelor's degree, 16% had a master's, 24% had a certificate, 24% had an ordinary diploma, and the remaining 6% had just completed secondary school. Because not all employees have the same educational background, information on the level of academic qualification of the sampled population was gathered. The distribution of respondents at various educational levels facilitates the gathering of data from various points of view. The variety of educational backgrounds is crucial for gathering data on the variables that affect cpmletion of private construction projects.

Working Experience

More than half of the participants (58%) had job experience ranging from 5 to 10 years, according to the participant's work experience in Table 1. 30% of the respondents had more experience in the 0–5 year range, while the remaining respondents (6% %) had experience in the construction industry for more than 10 years. Finding out relevant information from respondents with various work experiences is crucial for understanding the determinants of success for the private construction project.

The Influence of Top Management Support on the Completion of Private Construction Projects in Tanzania.

The study wanted to establish the extent to which top management support determines completion of private construction projects in Tanzania. The five point likert scale were used to examine the responses from the statement concern the role of the top management support on completion of the private construction project in Tanzania. The relative importance index (RII) was used to rank several factors in terms of their significance for timely completion of road building projects.

The findings in the Table 2 shows that, majority responses stated that good communication and control is major determinant for the top management to support the completion of the private construction project in Tanzania (*RII = 0.9560, mean = 4.7800*). The study also found client consultation with key stakeholders is among of the top management support which determines the completion of the private construction project (*RII=0.9240, mean = 4.6200*). Furthermore, the study found that incentives for contractors to finish ahead of time (*RII=0.9040, mean =4.5200*) and supportive work conditions (*RII=0.8840, mean =4.4200*). Troubleshooting and providing staff with opportunities for advancement and growth are also top management role to support completion of the private construction project with mean of 4.200 and 4.100 respectively.

Table 2. Influence of Top Management Support on the Completion of Private Construction Projects in Tanzania

	RII	**Mean**
Good communication and control	0.9560	4.7800
Client consultation with key stakeholders	0.9240	4.6200
Incentives for contractors to finish ahead of time	0.9040	4.5200
Supportive work conditions	0.8840	4.4200
Troubleshooting	0.8400	4.2000
Providing staff with opportunities for advancement and growth	0.8200	4.1000
Average	**0.8880**	**4.4400**

Source: Field data, (2023)

The Influence of Procurement Process on the Successful Completion of Private Construction Projects in Tanzania.

The study wanted to assess procurement process influences successful completion of private construction projects in Tanzania. The results in the Table 3 shows that, timely availability of project materials has been ranked as the number one procurement process which influences successful completion of private construction projects (*RII = 0.9440, mean= 4.6800*). Competitive procurement process and thorough and realistic assessment of the cost and benefits have also been stated as the procurement process which influence successful completion of private construction project with the RII score of 0.9320 and 0.9130 respectively. Furthermore, the findings

pointed out transparency in the procurement , social support and well committed public agency are the procurement process which influence successful completion of private construction project with the RII of 0.8730, 0.8500 and 0.8300 respectively.

Table 3. The Influence of Procurement Process on the Successful Completion of Private Construction Projects in Tanzania

	RII	**Mean**
Timely availability of project materials	0.9440	4.6800
Competitive procurement process	0.9320	4.5300
Thorough and realistic assessment of the cost and benefits	0.9130	4.4300
Transparency in the procurement	0.8730	4.4200
Social support	0.8500	4.3200
Well committed public agency	0.8300	4.2000
Average	**0.8890**	**4.43000**

Source: Field data, (2023)

The Influence of Communication in Successful Completion Private Construction Projects in Tanzania

The third objective of the study intended to determine how communication influences successful completion private construction projects in Tanzania. The findings in the table 4 show that majority of the respondent agreed that the communication is among of determoant which influence successful completion private construction projects in Tanzania (RII =0.9360, Mean = 4.6800). The findings also rank the communication channel which agreed and accepted by all playersinfluences successful completion private construction projects (RII =0.9600, Mean = 4.8000). Relevant information within prescribed time (RII =0.9520, Mean = 4.7600) and project information must communicated from a centralized point (RII =0.9360, Mean = 4.6800) are both found to influence successful completion private construction projects. Lastly, technical instructions issued through project manager have been stated as the factors which determine successful completion private construction projects (RII = 0.9200, Mean = 4.6000).

Table 4. The Influence of Communication in Successful Completion Private Construction Projects in Tanzania

	RII	**Mean**
The communication channel that agreed and accepted by all players	0.9600	4.8000
Relevant information within prescribed time	0.9520	4.7600
Project information must communicated from a centralized point	0.9360	4.6800
Technical instructions issued through project manager	0.9200	4.6000
Average	**0.9360**	**4.6800**

Source: Field data, (2023)

Discussion

The Influence of Top Management Support on the Completion of Private Construction Projects in Tanzania.

The study aimed to investigate the influence of top management support on the completion of private construction projects in Tanzania. The findings of the research indicated that top management support plays a significant role in determining the successful completion of such projects. This implies that when top management provides strong support, it positively impacts the overall outcome of private construction projects in Tanzania. The findings are inline with Ogweno *et al.*, (2016) who also found that top management related factors were more critical in determining timely completion of road construction project ts in Kisumu County that effective procurement process related factors. Project management depends on top management for authority, guidance, and support because it is ultimately how top management's goals or organizational objectives are carried out.

Top management support encompasses various aspects, including financial resources, decision-making authority, and strategic guidance. When these elements are effectively provided by top management, they contribute to the smooth progress and timely completion of private construction projects. Financial resources are crucial for ensuring that sufficient funds are allocated to the project, enabling the procurement of necessary materials and services. Additionally, decision-making authority allows top management to make prompt and informed decisions, resolving any issues or conflicts that may arise during the construction process. Moreover, strategic guidance from top management ensures that the project is aligned with the organization's goals and objectives, enhancing its chances of successful completion.

Depending on the extent of management support, there will be significant variances in the ultimate client acceptance or opposition to a project. In terms of their own engagement and readiness to contribute valuable organizational resources, protracted management support is connected to sustained management commitment at the top and intermediate levels of implementation. In order to accomplish project goals and objectives and make sure they are consistent with long-term business goals, management support is essential.

The Influence of Procurement Process on the Successful Completion of Private Construction Projects in Tanzania.

The study conducted aimed to evaluate the impact of the procurement process on the successful completion of private construction projects in Tanzania. The findings of the study indicated that the procurement process plays a significant role in influencing the successful completion of private construction projects in Tanzania. The procurement process encompasses various stages, including pre-qualification, tendering, evaluation, and contract award, which collectively contribute to the overall outcome of construction projects. The result supports the findings by Kariungi (2014) for a similar study carried out in Kenya Power and Lighting Company projects in Thika who noted that timely availability of materials and works has a significant impact on early project delivery. The availability of resources at the right time, in the right quantity, for the right customer, and at a reasonable cost and caliber level is ensured by an effective procurement process.

One of the key aspects highlighted by the study is that an effective and transparent procurement process leads to improved project outcomes. When the procurement process is well-managed and adheres to established regulations and guidelines, it ensures fair competition among contractors and suppliers. This fosters a conducive environment for quality workmanship, timely delivery, and

cost-effectiveness. Additionally, a transparent procurement process reduces the likelihood of corruption and unethical practices, which can hinder project progress and compromise its successful completion. Furthermore, the study emphasized that a well-structured procurement process promotes accountability and minimizes disputes during project execution.

By clearly defining roles, responsibilities, and expectations for all parties involved, it reduces ambiguity and confusion. This enables effective communication and coordination among stakeholders, leading to smoother project implementation. Moreover, an efficient procurement process facilitates proper risk management by ensuring that contractors possess the necessary qualifications, experience, and financial capabilities to undertake the project successfully. The timely completion of construction projects, which are frequently centered on infrastructure development and maintenance, depends on procurement management, which may occasionally include many procurement procedures in order to execute sophisticated construction projects. Project completion times have been extended by years due to protracted and difficult project preparatory processes. By the time a project was launched, its goals were typically out of date, and the technology included in its design was frequently similarly old. Yet, because the processes were so drawn out and challenging, those participating were unable to make any kind of progress.

The Influence of Communication in Successful Completion Private Construction Projects in Tanzania

The study conducted in Tanzania aimed to evaluate the impact of communication on the successful completion of private construction projects. The findings of the study indicated that communication plays a significant role in ensuring the successful completion of such projects in Tanzania. Effective communication among project stakeholders, including clients, contractors, architects, engineers, and suppliers, is crucial for achieving project goals and objectives. The findings are inline with [38] studied on the causes of infrastructure project delay and cost escalation in the federal road and rail construction projects and find that communication and top management support are the casuses of the delatys.

Communication acts as a vital tool for coordinating and integrating various activities throughout the construction process. It facilitates the exchange of information, ideas, and instructions between different parties involved in the project. Clear and efficient communication helps in minimizing misunderstandings, resolving conflicts, and addressing issues promptly, thereby enhancing project performance. Effective communication also fosters collaboration and teamwork among project participants, leading to improved coordination and synchronization of activities. Moreover, communication enables effective decision-making by providing relevant and timely information to all stakeholders. It ensures that everyone involved in the project is well-informed about project progress, changes, and requirements. This allows for better planning and resource allocation, reducing delays and cost overruns. Additionally, communication helps in managing expectations and maintaining trust among stakeholders, which is crucial for successful project completion.

Conclusion

The study on the factors influencing the timely completion of private construction projects in Tanzania revealed that top management-related factors play a significant role in ensuring timely project completion. These factors are crucial for promoting efficiency and effectiveness in the private construction sector, leading to reduced time and cost overruns and improved project deliverables. By addressing these management-related factors, stakeholders in

the construction industry can enhance project performance and contribute to the overall development of the sector in Tanzania.

Recommendations

Based on the study's findings, several recommendations can be made to improve the timely completion of private construction projects in Tanzania.

1. It is crucial for top management to prioritize and actively engage in project planning and execution. Effective leadership and management play a vital role in ensuring that projects are properly planned, resources are allocated efficiently, and potential risks are identified and mitigated. By having competent and committed top management, construction projects can benefit from better decision-making, coordination, and overall project control.
2. Improving communication within the project team and with external stakeholders is essential for timely project completion. Establishing clear lines of communication, implementing regular progress meetings, and utilizing appropriate communication tools can enhance collaboration and information sharing among team members. Effective communication helps to ensure that everyone involved in the project is aware of their responsibilities, understands project objectives, and can address any issues or challenges promptly. Additionally, maintaining open channels of communication with clients, suppliers, and regulatory authorities can help prevent delays caused by miscommunication or misunderstandings.
3. Streamlining the procurement process is crucial for timely completion of private construction projects. Efforts should be made to simplify and expedite the procurement procedures while ensuring transparency and fairness. This includes establishing clear procurement guidelines, prequalifying suppliers and contractors, and utilizing electronic procurement systems where applicable. By reducing bureaucratic hurdles and delays in the procurement process, construction projects can proceed smoothly without unnecessary disruptions.

Area for the Further Studies

The involvement of other determining elements, such as funding and project mission, project schedule/plan, technical duties, monitoring, and feedback, should be the subject of further study. The use of a bigger sample might be beneficial as it will lessen the aspect of bias, which was a likely drawback in this study.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art002

A Case Study of Migrant Children at Baity Center, Enrolled in Public System Through Civil Society Organisation, Delivering Integrated Services – Arousing Lives - From Dust to Dawn

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Abstract

From "Dust to Dawn" a case study of 10 migrant children, to eastern Libya from Egypt, Syria and Sudan. The stories of six boys and four girl, highlight the efforts and potential of a civil society organisation and its role in bringing these children from extreme vulnerability to the mainstream of public system and realization of their basic right – getting access to education, health, protection, wellbeing, and opportunities to develop to their full potential. This case study is nested in the Baity center "My Home" project, operational research to see the feasibility of a cross sectoral integrated services package for the vulnerable children under one roof. Future Makers, an infant civil society organisation in East Libya, operational since 2011 civil conflict implemented the project. In Libya, like other conflict affected countries, migrants, refugees and IDPs face difficulty in accessing education, health, and protection rights due to multiple factors. During first year, Future makers delivered services to more than 700 children in need through Baity center, extending their services to families in case of gender-based violence and MH issues. Case study elaborates the challenges of young migrant children and restrictive policies in Libya which poses difficulties to them in accessing basic rights. It is also tribute to Future makers who had been able to bring these children out of the dust and showed them a brighter dawn - to look forward to a beautiful future, under the rising sun.

Keywords: *Access To Education, Child's Rights, Civil Society Organizations, Vulnerable Children.*

Introduction

Since decades, Libya has been an attractive launching point for the migrants streaming into Europe [1]. Libya has been a transit Hub, and remains, a key actor when it comes to sub-Saharan migration to Europe – both for migrants and for Europe's attempts to control these migrants [2]. The country has also been a destination country for individuals fleeing conflict and persecution or seeking an escape from extreme poverty; lack of access to economic, social, and cultural rights; and other human rights violations. .[3] During COVID 19 epidemic, A greater proportion of unemployed migrants continue to report being unable to meet their needs than those who are employed. For instance, a larger proportion of unemployed migrants reported facing food insecurity, financial issues or lacking access to safe

Received: 28.03.2024 ***Accepted: 23.05.2024*** ***Published on: 30.07.2024***

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drinking water than those who were employed. During COVID 19 pandemic the trend continued from neighbouring countries through illegal migration processes [4].

When in-country conflicts and war erupted in 2011, the situation did not change and both legal as well as illegal immigrants continued to come to Libya. There is a deep-rooted network of human smuggling in the border areas, that further complicates the issues of illegal migration in particular. UN agencies with the network of international and national NGOs in Libya, one of the most prominent transit sites, navigate their dual roles as migration managers and humanitarian actors.[5] Women and children are the most vulnerable people among these migrants who don't have an easy access to basic facilities and for those who are non-Arabs speaking due to their language barrier and legal status in the country.

To serve these children on the move, UNICEF initiated the ***Baity center Project*** in 2021**,** which was operational research to test a strategy for delivering integrated package of services for children and mainstreaming the migrant and refugees' children into public systems. This was the first collaboration with a local civil society organisation and Ministry of Social Affairs in the east. The integration includes these children gaining normality as civil citizens and enable them to grow to their maximum potential in a healthy enabling positive environment with access to all basic services. This strategy included multiple partners, and cross sectoral service provision for the migrant and refugees and IDPs as most vulnerable groups in Libya, especially focusing on out of school children among both Libyan and migrant communities.

Libya faces major issues of legal and illegal migrant and refugees in the whole country, and about 34% comes directly to the east, those entering from South also ends up in the main cities of east including Benghazi and Ajdabiya. These migrant communities face numerous challenges in terms of settling down and having a access to basic rights for their children including education, health and protection. The main issues hindering migrants' access to education services were related to admission policies, language for Arabic speakers, affordability for transportation and safety of access. To ensure that the rights of every child are met, especially the most vulnerable like migrant and refugees, this operational research was initiated to deliver a multi-sectoral services & resilience building program for vulnerable children in Gwarsha area of Benghazi through local civil society organisation. Including host communities, internally displaced families from war affected areas. Migrant and refugee children in Benghazi were served through Baity Center, which is a safe child friendly spaces to fulfil their education, health and protection needs and hence enabled them to achieve their true potential as a successful approach.

Migrants mostly belong to neighboring countries, who are either poor or conflict affected populations.[6] Some migrants are in transit phase trying to escape to European countries through Libya that involves human trafficking as well. Human trafficking is adversely affecting the migration process and complicating the situation within country and at borders where we find migrant women and children pushed back into sea, and commonly die of unbearable circumstances either in the waters of Mediterranean or in the deserts of Libya. [5,6] Government policies about migrants and refugees is very strict and restricted to keep their non-Libyan status even years after staying in the country [7,8]. Getting admission into public schools, health care or getting psychosocial mental health support for these children and families is as hard as getting shelter, food and freedom to work in Libya for the parents and elders in the family [7,8]. According to WHO, in August 2021 bulletin, 2021 PMR (Periodic Monitoring Report) related indicators of July showed that total medical procedures provided were 35,141,

including outpatient consultations, referrals, mental health, trauma consultations, deliveries, physical rehabilitation.[9] This reflects the high need for mental and physical health in communities.

"Baity center" that means "Home" in Arabic was established in a densely populated area of Benghazi, where migrant, refugees and IDPs reside. An integrated package of cross sectoral services including health, non-formal education, and child protection services (MHPSS; mental health and psychosocial support for children and mothers, prevention against violence and case management for any gender-based violence) was delivered through outreach and centre-based services. One local NGO, *Future Makers*, was involved in establishing and running the centers. Technical experts from UNICEF supported the project along with funding stream.

Baity centers are the ray of hope for us and these children to get them mainstreamed into Public health systems in the country and is anticipated to help ensure their access to health, education, protection from violence and abuse and provide them enabling environment to grow to their best potential.

Study Population and Social Environment

Study was to observe acceptability, effectiveness, and public health administrative aspects of integrated services package delivery to the vulnerable Libyan, migrant and refugee children, through community based Baity center in east Libya, Benghazi, as a humanitarian context.

Specific objectives of the study were to assess the effect of an integrated multisectoral interventional strategy for service delivery to most vulnerable migrant, refugees, IDPs and OOS children, in east Libya and how it can help in realization of the child's rights. It also aimed at contribution of multisectoral intervention with special focus on protection and education for mainstreaming of migrants, refugees' children into public systems in East Libya like admission of non-Libyans into public school system. Target number of children for 1 year project duration was 550, app 100 to 150 per quarter, which did overshoot to more than 700, aged between 5 years to 17 years. Children studying in Grades/Class 1 to class 4 and elementary level depending upon the enrolment and needs, who were eligible for inclusion. Case study of the 10 children is nested with in the first year, efforts with more than 700 children in Baity center.

Information Gathering and Description of Activities

This project was designed as interventional study /operational research to test an integrated, multi sectoral intervention to deliver basic services for the vulnerable children in the East of Libya, Benghazi, Gwarsha area.

It is a combination of qualitative and quantitative research. Survey focus group discussion and in-depth interviews were used as research tools.

A theoretical framework for the Baity center was developed based on few such examples from other countries. This project was practically established with one center in Benghazi and based on the success, was scaled up systematically with implementation of standard package in collaboration with Ministry of social affair, in areas with deprived groups of population.

Intervention focused on most vulnerable Libyan and non-Libyan children to protect their basic rights and integrate in the public systems and society as a productive citizen in future. Intervention is an integrated package of multisectoral services including education, health and protection services, delivered to approximately 700 children both Libyan and non-Libyan, out of school, age 5 to 17 years, enrolled in Baity center (My home).

Initially, estimated number of enrollments were 100 to 200 per session and a total of 3 sessions expected in one year – each batch for

3 months and totaling to approximately 600 children in one year. Months of stay in center was at least 3 months per child depending upon the needs or opportunity to be incorporated into public school system. However due to the high demand in community, more than 700 children were enrolled and benefited from the cross sectoral intervention package.

This primary research was a combination of qualitative and quantitative research, in which qualitative aspects were expected to change with intervention time more than the quantitative elements. One of the key expected outcomes was "Children receiving information and education to catch up with the loss of educational time during migration/movement process for IDPs and getting admission in the public school system according to their age". The case study of the group 10 children, status reflected in Figure 1, is derived from this outcome when these 6 boys and 4 girls were enabled to get admission in public schools and continue their education towards a brighter future, initiated from Baity center and endless efforts of Future makers.

These variables, through specific indicators were used to assess the acceptability of interventions, trends in taking up services and assessing the financial requirement for the scale up as an evidence base for possible future resource mobilisation.

Qualitative information was collected throughout the course through regular and periodic resources to understand the reasons, benefits, fears and community perceptions about the program. Gender based outcome comparison within enrolled group was also done as a part of analysis.

To look at the added value of this interventional program, children from the same communities or similar context in other part of city, who could not access any institution/ Baity center, their parents and communities were included in the FGDs to see the progress and compare the services availability for out of Baity centers children in Benghazi especially in the area surrounding Baity center.

Results related to case study of 10 children

Figure 1 shows the composition of the 10 children by gender and migrant status, and Table 1 shows their demographic characters. Group of 6 boys and 4 girls, non-Libyan, out of school started from different semesters of Baity center during the first year of its establishment, started from March 2021, were enrolled in public schools through Baity center.

Though, school admission policies in Libya are not favorable for non-Libyan children but it's the facilitation process that made it possible for the children to be integrated into the public education system.

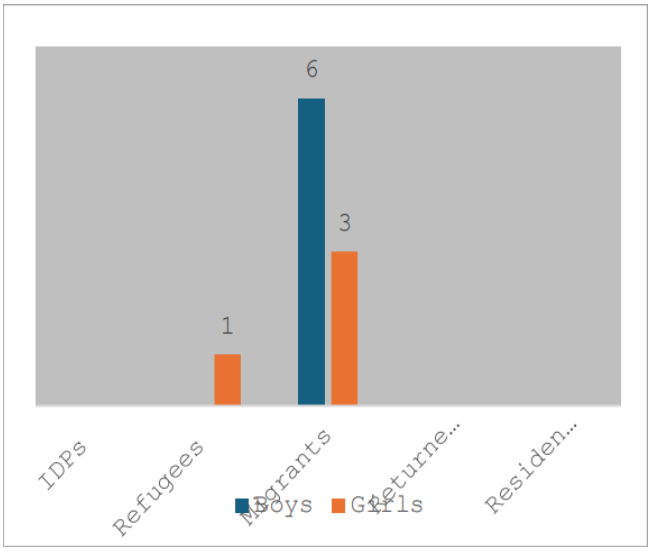

Figure 1. Children Enrolled in Public Schools

Table 1: Demographics and Services Accessed by Children Enrolled in Public Schools

Children /anonymous	Age	Sex	Classes attended	PSS sessions conducted	Health screening	Life skills classes	Taken up in grade
Child 1	2008	Female	Sixth grade	12	Yes	8	Sixth grade
Child 2	2011	Female	Fifth grade	12	Yes	8	Fifth grade
Child 3	2005	Female	Seventh grade	14	Yes	8	Seventh grade
Child 4	2011	Male	Fifth grade	16	Yes	8	Fifth grade
Child 5	2010	Male	Fourth grade	16	Yes	8	Fourth grade
Child 6	2016	Female	First grade	16	Yes	8	First grade
Child 7	2008	Male	Eighth grade	16	Yes	8	Eighth grade
Child 8	2010	Male	Sixth grade	16	Yes	8	Sixth grade
Child 9	2015	Male	First grade	16	Yes	8	First grade
Child 10	2014	Male	First grade	16	Yes	8	First grade

Regardless of the difficulties and challenges that the Future Makers Society faced in registering students due to the lack of their documents and the necessary papers to register them in the public schools, Future Makers Society got 10 children, six boys and four girls, got enrolled in the public schools, from different nationalities: Egyptian (6), Sudanese (3), and Syrian (1).

The key information about the families , migration process, initial and final settlement were detailed by the outreach teams who were mostly in contact with families and trying to address the challenges of access to Baity center and children's involvement in the non formal education process. Few children were interviewed indepth for their journeys, after their admission in schools.

All children belonging to Syrian (3), Sudanese or Egyptian families faced similar problem during the migration process. All migrated for the economic reasons. Journey was rough and mostly first settlement was in the coastal border municipalities. Three families out of 10 reported setting in Tripoli initially, the capital , situated in west of Libya. The final destination was Gwarsha area in Bneghazi where they got access to non formal eductaion in Baity center. Most of the boys were involved in child labor with their father , mother or on their own serving as an earlning member of the family whre as girls were also involved in domestic work with their mothers at own home or in host communities for financial gains. Table 1 shows the extent and variety of servcies that each child received at Baity Center during their enrollment period of one quarter or extended period as per need. Once outreach team form Baity center facilitated their entery test and enrollment in the Baity center , their journey towards new future started.

One of the boys, aged 11 years old, living with his parents and eldest among four brothers, shared that he endured numerous challenges and hardships, but finally found the Baity center as one who provided relief to him. Initially he felt uncomfortable but gradually got absorbed wth rest of the class mates. He was given eight psycho social support sessions, three months of non formal education for Maths, English, Arabic and life skills. Similarly, all these children were provide with

aforementioned support. Psyco social support and life skills eductaion was the backbone of program for these children, given their need for mental health and psycho social support.

For all then children, these sessions foused on topics such as; acceptance of the others, positive thinking / feelings as well as the activities of the friendly space such as interactive and motor games, that resulted in an improvement in their interaction with fellow children and a sense of belonging evolved.

One of the outreach team members expressed that "we found out that he was often bullied because of his weight, and his sensitive personality. The PSS team worked on this note and with time there was more integration and acceptance through many activities and awareness sessions".

In-depth interviews with outreach team members and teachers from future makers revealed the following key challenges for getting admission in regular public school for their migrants, which included 1) lack of legal documents or incomplete proof of legal status. 2) Financial barriers – the education in Libya Public school system is free, however transportation, clothes, food and related expenditures that are essential for the studying children. As many children are involved in labor with parents, opportunity coast of freeing up children for study has a financial implication for the families and siblings for access to basic necessities like food. 3)Besides all the tangible challenges, mental health and psychosocial situation of families and children, fear of being caught, and insecurities imprinted on the innocent minds during the tough migration process created a strong hesitation for joining any institute or group of people outside their immediate families and communities.

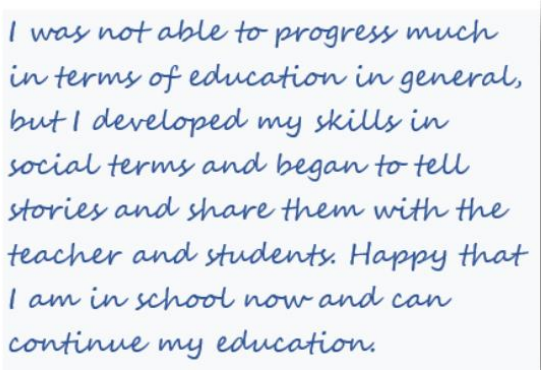

Figure 2. Verbatim from the Migrant Boy Enrolled in School through Baity Center

Discussion

In Libya, the political crisis leading to Qaddafi regime revolt took place in 2011. Long lasting contracted conflicts and humanitarian situation led to the collapse of all the major social sector services. Libya plays a significant role in migration to Europe, serving as both a transit hub and a destination for those fleeing conflict and poverty [10]. In January 2023, IOM DTM reported 706,509 migrants, scattered in 100 municipalities, vast majority in east, especially residing in host communities in Benghazi. Migrants belong from more than 20 countries across Asia, Middle East, Sub-Saharan Africa, and North Africa. In addition to Migrants and refugees, internal displaced families and returnees are also in a compromised situation due to protracted conflicts leading to political, economic and social instability [11]. In December 2021, the IOM Displacement Tracking Matrix (DTM) report presented the data and findings on internally displaced persons (IDPs) and returnees between December 2021, when Baity center project was initiated. DTM Mobility Tracking in Libya reported that number of IDPs within the country continued decreasing, with a parallel increase in the number of returnees. As compared to 661,892 returnees identified in

round 39, the number of those identified during round 40 increased to 673,554 individuals. This indicates a slight increase in the percentage of those returning (2%), accounting for a total increase of 19 per cent since October 2020 ceasefire in Libya [12]. As Benghazi was severely affected in conflicts and vast majority of families from old city of Benghazi fled to the safer areas of Benghazi or other municipalities in east libya not affected by conflicts. Baity center area also covered a dense population of IDPs in Benghazi and majority of children coming from catchment population were IDPs and returnees, during project. With the passage of time, based on migration trends and IOM tracking system, in January 2024, currently there are 705,746 migrants in the country and constantly increasing due to conflict and crisis in the neighboring countries [13]. For example, recent conflicts in Sudan led to a huge influx of the Sudanese feeing from their homes and entering neighboring countries to save their families and lives. Tunis and Libya are mostly the first target countries for these Sudanese refugees. According to UNHCR report of 29 January 2024, more than 10,000 Sudanese have entered Libya through Alkufra, a bordering city with Tunis [14].

A Multi Sector Need Assessment (MSNA) was conducted in 2022, to provide an overall cross-sectoral understanding of vulnerabilities among refugees and migrants in Libya. Assessment highlighted their most pressing needs and the severity of needs, both within each sector and from a cross-sector perspective. This also underpinned the specific challenges and needs faced by refugees and asylum seekers, particularly related to Food Security, Shelter, Water, sanitation, and hygiene (WASH), Education, Health, and Protection through living standard gaps among different population. Among all sectors the gap scale was 0-4, 4 being the maximum. Education sector gap and vulnerability of migrant and refugee children was second highest rated at 3, whereas health gap was the worse [15]. In 2024, same organisation conducted a study on the barriers and enablers for education among migrants and found similar barriers as we observed during Baity center project in Benghazi. These barriers include lack of public transportation. Like Baity center group, according to REACH report, all participants groups highlighted transportation hindering access to education directly by not having taxis or school buses as well as indirectly through financial constrains where parents cannot afford to have personal transport facility. Additionally, fuel scarcity, and limited private transportation options contribute to children's" unregular attendance. "Safety and Security Risks" associated with commuting also restricts access. Armed conflicts, pose significant security concerns especially for displaced and non-Libyan groups. Migrants and refugees also face risks of arbitrary arrest or capture at checkpoints [16].

During 2021, OCHA estimated education sector requires 1.7 m for 5 months to target support for 53705 school age children and 2358 teachers, This includes 23908 displaced children and 2205 returnees, 20030 non displaced , 1494 migrants , and 4573 refugee children. Out of all targeted ,8056 were children with disabilities. [17]. Overall figures covered whole libya. However, Benghazi and many other big cities in east of Libya are growing focus as a settlement point for the refugees who cross border in South or east through Egypt. Recent war in Sudan has shown the same trend for Sudanese refugees. Baity center in Kufra and Benghazi had been able to adjust many of the children form these families. Currently more systematic scale up of this approach is being designed for huge influx of post war Sudanese refugees in Libya.

In such situation, the Civil Society Organisation in Benghazi, Future Maker, who implemented this Operations Research and was capacitated to deliver services to most vulnerable children in integrated manner, were

able to take up the task as UNICEF partner. A Baity center has been established and outreach services team started working in January 2024. Teams are working at community level, referring children to the Baity center or if they have complete documents, then referred to school. Reports show that these refugees are in dire need of support for all services and need a comprehensive package of services. Here, Baity center model is being established as successful again. The need for having more capacitated civil society organizations in Libya is being evidenced by this situation. As these migration trends have been consistent for decades and are expected to continue in future, the model can have a significant impact if adopted in true sense by ministry of social affairs in collaboration with MOH and MOE and continue to scale up in all cities where most vulnerable families are hosted. Restrictive public environment exacerbates the existing low capacity in private sector and civil society organizations to meet the need of vulnerable children or to contribute to their wellbeing, in terms of resource availability as well as capacities. Future maker was selected through a very rigorous, careful, and tedious process as a partner followed by extensive efforts to build their technical, managerial, and financial capabilities.

Based on UNICEF's Multiple Overlapping Deprivation Analysis (MODA), 71 per cent of children aged 0–17 years are deprived in two or more dimensions of poverty. About 10 per cent of households engage in child labor as a livelihood coping mechanism.[18] which deprives them from their right to education. The Operations Research project was successful in achieving multiple outcomes and provided evidence that such children can be served and their access to basic rights can be ensured. It focused on developing an integrated services package to support vulnerable children while also raising awareness in communities and enhancing the capacity of Civil Society Organizations (CSOs) as a national resource. Through this research, which was anchored in actual service delivery through Baity center, the interventional package was proved successful and many dark truths hidden in the suffering communities were revealed through this model, such as sever need for mental health and psycho social support, case management for Gender based violence and child abuse cases, found among vulnerable families.

Appetite in the communities and among migrant families for their children's health and education was translated in to an evidence to advocate for the rights of these vulnerable non-Libyan children, suffering due to restrictive policies of the country. Results showed clearly that services for these children are lacking, and more partners need to pool-in resources and capacities to ensure that all these families and children have access to their basic rights and grow to the best of their potential as productive citizens in the country of their residence.

National capacity – the final way forward!! The involvement of local NGO - Future Maker as a partner was a careful and rigorous selection process, followed by ongoing efforts to build their technical, managerial, and financial capabilities. Additionally, collaboration with Ministry of Social Affairs, Ministry of Education and other Government departments in east, was part f the national capacity building efforts.

Literature clearly shows that the formative experiences of immigrant children will be shaped by reciprocal interactions between the child and its environment. The interrelated contexts of development within which children and youth are embedded shape their opportunities and have important implications for both educational and wellbeing outcomes [19].

Keeping the same objective in mind, researcher worked with ministry of social affair, education, and health as counterparts throughout the project and succeeded in scaling

up the model in other municipalities of east as well. This gives an indication for the sustainability of the project. More resources for the continuity of the project have also been promised by the donors, however long-term sustainability is expected through collaborative efforts with social affairs and education sectors in East Libya. Now more than ever, the world's children and young people need global action to invest in health and education, build more resilient systems and services that can reach everyone, and ensure that budget cuts and economic downturns do not harm them [20]. This Operations research revealed the truth that children can be brought out of dust and given a beautiful dawn with a well-designed community-based approach, such as "Baity Center", Arabic version of My Home!

Conclusion

Migration is an extremely intense process, especially illegal migration. Families and children involved in this process are affected by the events for a long time. The absence of legal status of the families poses immense challenges and deprive children of their basic rights.

In such situations, it is crucial that national institutes are strengthened to support these children and ensure their access to basic rights and essential services. This case study of 10 children exemplifies that impossible can be made possible. Future Makers, a local civil society organization, was instrumental in supporting about 700 children and their families for one year project. Their tireless struggle with each child to bring them back to a positive level was commendable. Team encouraged them to learn, enhanced their life skills, provided non-formal education and enabled them to take school examination and finally enrolled in school.

Establishing a multi-sectoral strategic package and building capacity of the local CSOs and institutes to deliver these services was the most vital step. The collaborative approach from government officials, other institutes, and families in addition to financial support from donor resulted in miraculous outcomes. To scale up the model and services package to be delivered to all such families in east of Libya, Ministry of Social Affairs was actively engaged throughout the process. The process of integrating this service delivery approach into ministry's agenda is ongoing and is expected to be scaled up to reach the last child. An effective combination of strategic multisectoral package under one roof and equipped civil society organization, brought children out of dust and raised them to the enlightened dawn. Commitment of Future makers was pivotal in this whole process that contributed to the healthy lives and bright future of these children.

Acknowledgements

The authors wish to acknowledge all the service providers in Future Makers that participated in the delivery of services to the vulnerable children in Baity center, Benghazi. Sincere thanks to outreach team who identified these children and brought them to Baity Center for a life changing experience. Big thanks to Gaballa Benhallom and May Abdulwanis, who build the capacity of Future Makers to establish and run the Baity center. Grateful to Dr. Ahsan Ahmed for constant reviews and feedback.

Declaration of Conflicting Interest

The Authors declare that there is no conflict of interest.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art003

Evidence-Based Study into the Coping Demands of Headmistresses in Selected Senior High Schools in the Kumasi Metropolis: A Mixed Method Study

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Abstract

Management of academic institutions is a daunting task since humans are placed at the center of all activities carried out in that space. Despite the continuous supply of human and material resources by various governments to supervise, plan, strategize, and implement structures for an expected result, there still exist loopholes. This study uses the mixed method technique to examine the coping demands of headmistresses in selected senior high schools in the Kumasi metropolis of Ghana. Using the cross-sectional study design with purposive sampling, this study was conducted on 14 female headmistresses from 14 senior high schools with the use of interview-based structured questionnaires with one-on-one interviews with headmistresses. Study results reveal that headmistresses' ambition and drive on their pathways to leadership, study results indicate that 57% of respondents agree is it through academic qualifications, followed by progressive promotion (36%) and finally intrinsic motivation (7%). On headmistresses coping mechanisms in their world of work, 50% reveal they ignore any form of negativity, followed by gender biases (48%) and personal reflection (2%). Again, study results revealed that headmistresses treat their critics as though they do not exist in dealing with negativity. This study recommends that upcoming research should consider these coping demands of female headmistresses relative to the demands of managing academic institutions zand state policies on education.

Keywords*: Coping Demands, Evidence-Based, Ghana, Headmistresses, Mixed Method, Senior High Schools.*

Introduction

Management of academic institutions is a vital part of human learning [1]; [2], with the opportunity of establishing unique codes of esteemed behavioural patterns [3]. It also establishes the circumstances for good instructional capacity and the development of cultural heritage for continuous learning for both educators and students [1]; [3]. Effective school leadership has proven to be a critical tool for improving school efficiency and equity [4]. The managements of most modern schools have shifted to the demands of contemporary societies [3]. Thus, much autonomy has been given to schools in their decision-making processes, and hence more outcomes expected of them [1]. This has thus has proven as synergies uniting stakeholders to meet expected outcomes as far as teaching and learning, with administrative decorum are concerned [3].

It is a general belief that the future of every society is reliant on education and for that matter schools. It is argued that education is an indispensable catalyst that strongly influences the development and economic fortunes of a nation and the quality of life of its people. The success of schools, however, depends on various school-related factors [5]. According to [6], the most important activity next to

Received: 06.05.2024 ***Accepted: 30.05.2024*** ***Published on: 30.07.2024***
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classroom instruction is to improve students' learning in school leadership. School leaders play a crucial role in school change and school improvement [7]. The leadership provided by school heads, both males and females, is an indispensable factor in enhancing students' achievement and for that matter the success of schools [4].

The three main levels of schools in Ghana—basic, high, and tertiary—can be used to organize leadership practices and expectations in the educational sector. At the tertiary level, leadership practice and performance are more concerned with raising the visibility of the schools through research and the impacts graduates have on local, national, and international levels than they are at the elementary and high school levels, where they are more concerned with students' accomplishments in standardized examinations. Building pupils' broad intellectual foundations by assessing their areas of strength and weakness is the primary goal of basic education in Ghana [8]. At this point, the leadership responsibilities of school administrators are focused on developing curricula and pedagogy, forging solid partnerships with parents and the community, controlling class sizes, and raising students' success levels.

The intermediate stage of education known as Senior High School, on which this research is centred, lays the groundwork for students' future post-secondary specializations in both academics and careers. This level of education is crucial to Ghana's educational system because it calls for the leadership and direction of school administrators and instructors to help students make decisions that will shape their future professional growth. The SHS level is the most challenging stage in Ghana's educational architecture, since students' failure to succeed at this level might have detrimental long-term effects on both their academic and professional growth [8]. The SHS level also corresponds to the adolescent stage of students' lives, during which significant physiological and psychological changes take place and a number of individual decisions must be made.

According to [9], women have taken on more leadership roles in Ghana, with the educational sector being a standout example, and they continue to increase in number [10]. Since the 1990s, women have assumed leadership roles at all levels of government and in all fields of study. Women have held positions at the highest level, as headmistresses of Senior High Schools (SHS), and as vice-chancellors of public institutions [10]; [11]; [4]. The idea is that women can lead just as well as men, and in some cases have done so with even greater outcomes [10]. However, regardless of gender, the performance expectations in administrative leadership remain the same [10].

The notion of headmistresses coping strategies pertains to the methods employed by female school heads to effectively manage the various pressures and challenges that are inherent in their leadership positions. This entails comprehending their stress levels, the techniques they employ to uphold a balance between their professional and personal lives, and the impact of their emotional intelligence on their coping mechanisms. The concept under consideration may be influenced by various variables, such as the individual's personal resilience, support systems both personal and professional, as well as the demands and expectations associated with their roles. It is in this light that the study, therefore, explores the coping strategies used to negotiate the challenges headmistresses are confronted with in their professional career trajectory.

The involvement of female leadership in the field of academia cannot be overemphasized [5]; [11]. There has been widely acknowledged research on female inclusion in the educational sector in Ghana including those of [10], [12], [1], [11], [2] and [4], however, none of them has researched into the coping demands of headmistresses let alone using empirical views, thoughts and opinions of these female leaders.

The work of [10]. exclusively delt with promoting equity in school leadership appointment while that of [12] covers female teachers in general. The work of [1] also dwells on leadership and economic development of Ghana in general while that of [11] concentrates on Ghana's educational system and its implication for educational equity. Again, the work of [2] thrives on the role of leadership development in restructuring vocational and technical education in Ghana while that of [4] focuses on educational leadership and quality education in disadvantaged communities in Ghana and Tanzania. There is consequently the need to discover the coping demands of headmistresses in the helm of their daily strenuous affairs as heads of selected senior high schools. Therefore, this study is aimed at exploring the views, opinions, thoughts and interpretations of heads of selected senior high schools in the Kumasi metropolis on their coping demands as heads of these academic institutions.

Methods

Study Settings and Design

This recent study was conducted in the Ashanti region of Ghana and was part of a broader study titled the lived experiences and coping strategies of selected headmistresses of senior high schools in the Kumasi metropolis, due to the multicultural nature of the area. The study was conducted between March 1, 2022 and March 31, 2022. The study employed the mixed method of research inquiry to examine and discover the experiences, opinions and views of study respondents, to provide a more all-inclusive insights a research question [13]; [14]. Hence, the purpose of using mixed methods was to make the study comprehensive and more credible that a single technique cannot accomplish [15]; [16].

Design

The study employs a phenomenological research design in the execution of the study to meet the research objectives. Thus, the researcher wanted to investigate the everyday experiences of headmistresses of selected senior high schools while suspending personal preconceived assumptions about the phenomenon [17]. The personal experiences of respondents are understood based on the meaning found in their daily schedules and coping demands of such schedules. The research bordered on the constructivist theoretical framework to understand how female headmistresses cope with educational leadership demands. Hence, the goal of this study was to understand and interpret how headmistresses conceptualized the meaning of leaderships roles and how they cope with the difficulties associated with their leadership demands.

Study Population

This study consisted of all female headmistresses in the Ashanti Region and focused on 14 of them within the Kumasi Metropolis. Regarding the hierarchical structure of the schools, the school heads are at the top and are in charge of management and handling the everyday administration of the schools. Hence, the leadership strategy, course, and dream of the heads have crucial impact on the organizations' leadership practices and styles as well as the success of these institutions. In effect, female SHS school heads with at least two years of continuous experience in such a leadership role were included in the study.

Sample and sampling procedure

The multistage sampling technique involving simple random sampling, cluster sampling and purposive sampling was applied. The study purposively selected randomly one administrative region out of the sixteen regions of Ghana. In the selected region, cluster sampling was used to group senior high schools in the administrative districts within the region, and one metropolitan area was considered.

Finally, 14 female headteachers of senior high schools were purposively selected. The researcher then arrived at the desired sample size after saturation for selection was reached. Thus, direct feedback on the important concerns raised in the study requires purposeful direct engagement of the school heads. Hence, the study aimed to perform a thorough analysis of headmistresses' coping mechanism to their numerous demands and schedules.

Data collection procedure

The study data were collected between March 1, 2022 and March 31, 2022. Study consent was sought from authorities of selected Senior High Schools and respective respondents. The interviews were conducted to gain the perspective results of the topic on the coping demands of study participants. Again, the identities of study respondents, along with the responses from interviews and focus group discussions were kept confidential. As a result, measures were taken to protect the intellectual interests of study respondents and their involvement in this project somehow did not endanger their overall well-being. The interviews were conducted for a period of not more than 30 minutes and done in safe and convenient environment according to the choice of the selected participants.

Data Analysis

Quantitative data were analyzed using tables, bars and cones, and the phenomenological analytical framework, through the Colaizzi's eight-step strategy was used to analyze qualitative data from participants. The steps applied to analyze qualitative data are as follows:

Using the phenomenological analytical framework, the study used Colaizzi's eight-step strategy in describing participants' experiences of their coping demands (1978). The steps applied to analyse the study are as follows:

1. Read transcripts several times to get a sense of whole content;
2. Add to bracketing journal any thoughts, feelings, and ideas gained due to connection with topic;
3. Identify significant statements and phrases from transcript;
4. Aggregate formulated meanings from significant statements;
5. Provide categories, clusters of themes from meanings;
6. Integrate resulting ideas into exhaustive description of phenomenon;
7. Reduce exhaustive description to fundamental structure;
8. Return to participants for member checking; and
9. Validate exhaustive description and its fundamental structure

Transcripts for the study were read repeatedly throughout the coding process and formulated meanings from noteworthy statements were created from responses and provided categories. The researcher then integrated the results into an exhaustive description of the phenomenon. Steps 7 and 9 were combined where the researcher reduced and validated the exhaustive description to a fundamental structure. Finally, themes were reviewed and checked against sampled transcripts to ensure consistency of narratives and themes.

Results

The leadership trajectories of the headmistresses within the Kumasi Metropolis showcase a myriad of experiences and pathways to ascendancy. Tracing the contours of their journeys provides a rich tapestry of professional growth, blending individual aspirations with systemic protocols set by the Ghana Education Service (GES). The findings of these background information of study participants are shown (see Table 1).

Table 1. Background Information of Participants

Participant	Year in Leadership Role	Previous Role(s)	Method of Progression
1	3 years (Headmistress) + 3 years (Assistant Headmistress)	Head of Department, Assistant Headmistress	Structured promotion through GES, interviews, moves due to family
2	+ 3 years Headmistress	AD II, AD I, Assistant Head	Ambition, rising through GES ranks, exams, and Interview
3	1 year (Headmistress) + 5 years (Assistant Head)	1 year (Headmistress) + 5 years (Assistant Head)	Progressed through management, became head of a newly absorbed school, faced challenges of establishing the school from scratch.
4	+4 years Headmistress	P.S, AD II, AD I, Assistant Headmistress	Sequential promotions through GES ranks: P.S. to AD II, AD II to AD I, then Assistant Headmistress
5	+4 years Headmistress	Guidance and Counselling Coordinator, HOD, Senior Housemistress, Assistant Headmistress	Rising through GES ranks, needed 3+ years in previous roles to apply for Assistant Headmistress, then 2+ years to apply for Headmistress
6	1 year (Headmistress) + 3 years (Assistant Head)	Head of Department, Assistant Headmistress	Progressive promotions through GES ranks: P.S. to AD II, AD II to AD I, then Assistant Headmistress
7	3 years Headmistress	Head of Department	Structured promotion through GES, interviews, push by old students 'recommendation
8	3 years (Headmistress) + 4 years (Assistant Head)	Housemistress, HOD, Assistant Headmistress	Ambition, rising through GES ranks, exams, and interview
9	6 years (Headmistress)	School chaplain as well as Assistant headmistress	Structured promotion through GES, interviews, and church structure

10	1 year (Headmistress) +3 years (Assistant Headmistress)	Guidance and Counselling Coordinator, Senior Housemistress	Ambition, rising through GES ranks, exams, and interview
11	3years Headship +5years Assistant Head	Head of Department, Assistant Headmistress Senior Housemistress Assistant Headmistress	Ambition, rising through GES ranks, exams, and interview, and church appointment
12	2years Headmistress 3years HOD, 5years housemistress	Housemistress, Head of Department Assistant Headmistress	Ambition and motivation GES ranks, exams, and interview
13	7yeas HOD 3years Headmistress	Head of Department, Headmistress	Rank, Interview, and Luck
14	2years Headmistress, 5years Assist 5years HOD	Housemistress, Head of Department Assistant Headmistress	Ambition and motivation GES ranks, exams, and interview

Source: Field work

Themes

The themes identified in the study as coping demands of headmistresses are outlined and presented below:

Theme 1: Coping Mechanisms and Resilience

Leaders often face criticism, doubt, and scepticism from various external sources. Whether it is community judgments, workplace gossip, or societal standards, there is a plethora of negativity that can hinder a leader's performance and well-being especially being a female leader.

Participant 3 succinctly encapsulated this, stating,

> *" In the community, sometimes they look at you with a different eye. Why is this woman always coming from work late and all that? She's busy, she doesn't even talk to anybody when there is funeral, you don't even see this woman coming to greet and all that. But sometimes, you see, it's not your problem, but it's because of the work schedule at the office."*

Theme 2: Ignoring Negativity

Leaders often face criticism, doubt, and scepticism from various external sources. Whether it's community judgments, workplace gossip, or societal standards, there's a plethora of negativity that can hinder a leader's performance and well-being. This subtheme emphasizes the importance of discerning which feedback to internalize and which to set aside.

In the process, the leader learns to remain steadfast in their vision and purpose, unwavering by external distractions.

Participant 6 succinctly encapsulated this, stating,

> *"Oh, you just behave as if they do not exist. Because if you want everything to bother you, you become depressed. And you know when you are growing old, high blood pressure and its associated diseases. So, you have to let go. You just listen to some of them or you hear some and you just smile and you just walk by. Because you know that doesn't state the truth."*

Furthering this sentiment, Participant 5 mentioned,

> *" In the community, sometimes they look at you with a different eye. Why is this woman always coming from work late and all that? She's busy, she doesn't even talk to anybody when there is funeral, you don't even see this woman coming to greet and all that. But sometimes, you see, it's not your problem, but it's because of the work schedule at the office."*

These sentiments highlight the importance of focusing on the larger picture and not getting bogged down by external negativity. These experiences are further corroborated by Fig. 1 below.

Table 2 Headmistresses' Coping Mechanisms in their World of Work

Coping mechanism	**Value**	**Percentage (100%)**
Ignoring negativity	7	50%
Gender biases	6	48%
Personal reflection	1	2%
Total	**14**	**100**

Source: Field Survey, 2023.

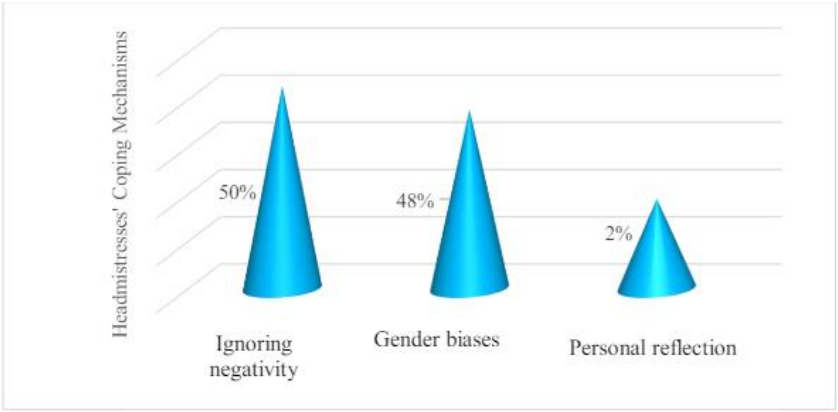

Figure. 1 Headmistresses' Coping Mechanisms in their World of Work

Source: Field Survey, 2023.

Theme 3: Advocacy for Women

However, every challenge was met with resilience and an inherent desire to uplift other women. The headmistresses weren't just leaders; they were advocates, challenging biases and laying pathways for future women leaders. Participant 13 passionately declared,

> *"And what some people don't understand is that females, we are really working hard to also contribute our quota to the society. Some don't*

think so. They think it's just a matter of us. We've been just pushed up, just for doing practically nothing. But we've been working hard and then we are moving up the social ladder and the academic ladder and in terms of positions."

Participant 10 added,

"You know, Ghanaian society, you've been a headmistress. It's a role model for the young ladies out there. So my leadership or my dream to become a headmistress has helped me to achieve that role of impacting positively to the ladies, the young women, the young women in my community."

Their advocacy, grounded in their lived experiences, emerged as a clarion call to recognize and value the contributions of women in leadership roles.

In essence, the journey of these headmistresses encapsulates the multifaceted experiences of women in leadership. Navigating the tightropes of societal expectations and biases, they've not only carved their niche but have also championed the cause for more inclusive, gender-sensitive leadership paradigms. These findings are further supported by study results in Fig. 2 below.

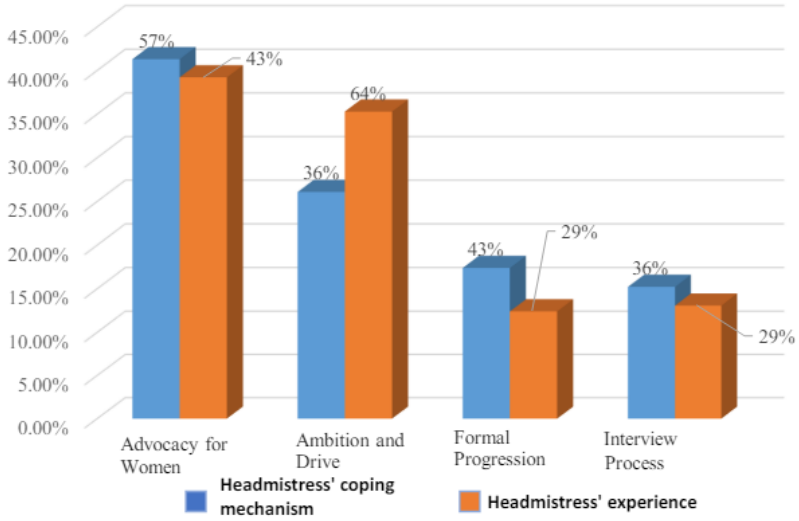

Figure 2. Leadership Experiences of Headmistresses

Source: *Field survey, 2023.*

Theme 4: Ambition and Drive

A common thread across the narratives was the intrinsic motivation and desire to ascend to leadership positions. This ambition often superseded any external factors and served as a driving force in their respective journeys. Participant 5 candidly expressed,

"Yes, it's been my ambition. I myself am a disciplinarian. And I have the conviction that if I have a group of students under me, together with myself, I will be able to discipline them. And then mould them into a good adult. And then you should know that if students are disciplined, they are academically good. Because a disciplined student will obey all school rules and regulations and will sit down and learn. So that is my main reason for becoming a headmistress."

Such expressions signify a deep-rooted passion for leadership and the broader sphere of influence it entails. Additionally, Participant 1's reflection,

" Oh, yes. As I went to the training college, every teacher hopes to climb the ladder of even becoming the director in charge,"

Hence, participant 1 captures the essence of the inherent aspiration that many participants felt towards the role of a headmistress.

In sum, the path to leadership, as portrayed by the participants, is a blend of structured professional progressions, rigorous evaluations, and an inherent drive to lead.

Table 3: Headmistresses' Ambition and Drive

Pathways to leadership	**Value**	**Percentage (100%)**
Intrinsic motivation	1	7
Progressive promotion	5	36
Academic qualifications	8	57
Total	**14**	**100**

Source: Field survey, 2023.

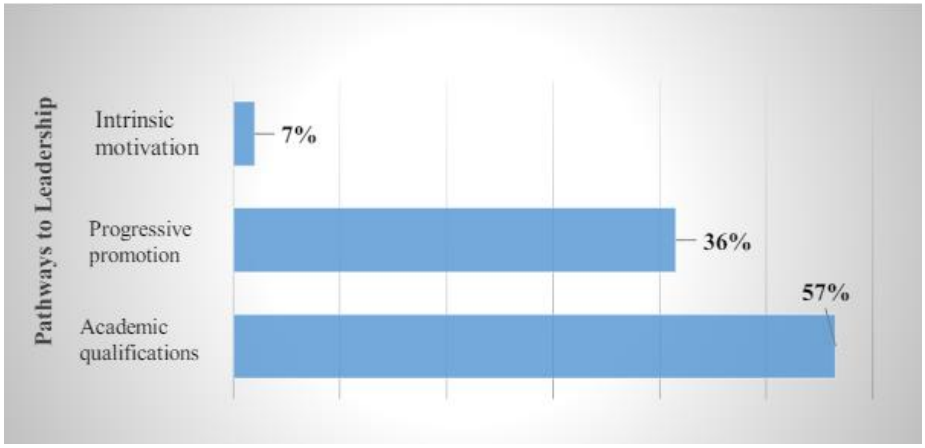

Fig 3: Headmistresses' Ambition and Drive

Source: Field Survey, 2023.

Discussion

Study parameters sought to explore how headmistresses cope with the multifarious demands that are intrinsically associated with their roles as female leaders. Through the prismatic lens of the themes and subthemes emerged from the study data, there is intricate dynamics of leadership, resilience, and gender interplay. An indispensable facet of the headmistresses' experience is the spectrum of challenges they confront in leadership roles. The internal obstacles, particularly those arising from staff compliance (See Fig. 1), resonate with findings from [18], which underlined the frequent tensions between leadership decisions and staff adherence, especially in academic environments. Leaders are often left navigating a complex maze, seeking both assertion and collaboration. The external obstacles headmistresses face further underscore the multifaceted nature of their leadership roles. Gender biases, deeply embedded within societal structures, emerge prominently (see Table 2). The alignment with the observations of [19] is evident, emphasizing the juxtaposition of traditional gender roles with the authoritative demands of leadership. Such biases not only challenge their legitimacy but also cast a prolonged shadow on their efficacy (see Theme 2).

The desire and drive of headmistresses' coping mechanisms and resilience to the continuous demands of their offices give them

the urge to cope with both internal and external pressures that come their way in their day-to-day routines (see Themes 1 and 2). It is fascinating to note how these mechanisms contribute to the evolving identity of study participants as revealed by study results (see Fig. 3). Desire for drive, as emphasized by the headmistresses, aligns with [20] broaden-and-build theory of positive emotions, suggesting that maintaining a positive outlook expands cognitive, emotional, and social resources. By focusing on constructive feedback and dismissing the negative, they bolster their resilience and mental fortitude. Moreover, Seeking Support sheds light on the collaborative nature of leadership identity construction. As [21] articulated, learning is a social process, and seeking guidance from experienced peers not only expands one's leadership toolkit but also enhances self-efficacy. Again, headmistresses' personal reflection is congruent with [22] reflection-in-action and reflection-on-action, emphasizing that identity is continually moulded and established through introspective practices. The study finding is consistent with earlier studies by [22], [1], [3].

Given these challenges discovered by this study (see Themes 1 and 2), the exploration into headmistresses' coping mechanisms offers insightful revelations. Ignoring negativity, for instance, emerges as a prominent adaptive strategy. This mirrors the work of [23], who posited that effective leaders in challenging contexts often develop selective attention, honing in on constructive criticism and sidelining unfounded negativity. Again, seeking support underscores the collaborative nature of their leadership journey. This resonates with the research by [24], which highlighted the indispensable role of mentorship and peer support in leadership trajectories, especially for women in patriarchal settings. By leveraging collective wisdom, they not only fortify their decisions but also create a sustainable support network. Moreover, personal reflection emerges as a vital cornerstone. [25] have expounded on the significance of introspection in leadership, emphasizing that recognizing one's strengths and weaknesses facilitates a more adaptable and responsive leadership style, especially crucial in dynamic academic settings. Such experiences compel them to consistently validate their worth. Furthermore, the experiences of bias they encounter necessitate an added layer of resilience. As corroborated by [26], biases against female leaders often manifest as doubting their capabilities or diminishing their achievements.

Finally, the passion and character as role models and unflinching support and advice from these women in higher levels of academia to future female leaders provide a reflective lens into their leadership identity evolution (see Themes 3 and 4). continuous learning reiterates [27] growth mindset, emphasizing that identity is not static; it evolves through learning and experiences. Their emphasis on pursue passion resonates with [28] self-determination theory, suggesting that intrinsic motivation, rooted in passion, is central to the self-concept of leadership identity. Amidst their leadership roles, these headmistresses also emerged as strong advocates for women, championing broader societal transformation and inclusivity, in line with the insights from [29]. These findings of women serving as role models and influencers are in agreement with the work of [30] and [31].

Limitations

This study has some limitations regarding the participants, scope and data collection instruments. The study was limited to only senior high school headmistresses. The experiences of female headmistresses in the selected senior high schools in the Kumasi metropolis could possibly influence their responses to the interviews and affect the

validity of the strength of the conclusion. Likewise, the study purposively selected 14 headmistresses in the Kumasi metropolis. The interview guide was a self-developed instrument based on previous literature and theories. That notwithstanding, the study employed several scientific scrutinise such as developing of interview guide with previous literature, pre-testing of tools, informed consent as well as methodological and interpretive rigour of analysing qualitative data [32]; [33].

Conclusion

In summation, the experiences of SHS headmistresses paint a vivid picture of leadership identity construction, emphasizing its dynamic, iterative, and multifaceted nature. It's a confluence of styles, coping mechanisms, communication, and personal philosophies, uniquely intertwining to shape leadership personas. Their narratives serve as an enlightening testament to the complexities of leadership identity, intricately blending theory with practice. While gender biases posed considerable challenges, the tenacity and resilience showcased by these women leaders are emblematic of broader shifts towards gender inclusivity in leadership roles. Their journey not only represents their personal triumphs but also serves as an inspiration for countless other women leaders navigating similar terrains.

Acknowledgments

The author is very grateful to the Ghana Education Service, Kumasi Metropolis, and the headmistresses of the senior high schools. She is also thankful to all the study participants for their responses and supports during the data collection. Lastly, she would like to express her gratitude to Rev. Patrick Agyekum for both his prayers and financial support.

Disclosure Statement

The author declares that she has no competing interests.

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Consent to Publish

Not applicable

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Data Availability Statement

All data supporting findings are available upon request.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art004

Examining the Lived Experiences and Identity Construct of Selected Headmistresses of Senior High Schools in the Kumasi Metropolis: A Mixed Method Study

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Abstract

Leadership roles are crucial in the sustainability of public institutions since it is the engine room for nurturing future leaders. Despite the granting of equal opportunities for females to assume leadership roles in academic institutions in Ghana compared to their male counterparts, there still remain some institutional challenges that female headmistresses have to grapple with. Using the mixed method technique, this study examined the lived experiences and identity construct of selected headmistresses of senior high schools in the Kumasi metropolis of Ghana. The cross-sectional study design with purposive sampling was conducted on 14 female headmistresses from 14 senior high schools in the Kumai metropolis. Interview-based structured questionnaires with one-on-one interviews were used. Study results indicate that 71% of challenges that headmistresses are exposed to are internally generated, especially in gender stereotyping by undermining female heads. On areas of headmistress' lived experiences, 57% of respondents agree that most efforts are geared towards women advocacy, with 64% demonstrating for ambition and drive. Again, this study reveals that through disciplined leadership experience, female school heads are able to mould students to become good adults as future leaders. The study recommends for future looking studies should consider these lived experiences of female heads in relation to the demands of policymakers to make lasting resolutions which are academically and environmentally friendly.

Keywords: *Ghana, Headmistresses, Identity Construct, Lived Experiences, Mixed Method, Senior High Schools.*

Introduction

Leadership is vital in the field of academia as it establishes the circumstances and expectations for good instruction and the development of a culture of continuous learning for both educators and students [1], [2], [3]. According to [3], effective school leadership is critical for improving school efficiency and equity. Expectations for schools and school leaders are shifting as countries strive to adapt their education systems to the requirements of modern society [2]. Many nations have shifted toward decentralisation, giving schools more autonomy in decision-making and holding them more responsible for outcomes [4]. In such cases, leadership and leadership practices play a critical role in uniting the ranks to adopt policies and strategies to meet the concerns of stakeholders, as well as issues pertaining to both curriculum and pedagogy [2].

The importance of school leadership has increased on the global agenda for education policy. It has a significant impact on teachers' capacities and motivations as well as the culture and environment of the classroom, helping to improve educational outcomes [5]. Effective school leadership is crucial to increase the effectiveness and equality of education [4]. According to [6], strong leadership is crucial in educational institutions since it improves the

Received: 06.05.2024 ***Accepted: 21.05.2024*** ***Published on: 30.07.2024***
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workforce's quality and encourages schools to support one another in making improvement.

Hence, effective school leadership, should exhibit strong accountability principles to boost confidence in leadership administration and develop quality standards to direct the actions of subordinates and students [3]. [7] argued that, as a result, the position of school leadership is becoming more and more characterized by a demanding set of responsibilities, including administration of finances and human resources as well as leadership for learning. In order to assist in developing quality and operational standards, leadership in educational institutions should be broad and provide advice and directions in a variety of formats. The focus of leadership study has shifted between leadership as a person and leadership as a position or process, making this vital [8].

Women leaders have different viewpoints on leadership than their male counterparts. They therefore employ more open communication options, set a good example, motivate people to achieve their best, and are more ready to make errors [9]. Furthermore, female leaders are more attentive to the requirements of their followers or subordinates [10], [11]. Despite these advantages, women executives confront several hurdles [11]. Ref. [12] has found that, due to the prevalent relationship between male features and leadership, women leaders feel a need to balance their feminine and masculine attributes in order to be viewed as suitable for a leadership post. Furthermore, male leaders advance quicker into leadership roles/positions than female leaders [13], [12]. When compared to male leaders, women leaders are more likely to have gender preconception affecting their performance appraisals and related awards while in a leadership position [13].

The SHS education in Ghana is divided into grades based on students' performance on the West African Examination Council's standardized exams: Grades A, B, C and D, as well as mission and non-mission schools. The student body is divided into mixed-sex, single-sex (boys), and single-sex (girls) students. The ownership structure is divided into public and private. Any one of these classifications has a significant impact on the school heads' real-world knowledge, inventiveness, leadership style, and functional abilities. This study gravitates towards exploring the lived experiences and how headmistresses construct their identity in their world of work.

Even though female academicians are increasingly visible in leadership positions in secondary schools, the experiences they cope with in order to achieve this prestige are not for the fainthearted [14]. In contemporary research in female leadership in Ghana, there has been limited research on women in educational leadership with no research on lived experiences on female headmistresses in Ghana. The work from [15] in the Tano North Municipality of Ahafo region of Ghana exclusively hovers on female teachers in general while that of [16] hangs on educational equity. The work of [3] borders on educational leadership and quality education in disadvantaged communities in Ghana and Tanzania while that of [17] only reviews Ghana’s educational policies and its implication for educational leadership in developing countries. A more classic work is that of [2] which focuses on the involvement of female educationists in the effectiveness of schools, however, it was conducted at the junior high school level. There is therefore the need to further explore women’s lived experiences towards school effectiveness at the senior high school level, hence, this study is aimed to bridge that gap. Thus, this study is a direct reaction to the empirical expectation that leadership practices examined, with a focus on female school leaders. The study explores the experiences of female heads of selected senior high schools as a reaction to filling the gap vis-à-vis the challenges they are exposed to in determining their duties in a Ghanaian educational setting. The study also explores the

ways on how female senior high school heads manage the demands of their jobs. In addition, the study further explores how leadership experiences in second cycle institutions shape the identity of female leaders. It is in this light that the study, therefore, explores the lived experiences of female heads of senior high schools in Kumasi Metropolis and how headmistresses construct their identity in their world of work.

Methods

Study Settings and Design

The study was conducted in the Ashanti region of Ghana and was part of a broader study titled lived experiences and coping strategies of selected headmistresses of senior high schools in the Kumasi metropolis. This region was purposively selected due to its geographical location (middle belt), which has diverse representation of the 16 regions of Ghana. The study was conducted between March 1, 2022 and March 31, 2022. This study instigated mixed method of research inquiry to explore and examine the views, opinions, and experiences of study respondents, to provide a more comprehensive understanding of a research question [18], [19], [20]. Thus, the purpose of using mixed methods was to make the study complete and more trustworthy that a single method cannot achieve [21], [20], [22].

Design

The study, therefore, employed the case study design in the accomplishment of its research objectives. The case study design helps provide the opportunity to solicit information from female headteachers' lived experiences in their leadership practices. The experiences of participants are interpreted based on the meaning found among the participants. The research was framed in a constructivist theoretical framework to understand how female headteachers handle educational leadership. Therefore, the goal of the research was to understand and interpret how the female headteachers conceptualized the meaning of leaderships roles and how they manage the difficulties associated with educational leadership. As the phenomenological approach is constructivist: the goal was to explain the essence of the lived experiences of a phenomenon or concept, under a study of individual. Due to the nature of the research, the data collection and analysis could be continually adjusted to the emerging results [23], which will lead to understanding the lived experiences and how headmistresses construct their identity in their world of work.

Population

The study consisted of all female headteachers in the Ashanti Region and focused on 14 heads of senior High schools in the Kumasi Metropolis. In terms of the leadership structure of the schools, the school heads are at the top and are in charge of overseeing and managing the day-to-day operations of the schools. As a result, the leadership strategy, direction, and vision of the heads have an impact on the substructures' leadership practices and styles as well as the success of the schools. This influenced the choice to include the SHS administrators in the study. Female SHS school heads with at least two years of continuous experience in such a leadership role were used in the study.

Sample and Sampling Procedure

The study adopted the multistage sampling process involving simple random sampling, cluster sampling and purposive sampling. The study then selected, randomly, one administrative region out of the sixteen regions of Ghana. In the selected region, cluster sampling was used to group senior high schools in the administrative districts of the region, and one metropolitan was considered. Then 14 female headteachers of senior high schools were purposively selected. The researcher then arrived at the desired sample size after saturation for selection was reached.

The choice of female headteachers as the study subjects is due to the fact that the study's target population was the female headteachers of the chosen SHSs. Because the researcher believed that the headteachers of the SHSs had in-depth knowledge and expertise in leadership methods for the efficient administration of their schools, purposive sampling was used in the procedure. As a consequence, direct feedback on the important concerns raised in the study requires purposeful engagement of the school heads. Hence, the study aimed to perform a thorough analysis of headmistresses' lived experiences and their identity construct as far as leadership roles of women concerned.

Data Collection Procedure

The study data were collected between March 1, 2022 and March 31, 2022. Study consent was sought from authorities of selected Senior High Schools and respective respondents. The interviews were conducted to gain the perspective results of the topic on the lived experiences and identity construct of selected headmistresses of senior high schools. Again, the identities of study respondents, along with the responses from interviews and focus group discussions were kept confidential. As a result, measures were taken to protect the intellectual interests of study respondents and their involvement in this project somehow did not endanger their overall well-being. The interviews were conducted for a period of not more than 30 minutes and done in safe and convenient environment according to the choice of the selected participants.

Data Analysis

In addition to tables, bars and pie chart used to analyze quantitative data, the phenomenological analytical framework, through themes using Colaizzi's eight-step strategy was used to describe participants' lived experiences (1978). The steps applied to analyse the study are as follows:

1. Read transcripts several times to get a sense of whole content.
2. Add to bracketing journal any thoughts, feelings, and ideas gained due to connection with topic.
3. Identify significant statements and phrases from transcript.
4. Aggregate formulated meanings from significant statements.
5. Provide categories, clusters of themes from meanings.
6. Integrate resulting ideas into exhaustive description of phenomenon.
7. Reduce exhaustive description to fundamental structure.
8. Return to participants for member checking and
9. Validate exhaustive description and its fundamental structure.

Study transcripts were read severally throughout the coding process and formulated meanings from significant statements were generated from responses and provided categories for these statements. The researcher then integrated the results into an exhaustive description of the phenomenon. Steps 7 and 9 were combined where the researcher reduced and validated the exhaustive description to a fundamental structure. Finally, themes were audited and checked against sampled transcripts to ensure consistency of narratives and themes.

Results

The management routes of the headmistresses within the Kumasi Metropolis showcase a valuable depth of experiences and routes to power. Tracing their journeys provides rich levels of professional development, considering individual aspirations with general conventions set by the Ghana Education Service (GES). The findings of the background information of study participants are shown in Table 1.

Table 1. Background Information of Participants

Participant	Year in Leadership Role	Previous Role(s)	Method of Progression
1	3 years (Headmistress) + 3 years (Assistant Headmistress)	Head of Department, Assistant Headmistress	Structured promotion through GES, interviews, moves due to family
2	+ 3 years Headmistress	AD II, AD I, Assistant Head	Ambition, rising through GES ranks, exams, and Interview
3	1 year (Headmistress) + 5 years (Assistant Head)	1 year (Headmistress) + 5 years (Assistant Head)	Progressed through management, became head of a newly absorbed school, faced challenges of establishing the school from scratch
4	+4 years Headmistress	P.S, AD II, AD I, Assistant Headmistress	Sequential promotions through GES ranks: P.S. to AD II, AD II to AD I, then Assistant Headmistress
5	+4 years Headmistress	Guidance and Counselling Coordinator, HOD, Senior Housemistress, Assistant Headmistress	Rising through GES ranks, needed 3+ years in previous roles to apply for Assistant Headmistress, then 2+ years to apply for Headmistress
6	1 year (Headmistress) + 3 years (Assistant Head)	Head of Department, Assistant Headmistress	Progressive promotions through GES ranks: P.S. to AD II, AD II to AD I, then Assistant Headmistress
7	3 years Headmistress	Head of Department	Structured promotion through GES, interviews, push by old students 'recommendation
8	3 years (Headmistress) + 4 years (Assistant Head)	Housemistress, HOD, Assistant Headmistress	Ambition, rising through GES ranks, exams, and interview
9	6 years (Headmistress)	School chaplain as well as Assistant headmistress	Structured promotion through GES, interviews, and church structure
10	1 year (Headmistress) +3 years (Assistant Headmistress)	Guidance and Counselling Coordinator, Senior Housemistress	Ambition, rising through GES ranks, exams, and interview
11	3years Headship +5years Assistant Head	Head of Department, Assistant Headmistress	Ambition, rising through GES ranks, exams, and

		Senior Housemistress Assistant Headmistress	interview, and church appointment
12	2years Headmistress 3years HOD, 5years housemistress	Housemistress, Head of Department Assistant Headmistress	Ambition and motivation GES ranks, exams, and interview
13	7yeas HOD 3years Headmistress	Head of Department, Headmistress	Rank, Interview, and Luck
14	2years Headmistress, 5years Assist 5years HOD	Housemistress, Head of Department Assistant Headmistress	Ambition and motivation GES ranks, exams, and interview

Themes

The themes identified in the study is are outlines and presented below:

Theme 1: Impact on Teaching and Learning on Leadership

The narratives underscored a profound belief in discipline's role as a cornerstone for academic success. Far from viewing discipline as mere adherence to rules, the headmistresses perceived it as an ethos that cultivates a conducive environment for learning.

Participant 6 pointed out,

" I myself am a disciplinarian. And I have the conviction that if I have a group of students under me, together with myself, I will be able to discipline them. And then mould them into good adults. And then you should know that if students are disciplined, they are academically good. Because a disciplined student will obey all school rules and regulations and will sit down and learn. So that is my main reason for becoming a headmistress."

Narratives from participants underscored a profound belief in discipline's role as a cornerstone for academic success. Far from viewing discipline as mere adherence to rules, the headmistresses perceived it as an ethos that cultivates a conducive environment for learning.

Participant 6 pointed out,

" I myself am a disciplinarian. And I have the conviction that if I have a group of students under me, together with myself, I will be able to discipline them. And then mould them into a good adult. And then you should know that if students are disciplined, they are academically good. Because a disciplined student will obey all school rules and regulations and will sit down and learn. So that is my main reason for becoming a headmistress. To make young men and women disciplined so that they will pass their exams and wherever they go, they will fit.

Notwithstanding the above expressed views, the headmistresses' accounts clarify that while their roles come with empowerment, authorization and influence, they're also rife with a spectrum of hurdles—ranging from internal dynamics and external societal constraints to the emotional nuances of being at the helm of affairs. (see Table 2 and Fig. 1).

Table 2. Headmistresses' Challenges in Leadership

Coping mechanism	**Value**	**Percentage (100%)**
Internal obstacles	10	71%
External obstacles	4	29%
Total	**14**	**100**

Source: *Field Survey, 2023.*

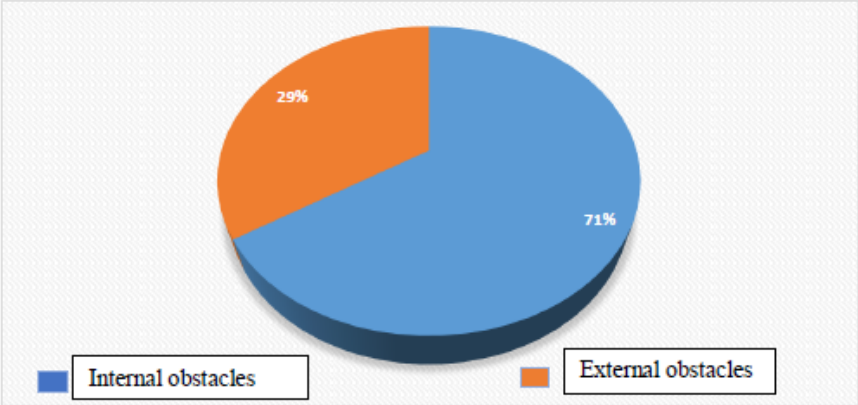

Fig. 1. Headmistresses' Challenges in Leadership

Source: *Field survey, 2023*.

Theme 2: Gender Dynamics In Leadership

The intricacies of gender dynamics in leadership form a pivotal aspect of the headmistresses' experiences. While their journey to leadership undeniably speaks volumes about their competence, tenacity, and resilience, the lens of gender paints a distinct picture. In the midst of leading educational institutions, the headmistresses found themselves at the intersection of leadership expectations and gender roles. The societal tapestry often wove conflicting images of how a woman leader should be.

Participant 1 noted, *"You know in our society, in our cultural settings as blacks, Africans, Ghanaians, most people see teachers, women being teachers as head leaders, they don't appreciate women as heads."*

Participant 5 candidly expressed, *"Some also think that female headmistresses, we are too knowing. We behave as if we know everything. So, at times, they don't like us as they like the males. Some of the males are very free-going and they think that the females should also be the same"* These experiences mirror the broader societal struggle to fit women leaders into preconceived boxes.

Despite their accomplishments, gender biases often clouded perceptions and judgments. Participant 3 share, *" And even managing men. You know, in our part of the world, it is not so easy. You know, per culture, men are the very bossy type, you know, detatorial type and all."*

Echoing similar experiences, Participant 7 lamented, *"With my internal challenges, like male teachers feeling that they are superior, that ladies shouldn't give them rules, ladies shouldn't manage them"* The shadows of bias, subtle yet persistent, often required them to work doubly hard to earn the same respect and recognition.

Table 3. Leadership Experiences of Headmistresses

Study Variables	Advocacy for women	Ambition and drive	Formal progression	Interview process
Headmistress' coping mechanism	8 (57%)	5 (36%)	6 (43%)	5 (36%)
Headmistress' experiences	6 (43%)	9 (64%)	4 (29%)	4 (29%)
Total	**14 (100%)**	**14 (100%)**	**10 (72%)**	**9 (65%)**

Source: *Field Survey, 2023.*

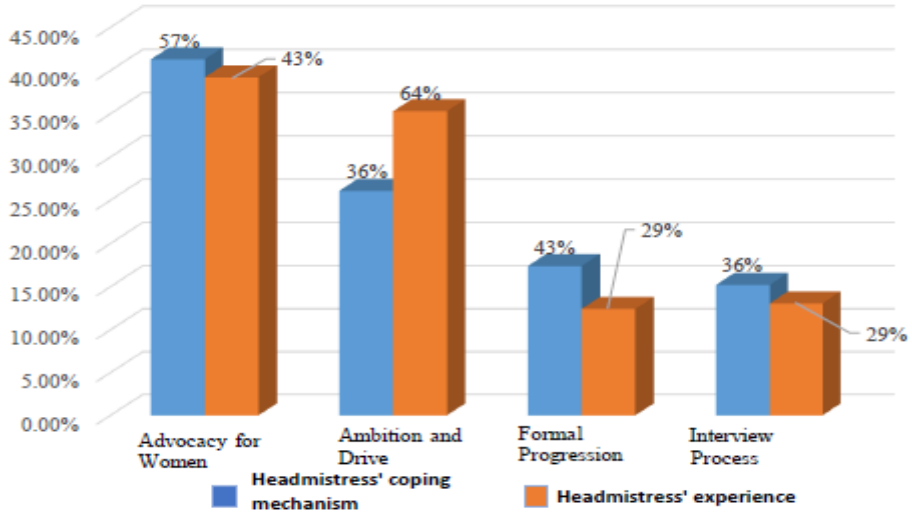

Fig 2. Leadership Experiences of Headmistresses

***Source**: Field Survey, 2023.*

Discussion

Leadership Experiences of Headmistresses in the Kumasi Metropolis

The leadership experiences of headmistresses in Senior High Schools (SHS) in the Kumasi Metropolis, as garnered from the presented themes, offer deep insights into the intricate nuances between formal expectations and personal motivations, styles, impacts, and the role of effective communication in the leadership domains of study respondents (See Fig. 2 and Table 3). Study results indicate that formal progression highlights the structured and procedural steps that these educational leaders' traverse, reflecting the global trend where institutions rely on tried-and-true systems to identify and groom potential leaders [1]. The interview process offers a more detailed lens into the selection mechanisms, emphasizing the meticulous nature of appointing leadership positions (See Table 3). Interestingly, as identified by [24], such meticulous processes correlate with better institutional outcomes, validating the rigorous approach within the Kumasi Metropolis. Nevertheless, beyond the formalities, the Ambition and Drive theme accentuates the inner motivations fuelling these headmistresses. In line with self-determination theory posited by [25], intrinsic motivations are pivotal for sustaining leadership roles in challenging terrains. These findings are in consonance with the works of [26], [27].

Constructing Headmistresses' Identity

Constructing a leadership identity is a transformative journey, a complex interplay of experiences, reactions, and reflections that shape leaders over time. The narratives of headmistresses from SHSs offer a profound understanding of this intricate process, uniquely blending theory with experiential insights (See Fig. 1). Drawing from their stories, a multi-dimensional tapestry of leadership identity emerges, providing valuable insights to the academic and practical realm of leadership and this is evident in responses from participants A, B and C above (see theme 2). Hence, the emphasis on Adaptive Leadership resonates with [28] and [29], that perspectives with

effective leadership hinge on the ability to recognize and adapt to varying contexts. By acknowledging the fluidity of situations and tailoring their leadership style, headmistresses construct an identity that's not just position-centric but contextual. This is further underscored by their authoritative approach, echoing the findings of [30], that sometimes autocratic leadership is imperative, especially when swift decisions are pivotal. Contrarily, their empathetic leadership approach underscores the essentiality of emotional intelligence in leadership, a quality that [31] posit as crucial for understanding and managing emotions in oneself and others. Lastly, Inclusiveness in their leadership style accentuates the collaborative spirit, resonating with [32] transformational leadership theory, as collaboration and collective decision-making forge stronger, more resilient teams.

Limitations

The current study has limitations regarding the participants, scope and data collection instruments. The study was limited to only senior high school headmistresses, without the perspectives of their male counterparts. The experiences of female headmistresses in the selected senior high schools in the Kumasi metropolis could possibly influence their responses to the interviews and affect the validity of the strength of the conclusion. Similarly, the study purposively selected 14 headmistresses in the Kumasi metropolis. The interview guide was a self-developed instrument based on previous literature and theories. That notwithstanding, the study employed several scientific scrutinise such as developing of interview guide with previous literature, pre-testing of tools, informed consent as well as methodological and interpretive rigour of analysing qualitative data [33], [34].

Conclusion

The leadership position within the Senior High Schools of the Kumasi Metropolis, as delineated through the experiences of headmistresses, provides a multifaceted glimpse into the dynamics of educational leadership in a gendered context. It amalgamates not only the challenges and triumphs intrinsic to the role but also the broader implications for leadership paradigms in educational institutions. In essence, the leadership journey of the headmistresses in the Kumasi Metropolis is emblematic of a larger narrative of change, resilience, and evolution. It stands as a reflection of the changing face of educational leadership in the region and offers invaluable insights for future research, policy-making, and leadership training endeavours. As we look forward, it is imperative to acknowledge, celebrate, and learn from these narratives, for they provide the compass for future generations of educational leaders.

Acknowledgments

The author is very grateful to the Ghana Education Service, Kumasi Metropolis, and the headmistresses of the senior high schools. She is also thankful to all the study participants for their responses and supports during the data collection. Lastly, she would like to express her gratitude to Rev. Patrick Agyekum for both his prayers and financial support.

Disclosure Statement

The author declares that she has no competing interests.

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Consent to Publish

Not applicable

Data Availability Statement

All data supporting findings are available upon request.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art005

An Investigation of Technology and E-Government Adoption in Guyana and Evaluate the Key Determining Factors for Strategic Gain

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Abstract

This research manuscript provides a comprehensive exploration of technology and e-government adoption in Guyana, with a primary focus on identifying the key determining factors for achieving strategic gains in digital governance. Through a mixed-methods approach combining qualitative and quantitative analyses, the study assesses the current state of technology infrastructure and e-government initiatives in Guyana, while also highlighting challenges and opportunities for improvement. Empirical investigations, including exploratory studies and surveys, were conducted to understand citizen and employee acceptance of e-government services, as well as factors influencing adoption. The research reveals insights into the usability and adoption of e-government systems in Guyana, utilizing the Technology Acceptance Model as a predictive framework. Results indicate a willingness among citizens and employees to embrace e-government services, with perceived usefulness and ease of use being significant determinants. However, issues related to trust and cultural factors require attention to enhance adoption rates. The study proposes solutions and offers a conceptual framework emphasizing the importance of e-government adoption as a strategic enabler for Guyana's ICT vision 2031. Overall, this research contributes valuable insights and recommendations for policymakers and stakeholders to enhance technology utilization and promote effective e-government services in Guyana.

Keywords: *E-Government, Government to Citizens, Government to Business, Government to Government and eGovernance Academy, Information Communication and Technology.*

Introduction

In the contemporary era, where the global landscape is increasingly shaped by digital advancements, the adoption of technology and e-government initiatives holds profound implications for governance efficacy and public service delivery. Guyana, as an emerging economy on the cusp of technological evolution, faces the imperative to leverage digital innovations to enhance its governance frameworks and address the evolving needs of its citizens. This manuscript embarks on an investigative journey into the realm of technology and e-government adoption in Guyana, aiming to elucidate the key determining factors for strategic gain in digital governance.

Problem to be Solved: Guyana, like many developing nations, grapples with multifaceted challenges in its quest for effective digital governance. These challenges encompass inadequate technology infrastructure, limited internet accessibility, bureaucratic inefficiencies, and a lack of citizen-centric e-government services. Consequently, there exists a pressing need to identify and address these obstacles to facilitate the seamless integration of technology into governance processes and enhance service delivery to citizens.

Existing Solutions for the Problems: Several initiatives have been undertaken to

Received: 12.03.2024 ***Accepted: 02.05.2024*** ***Published on: 30.07.2024***
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address the challenges hindering technology and e-government adoption in Guyana. These solutions range from infrastructure development projects aimed at improving internet connectivity to the implementation of e-government platforms for online service delivery. Additionally, capacity-building programs and policy reforms have been initiated to enhance the digital literacy of government officials and foster a conducive environment for technology integration.

Which is the Best One? Determining the optimal solution requires a comprehensive evaluation of the efficacy, scalability, and sustainability of existing initiatives. While some solutions may excel in addressing specific challenges, the best approach entails a holistic strategy that integrates infrastructure development, capacity building, policy reforms, and stakeholder engagement. Moreover, the ideal solution should prioritize citizen-centricity, ensuring that e-government services meet the diverse needs and preferences of Guyana's populace.

Limitations: Despite the progress made in technology and e-government adoption, Guyana faces inherent limitations that pose barriers to achieving optimal outcomes. These limitations encompass resource constraints, institutional inertia, regulatory complexities, and socio-economic disparities. Addressing these limitations necessitates a nuanced understanding of the contextual factors shaping Guyana's digital landscape and the formulation of tailored strategies to overcome them.

Achievements: Amidst the challenges and limitations, Guyana has also witnessed notable achievements in its journey towards digital governance. These achievements include the establishment of foundational infrastructure for technology adoption, the launch of innovative e-government platforms, and the enhancement of digital literacy among government officials and citizens. Furthermore, Guyana's commitment to embracing digital innovations underscores its potential to harness technology as a catalyst for socio-economic development and inclusive governance.

Methodology

Description: The methodology employed in this investigation combines qualitative and quantitative approaches to comprehensively analyze technology and e-government adoption in Guyana. It encompasses data collection techniques such as questionnaires, interviews, and case studies, aimed at eliciting insights from diverse stakeholders including government officials, technology experts, and citizens.

Description of the Experiments Done: The research design involves distributing questionnaires to gather quantitative data on technology infrastructure, internet penetration, and usage patterns among Guyanese citizens. Additionally, qualitative interviews are conducted with key stakeholders to explore their perspectives on e-government initiatives, challenges, and opportunities. Furthermore, case studies are undertaken to examine successful digital governance models in other countries and draw relevant lessons for Guyana.

Description of Statistical Methods Used: Quantitative data collected through questionnaires are subjected to statistical analysis using descriptive and inferential statistics. Descriptive statistics such as means, frequencies, and percentages are utilized to summarize key indicators related to technology adoption and e-government usage. Inferential statistics, including correlation analysis and regression analysis, are employed to identify significant relationships and predictors influencing digital governance outcomes [1].

The methodology for this investigation encompasses a multi-faceted approach involving questionnaires and interviews to gather comprehensive insights into technology

and e-government adoption in Guyana. Rigorous data analysis techniques, including both qualitative and quantitative methods, are employed to derive meaningful conclusions and recommendations for enhancing digital governance in the country [2].

Results

Technology Infrastructure and Internet Accessibility: Survey findings indicate that Guyana's technology infrastructure is characterized by limited coverage and reliability, particularly in rural and remote areas. Approximately 65% of respondents reported access to internet services, with disparities noted between urban and rural regions. Key challenges identified include inadequate broadband infrastructure, high costs of internet access, and inconsistent network connectivity.

E-Government Adoption and Usage Patterns: Analysis of questionnaire data reveals a moderate level of awareness and usage of e-government services among Guyanese citizens. Popular e-government services include online tax filing and utility bill payments.[3] However, uptake of e-government services remains constrained by factors such as digital literacy barriers, limited-service offerings, and concerns about data privacy and security.

Stakeholder Perspectives and Challenges: Qualitative interviews with government officials and technology experts highlight several challenges impeding e-government adoption in Guyana. These challenges include bureaucratic inertia, insufficient funding for digital initiatives, and resistance to change within government agencies. Additionally, stakeholders emphasize the importance of citizen engagement, capacity building, and inter-agency collaboration in advancing digital governance objectives.

Key Determining Factors for Strategic Gain: Regression analysis of survey data identifies several key determining factors influencing successful digital governance outcomes in Guyana. Leadership commitment, institutional capacity, stakeholder collaboration, and citizen engagement emerge as significant predictors of e-government effectiveness. Furthermore, the availability of reliable technology infrastructure and supportive policy frameworks are found to be essential enablers of digital governance success.

Limitations and Areas for Improvement: Despite notable achievements, the investigation identifies several limitations and areas for improvement in Guyana's digital governance landscape. These include the need for enhanced investment in technology infrastructure, targeted capacity-building initiatives, and the development of robust cybersecurity measures. Moreover, addressing socio-economic disparities and promoting digital inclusion are imperative to ensure equitable access to e-government services.

Discussion

The results of the investigation into technology and e-government adoption in Guyana reveal both challenges and opportunities for advancing digital governance in the country. This discussion synthesizes key findings and explores their implications for policy, practice, and future research.

1. Technology Infrastructure and Internet Accessibility:

- Limited technology infrastructure and internet accessibility emerge as significant barriers to e-government adoption in Guyana.
- Addressing these challenges requires strategic investment in broadband infrastructure expansion, particularly in underserved rural and remote areas.
- Policy interventions aimed at reducing internet costs and improving network reliability are essential to ensure equitable access to digital services for all citizens.

2. E-Government Adoption and Usage Patterns: While there is moderate awareness and usage of e-government services among Guyanese citizens, uptake remains constrained by digital literacy barriers and concerns about data privacy [5].

Efforts to promote digital literacy and raise awareness about the benefits of e-government services are critical to increasing adoption rates.

Furthermore, enhancing the usability and security of e-government platforms can instill greater trust and confidence among users.

3. Stakeholder Perspectives and Challenges: Stakeholder perspectives underscore the complex challenges inherent in implementing e-government initiatives, including bureaucratic inertia and resistance to change.

Building consensus among stakeholders, fostering a culture of innovation, and providing adequate resources and support are essential to overcoming these challenges.

Moreover, promoting a collaborative approach to digital governance, involving government agencies, private sector partners, and civil society organizations, can facilitate the co-creation of solutions and drive sustainable change [6].

4. Key Determining Factors for Strategic Gain: The identification of key determining factors, such as leadership commitment, stakeholder collaboration, and technology infrastructure, underscores the multi-dimensional nature of digital governance success.

Policy interventions should prioritize these factors, focusing on fostering an enabling environment for digital innovation and transformation.

Continuous monitoring and evaluation of e-government initiatives are essential to assess their impact and make informed decisions about resource allocation and strategy refinement.

5. Implications for Policy and Practice: The findings of this investigation have significant implications for policy formulation and practice in Guyana.

Policymakers should prioritize investments in technology infrastructure, digital skills development, and cybersecurity to facilitate the widespread adoption of e-government services.

Furthermore, efforts to streamline government processes, enhance service delivery, and promote transparency and accountability through digital means are imperative for building trust and confidence in governance institutions.

6. Future Research Directions: Future research endeavors should focus on longitudinal studies to track the progress of e-government adoption in Guyana over time [7].

Additionally, comparative analyses with other countries in the region can provide valuable insights into regional trends and best practices.

Exploring emerging technologies such as blockchain, artificial intelligence, and Internet of Things (IoT) in the context of digital governance can also offer new avenues for research and innovation.

In conclusion, the discussion highlights the importance of addressing the identified challenges and leveraging the opportunities presented by technology and e-government adoption in Guyana. By embracing a holistic and collaborative approach, Guyana can harness the transformative power of digital governance to drive socio-economic development and improve the lives of its citizens.

Conclusion

The investigation into technology and e-government adoption in Guyana and the evaluation of key determining factors for strategic gain in digital governance are justified by several compelling reasons:

Enhancing Governance Efficiency: Effective adoption of technology and e-government initiatives can streamline

government processes, improve service delivery, and enhance transparency and accountability in governance institutions. By identifying barriers to adoption and evaluating strategies for overcoming them, this investigation aims to contribute to the enhancement of governance efficiency in Guyana.

Promoting Inclusive Development: Access to digital services can bridge socio-economic disparities and empower marginalized communities by providing them with opportunities for participation in governance processes and access to essential services [12]. By understanding the factors influencing e-government adoption, this research seeks to promote inclusive development and ensure equitable access to digital resources for all citizens in Guyana [13].

Facilitating Economic Growth: A robust digital infrastructure and efficient e-government services can attract investment, stimulate innovation, and drive economic growth in Guyana [14, 15, 16]. By identifying best practices and strategic approaches to digital governance, this investigation aims to create an enabling environment for entrepreneurship, job creation, and sustainable development in the country.

Fostering Good Governance: Digital governance principles such as transparency, accountability, and citizen engagement are fundamental to fostering good governance practices [17, 18]. By evaluating the effectiveness of e-government initiatives and identifying areas for improvement, this research seeks to promote good governance norms and strengthen democratic institutions in Guyana [4].

Uses and Extensions: Policy Formulation: The findings of this investigation can inform policy formulation and strategic planning efforts aimed at advancing technology and e-government adoption in Guyana [19]. Policymakers can use the insights generated to design targeted interventions, allocate resources effectively, and prioritize initiatives that maximize the impact of digital governance.

Capacity Building: The identification of key determining factors for strategic gain in digital governance can guide capacity-building initiatives for government officials, policymakers, and stakeholders involved in e-government implementation [8]. Training programs can be tailored to address specific skill gaps and empower individuals to drive digital transformation efforts in their respective roles.

Knowledge Sharing: The lessons learned from this investigation can be disseminated through knowledge-sharing platforms, workshops, and conferences to facilitate peer learning and collaboration among countries facing similar challenges in digital governance. By sharing best practices and success stories, Guyana can contribute to the global discourse on effective e-government strategies.

Research Continuation: The findings of this investigation lay the groundwork for future research endeavors exploring emerging trends, evaluating the long-term impact of e-government initiatives, and assessing the effectiveness of innovative technologies in enhancing digital governance [9]. Continued research in this area can further refine strategies and inform policy decisions to drive sustainable development and inclusive growth in Guyana [10, 11].

Table 1. E-Government Adoption and Usage Patterns

E-Government Service	Level of Awareness (%)	Level of Usage (%)	Main Barriers to Usage
Online Tax Filing	75	50	Lack of Digital Literacy
Utility Bill Payments	60	40	Concerns about Data Privacy
Vehicle Registration	50	30	Limited-Service Offerings
Public Service Inquiries	40	25	Accessibility Issues

Table 1. presents the level of awareness and usage of various e-government services among Guyanese citizens. It also identifies the main barriers to usage, such as digital literacy, data privacy concerns, and limited-service offerings, providing insights into factors influencing e-government adoption.

Table 2. Key Determining Factors for Strategic Gain

Determining Factor	Regression Coefficient	Significance Level	Impact on Digital Governance Outcome
Leadership Commitment	0.65	$p < 0.05$	Positive
Stakeholder Collaboration	0.52	$p < 0.05$	Positive
Technology Infrastructure	0.45	$p < 0.05$	Positive
Digital Literacy	-0.30	$p < 0.05$	Negative

Table 2. presents the results of regression analysis identifying key determining factors for strategic gain in digital governance in Guyana. It includes regression coefficients, significance levels, and the impact of each factor on digital governance outcomes, providing valuable insights for policymakers and stakeholders

Conflict of Interest

The author of this research manuscript, titled "An Investigation of Technology and e-Government Adoption in Guyana and Evaluate the Key Determining Factors for Strategic Gain," disclose potential conflicts of interest. I have affiliations with the Government of Guyana, ICT Agency, which may have a vested interest in the outcomes of this study. However, I affirm that the research was conducted with integrity and impartiality, and any potential conflicts of interest were appropriately managed to ensure the objectivity and reliability of the findings [20]. The research methodology, data analysis, and interpretation of results were conducted independently of any external influence, and the I have made every effort to present accurate and unbiased information.

Acknowledgements

I would like to express my sincere gratitude to all individuals and organizations who contributed to the completion of this research project on "An Investigation of Technology and e-government adoption in Guyana and Evaluate the Key Determining Factors for Strategic Gain for a Digital Governance."

First and foremost, I extend my

appreciation to the invaluable contributions of the participants who took part in interviews, surveys, and discussions, sharing their experiences, perspectives, and expertise. Their input provided invaluable insights into the challenges and opportunities surrounding technology and e-government adoption in Guyana.

Furthermore, I extend my appreciation to our colleagues and peers for their constructive feedback, guidance, and encouragement throughout the research process. Their support played a crucial role in shaping the direction and outcomes of this study.

Last but not least, I would like to thank my family for their unwavering support and understanding during the course of this research endeavor. Their encouragement and patience were invaluable throughout this journey.

The collective efforts of all those who contributed to this research project are greatly acknowledged. It is my hope that the findings and insights generated will contribute to the advancement of technology and e-government adoption in Guyana and pave the way for enhanced digital governance practices.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art006

Identification of Rainfall and Temperature Trends in the Context of Climate Change for the Towns of Bol, Fianga, Moundou and N'Djamena in Chad

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Abstract

Climate change, characterised by extreme weather events, is one of the most serious threats to sustainable development, with expected adverse effects on human health and food security. Chad, which is half arid, is more than threatened by these increasingly frequent extreme hydrometeorological events, which will weaken its economy and have a negative impact on public health. The aim of this study is to identify rainfall and temperature trends in the context of climate change in the study area, which is made up of four (4) towns (N'Djaména, Bol, Fianga and Moundou) that are representative of Chad. They are divided according to bioclimatic zones, i.e. two in urban areas and two in rural areas. The selection criteria were based on previous malaria and cholera epidemiological situations. Of the 4 towns selected, two are considered to be endemic and at risk, and the other two are those that rarely experience epidemics. In situ observation data from observation stations in the study area will be used to identify obvious signals of climate change. To this end, an analysis of changes in annual precipitation and temperature over the last four (4) decades (1980-2023) was carried out before and after the detected break using statistical tests, as well as a trend and variability analysis of precipitation and extreme temperature indices.The results show that over the last few decades, there has been a change in the precipitation regime in terms of frequency and intensity at all sites.This general downward trend over the 1981-2020 series is linked to the extremely severe droughts of the 1980-1990 and 1990-2000 decades, marked by the El Niño phenomenon of 1983/1984 and a statistically significant increase in temperatures.The study thus contributes to modelling efforts to better predict the resurgence of climate-sensitive diseases.

Keywords*: Chad, Extreme Hydrometeorological Events, Rainfall, Temperature, Trend.*

Introduction

Climate change is considered as one of the greatest threats to sustainable development and livelihoods of the people in developing countries, with adverse effects expected on human health, food security, economic activity, natural resources, and infrastructure [1]. The sixth report of the Intergovernmental Panel on Climate Change (IPCC) [2] predicts an accelerated warming of more than 1.5˚C over the next few decades, which will be beyond the global limit of 1.5˚C warming.

Sub-Saharan Africa is the most vulnerable region in the world to climate change. Rising temperatures, sea-level rise, and rainfall anomalies increase the frequency and intensity of natural disasters such as devastating cyclones, locust invasion in East Africa, and the desertification in the Sahel [3].

Landlocked Sub-Saharan country, Chad covers an area of 1,284,000 km2 with more

Received: 08.05.2024 ***Accepted: 30.05.2024*** ***Published on: 30.07.2024***
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than half being arid. It is more threatened than ever by the negative effects of climate variability and change, characterized by an increase in intensity and frequency of extreme weather events, including floods, droughts and heatwaves, as evidenced by the severe floods in recent years that have caused material damage and loss of human life [4, 5].

Highlighting these changes can only be achieved through analysis of climatic data at the local scale or high resolution, whereas IPCC studies are often conducted at large scale of 2.5° by 2.5, equivalent to approximately 250 km by 250 km [6]. Such a resolution does not allow for appreciation of the evolution of climatic parameters at a local scale, even if in recent years, other studies have been conducted at finer scales, with a grid of 0,5° by 0,5° (or 50 km by 50 km), but again, this grid is too large for our studies. Several studies have relied on these large-scale data for localised vulnerability analyses, leading to biased results, hence the need to use observed data for optimal results. Moreover, the variability and trends of precipitation and temperature at the local scale are of great importance for assessing their impacts on the evolution of climate-sensitive diseases and population vulnerability [7,8] . This situation therefore justifies the need to highlight the evolution of temperatures and precipitation, the main meteorological parameters characteristic of climate change.

The objective of this article is to carry out a localised detection of climate change at the stations of Bol, Fianga, Moundou, and N'djamena using appropriate indicators. The work will extend the analysis of [9;10] on extreme climate indices in Chad. To accomplish this, four key indicators have been chosen for examination: anomalies (both deviation and percentage), normalized indices, extreme climate indices, and trends in precipitation, as well as maximum and minimum temperatures.

Context, Data and Methods

Presentation of the Study Area

The study area consists of four (4) cities distributed across the bioclimatic zones of Chad, including two rural areas. These cities are Bol, Fianga, Moundou, and N'djamena. The selection criterion is based on previous epidemiological situations of malaria and cholera. Among the four target cities, two are considered endemic and high-risk areas, while the other two rarely experience epidemics [11]. Cholera and malaria emerge during the period from July to September considered to be the heart of the rainy season (see Figure 5). Moundou and Fianga are two cities located in the Sudanian zone. Moundou is recognised as an area where malaria is endemic, while Fianga is recognised as a cholera hotspot. For the Sahelian zone, the choice is focused on N'djamena, a city recognised as a hub for malaria epidemics, while Bol is recognised as a hub for cholera epidemics. The choice also considers the differences in socio-economic conditions between urban and rural areas. Another reason that justifies the choice of the study area is the availability of climate data.

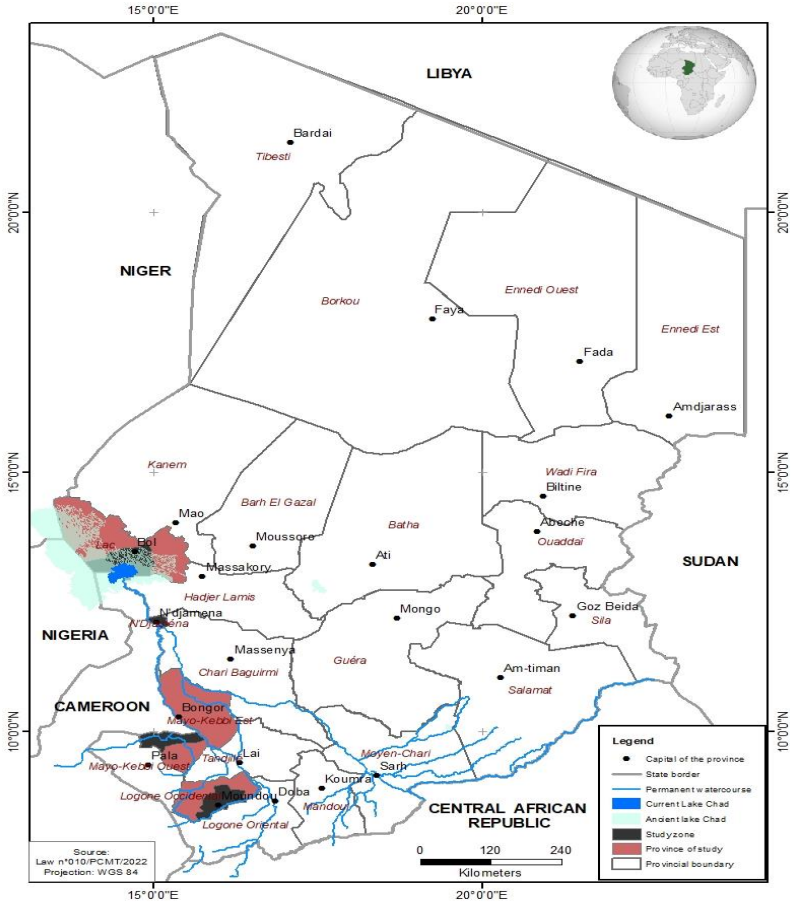

Figure 1. Map of Chad Including the 4 Towns in the Study Area

Geographical Characteristics of the City of Bol

The city of Bol is located on the shores of Lake Chad, 153 km north of the capital city, in the Sahelian zone of Chad, between 13° 27' 31'' North latitude and 14°42' 53'' East longitude (see Figure 1). Its desert climate is dry and hot. The city of Bol is the capital of the Lake Province and the Mamdi Department. It has around 15,000 inhabitants.

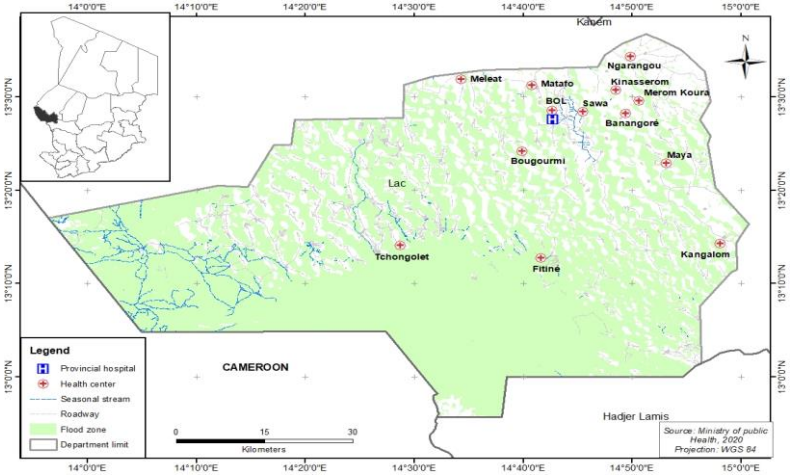

Figure 2. Geographic Location Map of the City of Bol

Geographical Characteristics of the City of Fianga

The city of Fianga is located approximately 8 km from Lake Fianga, at a latitude of 9° 54′ 55″ North, a longitude of 15° 8′ 15″ East (see Figure 2 below), and an altitude of 339 meters. Fianga has a hot and slightly humid climate. Over the year, the average temperature in Fianga is 30,6°C and the average rainfall is 890.6mm (Table 1). As the capital of Mont Illi Department in the Mayo-Kebbi East province, Fianga has a population of approximately 17,000 inhabitants as of 2020.

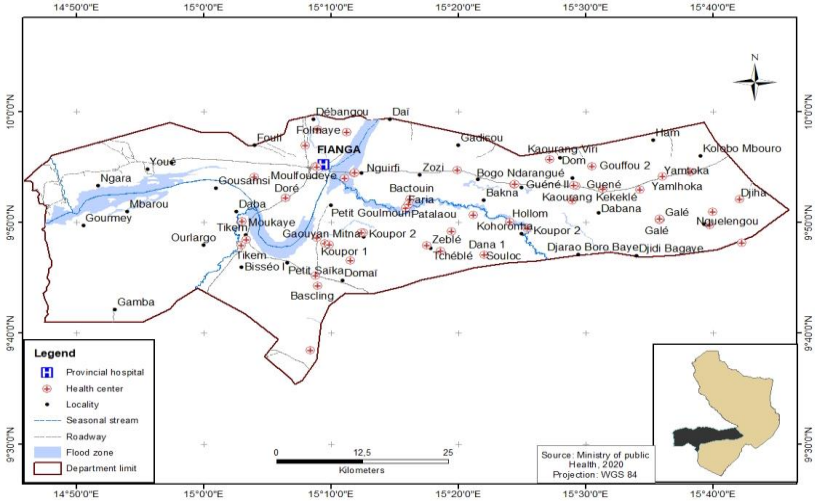

Figure 3. Geographic Location of the Town of Fianga and the Number of Inhabitants

Geographical Characteristics of the City of Moundou

Located at the latitude of 8°34′00″ N, a longitude of 16°04′59″ E (see Figure 3), and an altitude of 401 meters, Moundou is the second city and economic capital of Chad. The city is belt on the left bank of the Logone River, near Lake Wey, which poses a flooding threat to the city. As the capital of Logone region and the Lake Wey department, Moundou has a population of approximately 200,000 as of 2020.

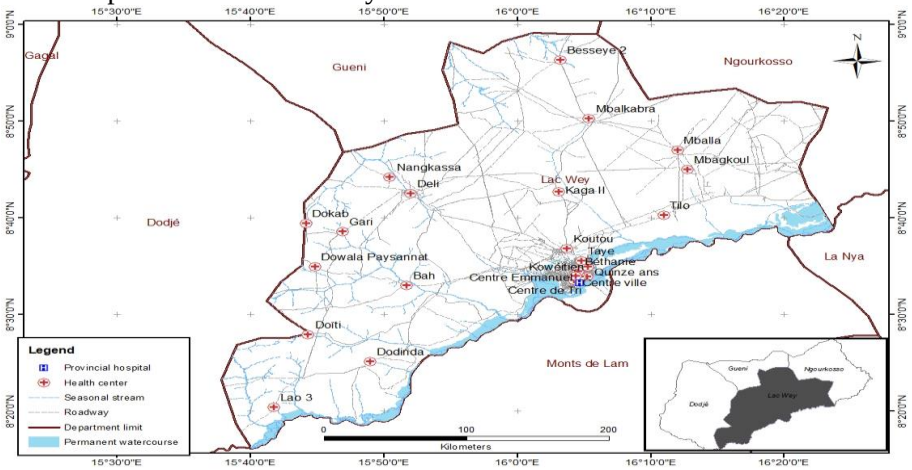

Figure 4. Geographic Location Map of the City of Moundou.

Geographical Characteristics of the City of N'Djamena

Located at a latitude of 12° 07' N; a longitude 15° 03' E (Figure 4), and an altitude of 295 meters in the Sahelian zone, the city of N'djamena is the capital city of Chad, at the confluence of the Chari and Logone rivers. N'djamena is the only major city in a poorly urbanized country. It experiences an arid climate with a 9-month dry season, while the humid season lasts for 3 months (from July to September). The cumulative annual rainfall is less than 500 mm (Table 1) per year

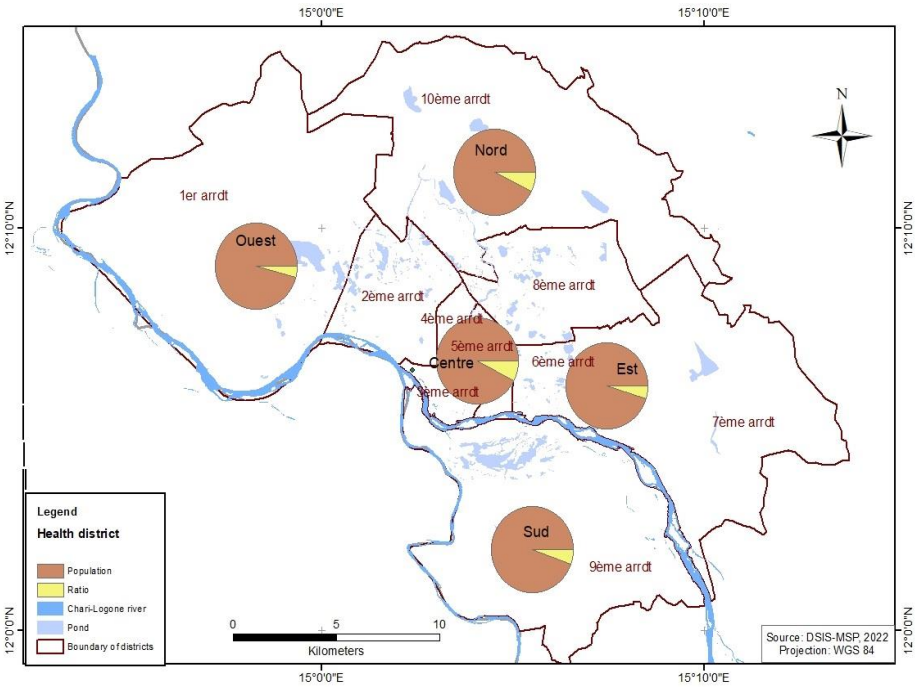

Figure 5. Geographic Location Map of the City of N'djamena

Table 1. Presentation of the Weather Condition of the Study Area (Bol, Fianga, Moundou, and N'djamena): Values of Averages and Standard Deviations of Minimum, Maximum and Average Temperatures, Rainfall and Relative Humidity

Station	Maximal temperature (°C)		Minimal temperature (°C)		Mean temperature (°C)		Annual rainfall average (mm)		Relative humidity (%)	
	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
Bol	42	2.3	22.4	1.8	29.5	2	231	1.9	31	7
Fianga	36.5	4.3	13.1	3.2	30.6	5.6	890.6	92	49.5	28.3
Moundou	36	4.3	12.6	3	27.5	1.1	1040	104	58	23
NDjamena	44	3.6	22	4	29	3.8	548	6	39	25

NB : SD : standard deviation

Data

The data of this study come from the climatological database of the National Meteorological Agency of Chad. These are daily and monthly precipitation and temperature data from the stations under discussion from 1981 to 2020 (40 years). However, resource to reanalysis data was necessary to compensate for the missing data. The reanalyses provided datasets combining

satellite and station observation data, particularly useful for climate studies [12].

The reanalysis data used are those of the ARC2 model with a 10 km (0,1°x 0,1°) spatial resolution produced by the Climate Prediction Centre (CPC) of the National Oceanic and Atmospheric Administration (NOAA) [13] The use of these data was validated by comparing them with observed data to retain datasets close to real data. The quality of the data was then evaluated by filling in missing data with median values and eliminating aberrant data easily detected by the Rclimdex software.

Analysis methods

To determine the extent to which human activities have disrupted the climate system, climatologists have developed processes for detecting and attributing climate change. Detection involves showing that the climate has changed in a statistically significant sense, without giving the reason for the change [14]. It is therefore a matter of statistically justifying the existence of a real change, as opposed to a "normal" climate fluctuation. Moreover, we have on one hand studied the evolution (variability and trend) of annual precipitation and temperatures before and after the break detected by statistical tests and on the other hand, we have analysed the trends and variability of extreme precipitation and temperature indices.

For the analysis of interannual rainfall variability, we used Nicholson's method [15], which made it possible to identify the periods of dry and humid years at each station. It is defined as a centered and reduced variable expressed by the equation [16]

$$I = \frac{Xi - \overline{X}}{\sigma}$$

With Xi: variable for year i, $\overline{X}$: average of variable over the studied period, and σ: standard deviation of the variable over the period under study. The centered and reduced 5-year moving average was applied because it reduces small internal fluctuations and highlights the major trends of rainfall indices.

The approach adopted in this study to analyse extreme rainfall and temperature events is that of climate indices [9, 17, 18]. It was proposed by the team of expert on climate change detection and indices (ETCCDI) using the ClimPACT 2 master program generated with RCLIMDEX software.

In this study, 7 indices were retained, including 5 characterising extreme rainfall are presented in Table 2. These include the amount of total annual rainfall (PRCPTOT), daily rainfall intensity (SDII), the number of days of heavy rain (R20), the total amount of annual on very humid days (R95p) and the percentage of total annual rainfall on very humid days (R95pTOT).

For temperature extremes, 2 indices namely TX90p and TN90p were retained, representing the percentage of climatologically hot days and nights, respectively. The choice of these indices is justified by the fact that they are the most relevant to highlight the extent of climate variability and change and the evolution of floods in terms of frequency and intensity of floods as factors of proliferation of malaria and cholera vector agents.

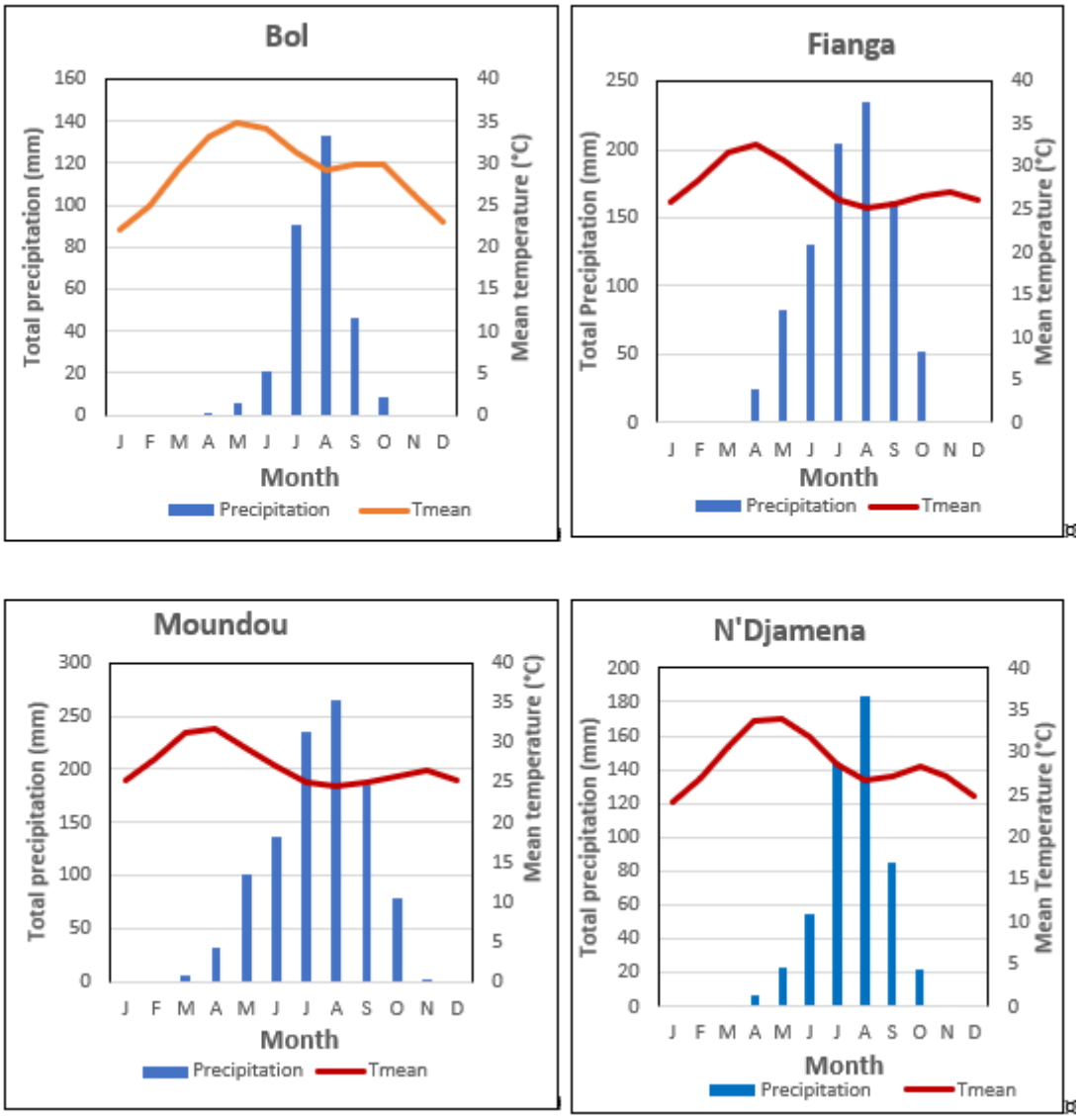

Figure 6. Annual Cycle of Precipitation Regimes and Average Temperatures (1981-2020) of the Cities of Bol, Fianga, Moundou and N'Djamena

Table 2. Description of Extreme Rainfall and Temperature Indices

Indices	Description	Definition	Unity
PRCPTOT	Total annual precipitations on rainy days	PRCP annual total on wet days (RR>=1mm) PRCPTOT is expressed as percentage changes relative to the pre-industrial reference period 1861–1880.j	Mm
SDII	Simple index of precipitation intensity	Let RRwj be the daily volume of precipitation recorded on rainy days, w (RR ≥ 1mm) of period j. If W represents the number of rainy days of j	Day

R20mm	Annual number of days where precipitation ≥ 20mm	Let RRij be the daily volume of precipitation recorded on a day i of period j.Count the number of days where: RRij ≥ 20mm	Day
R95p	Annual PRCP total when RR > 95th percentile	RRwj the daily volume of precipitation recorded on arainy day, 'w', (RR ≥ 1.0mm) of period i, and RRwn95 the 95th percentile for precipitation recorded on rainy days during the reference period 1981-2010.	Day
R95PTOT	Percentage of total annual rainfall amounts on very humid days	Let RRwj be the daily volume of precipitation recorded on a rainy day, 'w', (RR ≥ 1.0mm) for the period (1981-2010), and RRwn95 the 95th percentile. R95pTOT=100 x R95p/PRCPTOT	%
TN90P	Percentage of days where TN> 90th percentile	Percentage of climatologically warm nights (Minimum temperatures above the last decile (daily decile calculated over 5 consecutive days).	%
TX90P	Percentage of days where TX > 90th percentile	Percentage of climatologically hot days (days where the maximum temperature is above the last decile (daily decile calculated over 5 consecutive days).	%

To highlight the chronological variability of precipitation, maximum and minimum temperatures at each station, we proceeded to detect breaks within the series then analysed their evolution, general trend and their significance. Breaks in the data series were detected using statistical tests of Pettitt and the segmentation method of Hubert [19, 20, 21], which made it possible to detect potential changes in precipitation patterns and temperatures. These tests are grouped together in the Khronostat software developed by the Research Institute for Development (RID) and the University of Montpellier [22]. The annual trend was identified using the linear regression method [23]. The evolution of statistical significance was performed using the Mann-Kendall criterion [24] . This non-parametric test looks for the presence of a long-term trend in the data. In order to validate this trend, the probability, p-value, was then evaluated, which expresses the strength of the evidence for or against this hypothesis (the trend is accepted with a p-value < 0,05 considering a 95% confidence level).

Results

Analysis of the Evolution of Precipitation Indices

Figure 6 shows the interannual variability of rainfall through standardized values (anomalies) over the 1981-2020 data series of rainfall from the N'djamena, Moundou, Fianga, and Bol stations. The application of the segmentation method of Hubert and Paturel [25] on the 1981-2020 rainfall series detects

break points for the four locations in the following years: Bol in 1995, Fianga in 1984, Moundou in 2010 and N'Djamena in 1996. Except for Fianga, which had a highly variable rainfall pattern with a downward trend, all other locations experienced a trend of increasing precipitation conditions during the decade 2010-2020, particularly during the last 4-5 years (2015-2020). Overall, there was an alternation of dry and wet years after the 1980s, marked by an extremely severe drought episode of about 5 consecutive years.

The Bol location experienced three periods from 1981-1995 marked by high variability, followed by a persistent drought period from 1996 to 2010 (Figure 6d) with a 17% decrease (see Table 3) in precipitation compared to the average. During the period from 2011 to 2020, a return to excess precipitation conditions was observed. The locations in N'djamena (figure 6a), Moundou (figure 7b) and Fianga (figure 6c) experienced strong variability with a general upward trend, even if they are not statistically significant except in the N'djamena station where the trend is significant at the 5% threshold after a Mann-Kendall test. The localities of N'Djamena, Moundou et Fianga recorded rainfall surpluses of approximately 31,5%, 8% et 23,8% (Table 3) during the 2010-2020 period, with episodes of heavy rainfall during the last 5 years (2015-2020) in N'Djamena and Moundou. This situation could explain the severe flooding of 2020, which affected 87% of the national territory.

This study is a step towards integrating the climate change dimension into the national public health policy on malaria and cholera epidemics. The aim is to help set up a climate-health model for monitoring these epidemics, based on meteorological parameters. At the end of the study, opportunities for climate-health research into meningitis will also be explored.

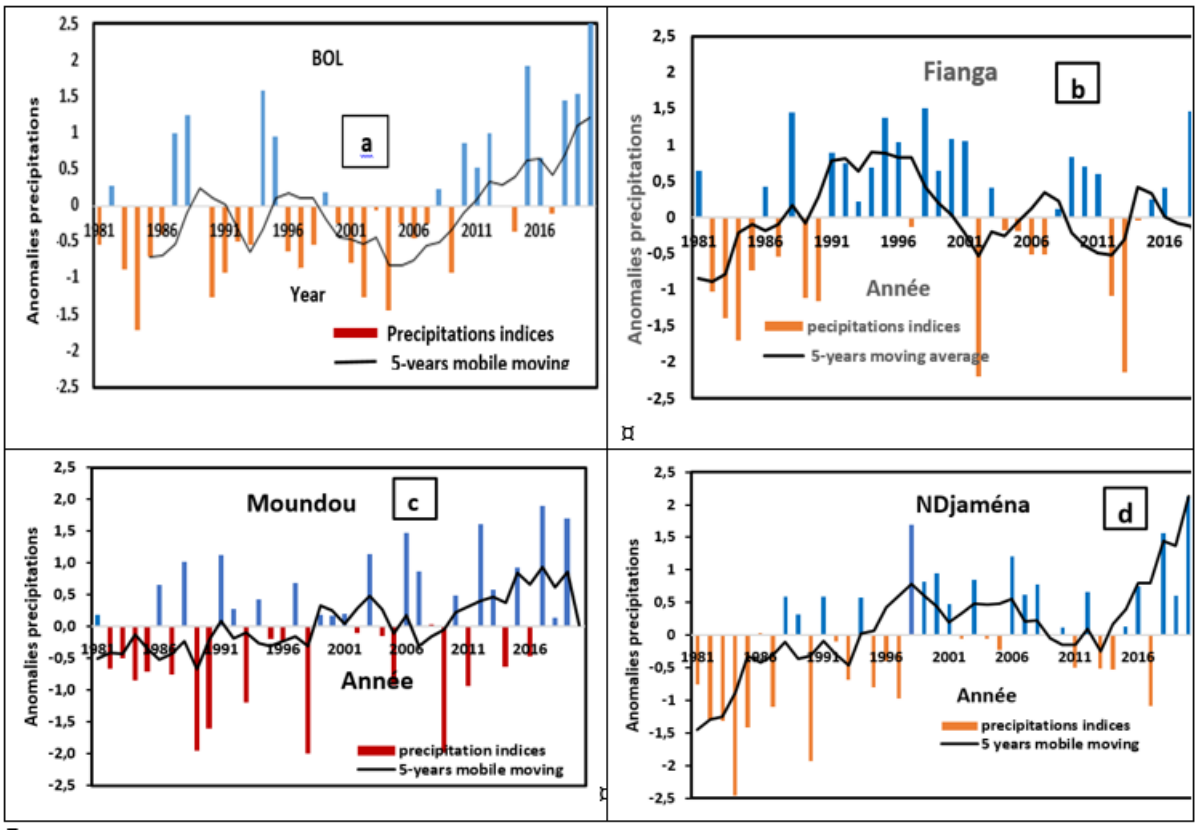

Figure 7. Interannual evolution of the standardized rainfall index (blue and red color) and moving average (curve in black color in the localities of Bol(a), Fianga(b), Moundou (c) and N'Djamena (d)

Table 3. Evolution of Rainfall before and after the Break Years Obtained by the Pettitt Test and Rate of Variation of Localities (Bol, Fianga, Moundou and Minimum Temperatures N'djamena)

Locality	Period before rupture	Period after rupture	Average before rupture	Average After rupture	Rate of change
Bol	1981-1995	1996-2020	211.7	174.9	-17.4%
Fianga	1981-1984	1985-2020	683.6	846.1	23.8%
Moundou	1981-2010	2011-2020	1014.2	1100.9	8.0%
N'Djamena	1981-1996	1997-2020	464.9	611.4	31.5%

Analysis of Extreme Temperature Evolution

The annual averages of maximum and minimum temperatures for the study area were calculated using the 1981-2020 data series. These averages are represented in the graphs of figures 7 and 8. Both variables, minimum temperatures (Tmin) and maximum temperatures (Tmax), have increased during the period under review. West and Central Africa are particularly threatened by climate change. This increase is significant at 5% level using the Mann-Kendall test (see Figures 7 and 8). In general, it can be seen that minimum temperatures have increased more than the maximum temperatures in all the studied locations and in a linear manner, while the maximum temperatures experienced variability from one decade to another (see the temperature maps of N'Djamena and Moundou). A particular increase in both minimum and maximum temperatures is noted during 1997-2007 period.

Analysis of Minimum and Maximum Temperatures at Bol and N'Djamena Stations (Sahelian zone of Chad)

From the Pettitt test carried out on the minimum and maximum temperature data series at Bol and N'djamena stations from 1982 to 2020, two years of rupture (1995 and 1996) were identified for minimum and maximum temperatures respectively, at the Bol station, with two sub-periods (sub-series) for minimum temperatures from 1982 to 1989 and 1990 to 2020, and for maximum temperatures from 1981 to 1996 and 1997 to 2020. The minimum temperature values varied from 18,2 to 19°C (an increase of 1.2 °C), and the maximum temperature values varied from 39.9 to 40.7°C (an increase of 0.8°C). These trends were confirmed by the Mann-Kendall test result, which highlighted the significance of the trend at 5% level. The minimum temperatures at N'djamena varied from 21.4 to 22.2°C (an increase of 0.7°C) during the periods 1982-1996 and 1997-2020. Meanwhile, the maximum temperatures experienced an increase of 1.7°C between 1981 and 2007, followed by a decrease of 1°C during the period 2008-2020. However, the trend of maximum temperatures over the entire series from 1981 to 2020 is upward, with an increase of 0.7°C, and is significant at 5% level using the Mann-Kendall test (Figure 7).

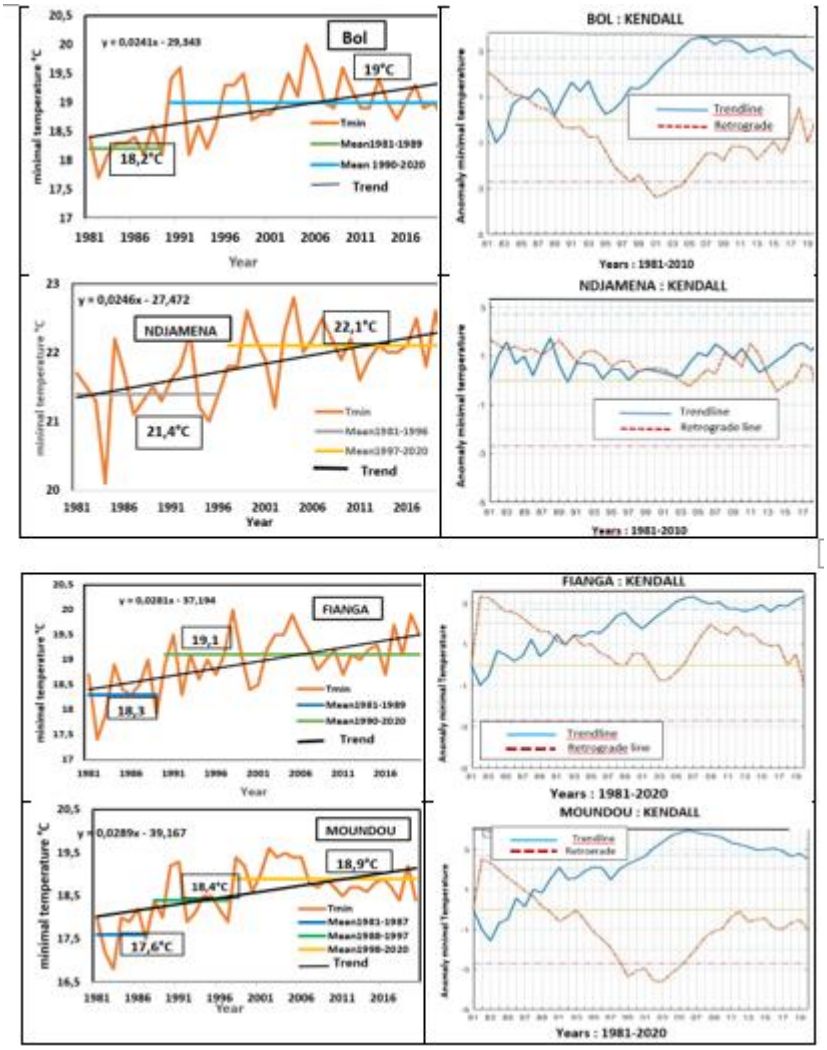

Figure 8. Evolution of the Average Minimum and Maximum Temperatures from 1981 to 2020 and the Periods Identified by the Hubert Segmentation Test. Averages by Period and Trends at the N'djamena and Bol Stations from 1981 to 2020 (Sahelian zone)

Analysis of Minimum and Maximum Temperatures at Fianga and Moundou Stations (Sudanian Zone of Chad)

The Moundou and Fianga stations, located in the Sudanian zone, experienced a significant increase in both minimum and maximum temperatures as confirmed by the Mann-Kendall test at 5% level (Figure 8). The temperature data series recorded breaks with multiple sub-series. The Pettitt's tests identified 1997 as the break year for both Moundou and Fianga.

The minimum temperatures in Moundou increased from 20.7 to 21.5°C, a rise of 0.8°C, during the sub-periods 1981-1997 and 1998-2020, with a normal (1981-2010) minimum temperature of 21.1°C. Meanwhile, the maximum temperatures, despite an overall upward trend, experienced an alternation of low and high values, with an average maximum temperature of 32.9°C between 1981-1997, 34,9°C between 1998-2007, a variation of 2°C which then dropped to 33.5°C between 2008-2020. However, there was an overall increase of 0.6°C from 1981 to 2020. The normal (1981-2010) maximum temperature is 33.5°C. At the Fianga station, the maximum temperatures varied from 34.2°C to 35.5°C, respectively during the periods 1981-1997 and 1998-2007, an increase of 1.3°C. They then experienced a decrease of 0.6°C between 2008 and 2020. The general trend over the entire 40-year series is an

increase of 0.8°C, during the periods 1981-1989 and 1990-2020.

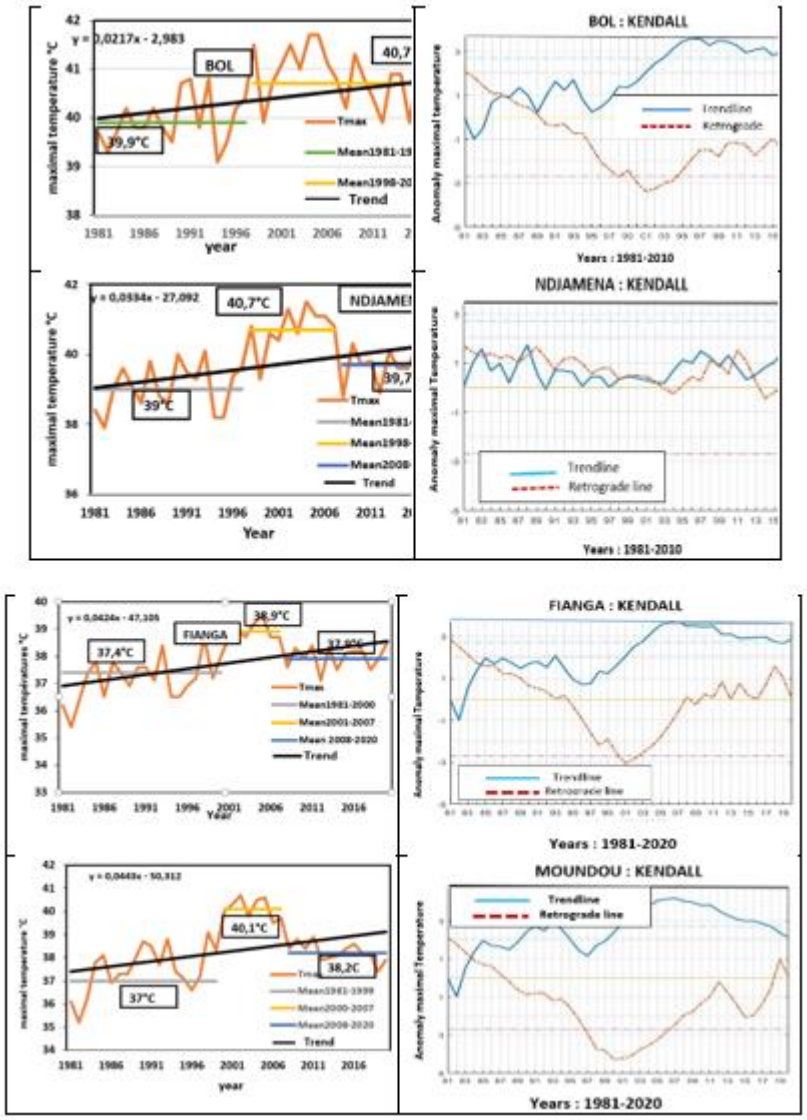

Figure 9. Averages by Periods and Trends at Fianga and Moundou Stations from 1981 to 2020 (Sudanese Zone)

Analysis of Climate Extreme Indices

Trend using the Mann-Kendall Test

The results obtained by applying the Mann-Kendall test at a risk level of $\alpha = 5\%$ (P-value = 0,05), on the climate indices (PRCPTOT, R95p, R95pTOT, SDII, R20, TN95p, and TX95p) retained for the 4 studied stations are recorded in table 4. For the applied test, a significance threshold of 5% was used, indicating whether or not there are monotonic trends. P-values less than 0.05 are considered as indicators of a trend. If the slope value is positive, the trend is upwards, and if it is negative, the trend is downwards (Table 4).

Table 4. Results Of Mann-Kendall Tests at 5% Threshold Expressed by P-Values Less than 0.05

Indices	BOL		FIANGA		MOUNDOU		N'Djamena	
	P-Value	Slope	P-Value	Slope	P-Value	Slope	P-Value	Slope
TX90p	0.138	0.153	0.055	0.221	0.293	0.160	0.123	0.153
TX90p	0.683	0.040	0.000	0.295	0.016	0.226	0.149	0.040
SDII	0.039	0.037	0.525	0.009	0.039	0.027	0.278	0.037
R20 mm	0.023	0.059	0.324	0.045	0.046	0.107	0.124	0.059
R95p	0.029	2.255	0.479	1.206	0.009	4.093	0.546	2.255
R99p	0.294	0.878	0.174	1.443	0.004	2.881	0.780	0.878
PRCPTOT	0.054	2809	0.177	-2.682	0.488	-1.902	0.382	-1.700

Annual Cumulative Rainfall

From 1982 to 1990, the annual cumulative rainfall values oscillated between1514.4 mm in Moundou in 1982 and 725 mm in Fianga in 1984, two localities in the Sudanian zone of Chad (see Figure 10). In contrast, Bol and N'djamena in the Sahelian zone recorded a cumulative rainfall ranging from 756.3 mm in 1982 in N'djamena and 157.4 mm in 1984 in Bol during the same period. During the periods 1990-1999 and 2000-2011, all locations in both the Sudanese and Sahelian zones recorded low cumulative rainfall, with 833 mm in Moundou, a drop of 500 mm compared to the highest cumulative rainfall in 1982. The lowest cumulative rainfall was recorded in Bol, with 147 mm in 2004.

This condition gradually improved during the period 2011-2020, reaching high values of 1347.5 mm. The general trend is decreasing, but not statistically significant at 5% level, except at Bol station where the upward trend is significant (Table 4).

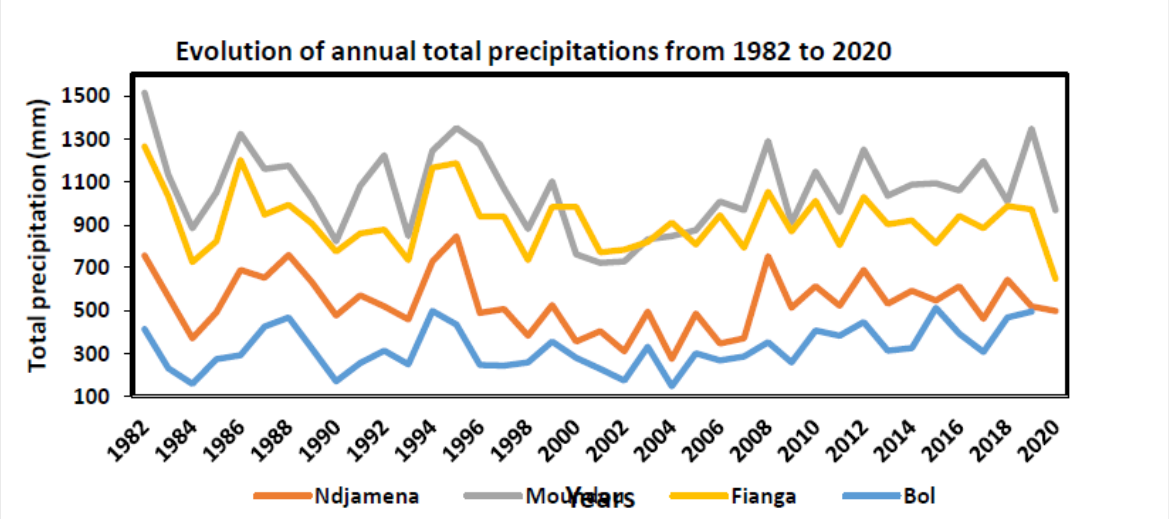

Figure 10. Evolution of Annual Cumulative Rainfall Amounts (Prctot) from 1981 To 2020 at the Stations of Bol, Fianga, Moundou et N'Djamena.

Annual Evolution of Extreme Rainfall Heights and Frequency

The annual evolution of heights (R95p) and frequency of extreme rainfall (R95pTOT) was characterised by a strong variability of decrease and increase in extreme rainfall accumulations in most stations except for Moundou, which experienced a clear upward trend from 21 to

573 mm with a frequency evolution of 15 to 27%. The period from 1981 to 1990 was marked by significant disruptions in the distribution in time and space.

In general, the decades 2000-2010 and 2010-2020 were marked by good rainfall, both in height and frequency with quantities reaching up to 573 mm in Moundou, while Bol experienced the highest frequency (42%) the period 2011-2020. These extreme rainfall events are responsible for the severe flooding in recent years in N'Djamena and Moundou causing significant damage [26].

Table 5. Ten-Year Change in Percentage of Total Annual Rainfall on Very Humid Days (R95p) and Frequency (R95ptot) of Extreme Rainfall

Decade	BOL		FIANGA		MOUNDOU		N'DJAMENA	
	R95p	R95pTOT	R95p	R95pTOT	R95p	R95pTOT	R95p	R95pTOT
1981-1990	0-232	20,2%	0-329	21,1%	21-329	15,3%	0-383	28,3%
1991-2000	0-118	13,5%	19-371	18,2%	0-320	18%	19-295	17%
2001-2010	15-68	13%	67-323	20,1%	141-287	18,7%	23-105	13,1%
2011-2020	32-218	42,3%	41-308	24%	134-573	27%	63-331	31,4%

Analysis of the Evolution of Frequency and Intensity of the Days of Heavy Rainfall

The frequency and intensity of extreme weather events are two relevant indicators characteristic of climate change. Figure 10 shows a strong variability in frequency and intensity during the period 1981 to 2013, with a decreasing trend in the number of days with rainfall above 20 mm (R20), thus confirming the results of the study by Panthou [26] which revealed that the Sahelian rainfall regime over the last 10 years was characterised by a significant deficit in the number of rainy days. From 2014, an increase in frequency and intensity of rainfall events at all stations, except for Moundou which experienced a decrease in intensity (SDII). The locality of Fianga recorded a persistent increase in frequency and intensity during the two periods, 1999-2004 and 2014-2020. It is worth noting that the stations in N'djamena and Bol in the Sahelian zone experienced episodes of high frequency and intensity rainfall over the last five years.

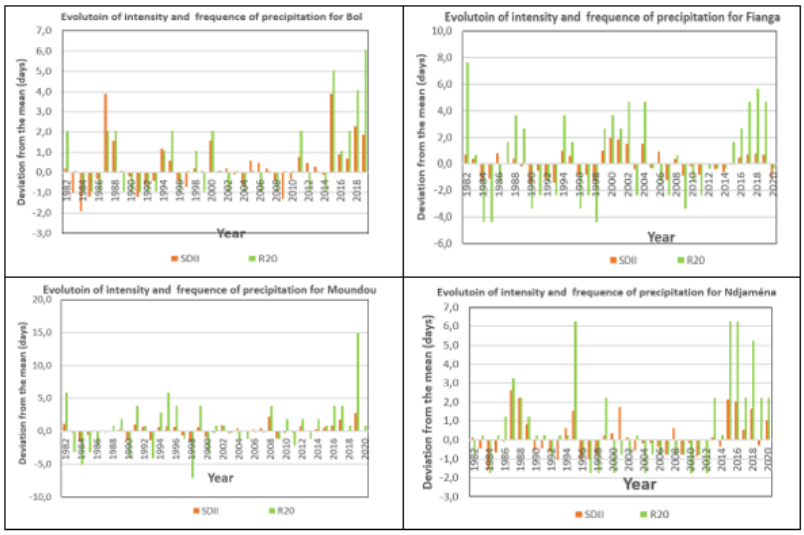

Figure 11. Interannual Evolution from 1981 to 2020 of Intensity (Sdii): Histogram in Red and Frequency (R20); Histogram in Green of Precipitation from the Stations of Bol, Fianga, Moundou and N'djamena

Analysis of Climatologically Hot Nights

The percentage of climatologically hot nights (TN90p) is a relevant indicator for identifying signs of change. Statistical tests using the Pettitt test at the 10%, 5% and 1% levels made it possible to detect break years and sub-series by segmenting the data using the Hubert method. The trends in the indices are presented in Table 6. Between 1997 and 2006, hot nights increased at all locations except for Bol station where they remained stable at 8% over the entire series. However, a decrease in hot nights was observed between 2007 and 2020 (see Figure 7) at all four locations, despite an overall increasing trend over the 40-year period. Nevertheless, the highest values were observed at the Moundou and Fianga stations in the humid Sudanese climate zone.

Table 6. Analysis of the Percentage of Climatologically Hot Nights in Relation to the Break Date Detected by the Pettitt test and the Periods Released by Hubert' S Segmentation.

Station	Pettitt test	Hubert segmentation	Average before rupture (%)	Average after rupture (%)	Rate of variation (%)
Bol	1988	1982-1988	9.9.		9.9
Fianga	1996***	1982-2004	6.6		
		2005-2006		23.5	16.9
		2007-2020		11.5	4.9
Moundou	1997***	1982-2000	5.1		
		2001-2006		21	15.9
		2007-2020		8.8	3.7
N'Djamena	1996**	1982-1996	6.2		
		1997-2006		15.8	9.9
		2007-2020		9	2.8

N.B: *; ** and *** significant respectively at the 10% threshold; 5% and 1% according to the result of the Pettitt test (1979).

Analysis of Climatologically Hot Days

The frequency of hot days (TX90p) increased after the break years (1995, 1996, and 2007) detected by the Pettitt test at the 10%, 5% and 1% levels at the four stations during the periods from 1997 to 2006. The rates of change ranged from 3% to 26.4% in N'djamena, 1% to 14.8% in Bol, 6.3% to 30.1% in Moundou and 3.7% to 19.7% in Fianga. As shown in Table 7, there was a decrease in hot days during the period from 2007 to 2020 at all the four stations.

Table 7. Analysis of the Percentage of the Number of Climatologically Hot Days in Relation to the Break Date Detected by the Pettitt Test and the Periods Released by Hubert's Segmentation

Station	Pettitt test Year of rupture	Hubert segmentation	Average before rupture (%)	Average after rupture (%)	Rate of variation (%)
Bol	1995***	1982-2000	7.1		9.9
		2001-2005		21.9	14.8
		2006-2018		8.8	1.1
Fianga	1997***	1982-2000	4.9		
		2001- 2006		24.6	19.7
		2007- 2020		8.6	3.7

Moundou	1996***	1981-1996	3.5		
		2001- 2006		33.6	30.1
		2007- 2020		9.8	6.3
N'Djamena	1996***	1982-1996	6.4		
		1997- 2003		15.3	8.9
		2004-2006		29.9	26.4
		2007-2020		9.4	3

The signs * and ** *** mean that the break is respectively significant at 90 and 95% and 99% according to the result of the Pettitt test (1979)

Discussion and Conclusion

The purpose of this study is to detect signals of climate change in the localities of Bol, Fianga, Moundou and N'Djamena. The results obtained show that over the past few decades, there has been a modification of the rainfall regime in terms of frequency and intensity across all locations. However, a slight decrease in annual rainfall accumulation was observed from 1981 to 2020. This overall decreasing trend over the 1981-2020 series is linked to episodes of extremely severe drought that lasted for about 5 consecutive years during the 1980-1990 and 1990-2000 decades, marked by the strong El niño phenomenon of 1983/1984 and 1997 [27] and the historic drought of 1983-1984 that affected Central Africa and the Sahel [28]. These results were also observed in the works of New et al., and Aguilar et al. [29, 9]. In fact, in their studies on the evolution of extreme daily climate conditions covering southern and western Africa,[9] showed that regions are experiencing an overall decrease in total annual rainfall and the number of rainy days. Aguilar et al. also reached the same conclusions in their analysis of precipitation in Central Africa between 1955 and 2006 [9] . While the general trend of rainfall is decreasing from 1981 to 2020, there is however an increasing variability observed from 2011-2020 decade in all locations, with N'Djamena, Moundou and Fianga recording rainfall surpluses of approximately 31,5%, 8% and 23,8% respectively, during the 2010-2020 period with episodes of heavy rainfall over the last 5 years (2015-2020) in N'djamena with annual cumulative deviations of over 100 mm compared to the norm (1981-2010). These variabilities were considered by some of the authors as a return to normal rainfall conditions, particularly [30] who noted for the Sudanian and Sahelian regions of the Sahel an upward trend in total annual rainfall accompanied by an increase in frequency of short episodes of extreme drought and heavy rainfall events (flooding), making the rain season more uncertain and unpredictable.

The results of the study also show a general increase in extreme rainfall events in terms of frequency of heavy rains (R20), intensity (SDII), rainfall heights (R95), and frequencies of very humid days (R95pTOT) across all locations over the last five years (2015-2020). However, a more notable increase in frequencies of very humid days (R95pTOT) was observed in the Sahelian zone than in the Sudanian zone, with 42% in Bol and 31% in N'Djamena. These analyses confirm the results of the recent studies [31, 32, 33]. This trend has already been observed by IPCC studies [34], predicted an intensification of extreme climate phenomena over the next few decades in the Sahel. This was confirmed by several studies [35, 36, 31]. The increase in rainfall accumulation, frequency, and intensity led to serious flooding in 2020, which affected 87% of the national territory [5]. If this trend continues, we will see an increase in disasters with associated damages and costs [37,38,39,40] and a resurgence of epidemics of climate sensitive diseases such as malaria and cholera [41].

Extreme temperatures, both minimum and maximum, have risen throughout the 1981-2020 period, corroborating the IPCC's publication [31] findings that forecast temperature shifts and heightened precipitation extremes across West and Central Africa. This aligns with a projected global average temperature rise of 1.5°C to 2°C above pre-industrial levels [42,43]. We generally notice that the minimum temperatures increased more than the maximum temperatures in all the localities studied, and in a linear fashion, while the maximum temperatures experienced variability from one decade to another (see the temperature maps of N'Djamena and Moundou). The localities of Bol and N'Djamena in the Sahelian zone recorded an increase in minimum temperatures of 0.7°C and 1.2°C respectively; and maximum temperatures of 0.7°C and 0.8°C, while the localities of Moundou and Fianga in the Sudanese zone recorded a rise in minimum temperatures of 0.8°C for both localities and maximum temperatures of 0.6°C and 0.7°C thus showing an increase in both minimum and maximum temperatures, slightly higher compared to the values of localities in the Sudanese zone. We note a particular increase in both minimum and maximum temperatures during the period 1997-2007.

The frequency of hot days (TX90p) and hot nights (TN90p) showed an increasing trend during the period between 1996/1997 and 2007, which corroborates the results of Mbaiguedem [44] which reveal that from 2006, there is a persistence of hot nights of more than 20 days, and also the results of Bedoum [45] whose indices indicate an increase in hot nights in both Chad and Central Africa. On the other hand, we note a significant drop in both TN90p and TX90p between 2007 and 2020. This could be explained by the improvement in precipitation conditions.

Annual rainfall in Chad has experienced alternating periods of humidity and drought, with a general trend of decline between 1981 and 2020. A change of rainfall regime since the late 1990s, detected by statistical tests as a break year in the chronological series has been observed. The study allowed us to show and highlight a succession of dry and humid periods. It appears that the decades of 1980-1990 and 1990-2000, and part of the 2000s, were characterised by episodes of severe rainfall deficits. Except for the locality of Bol, where the precipitation trend decreased by around 17%, all other localities experienced high variability and a tendency to excessive rainfall conditions during the 2010-2020 decade. This recovery seems more pronounced in the Sahelian zone than in the Sudanese zone. The return of rains in the studied localities was marked by a sharp increase in frequency and intensity of extreme rainfall, which could explain the severe flooding of recent years that affected 87% of the national territory between 2019 and 2022. On the other hand, maximum and minimum temperatures increased by 0.6 to 1.2°C respectively, with a more accelerated increase in minimum temperatures and an increasing trend in climatologically hot nights (TN90p), which is one of the major characteristics of climate change.

It can be concluded that the localities of the study area are characterised by unstable rainfall patterns associated with rising temperatures. Such a climatic context is not without consequences for the development of key sectors. These conditions are conducive to and favor the proliferation of mosquitoes, which are vectors for the Plasmodium parasite [46]. The study by Huston [47] reveals that long-term shifts in temperatures and precipitation patterns, along with increased climate variability and more frequent extreme weather events, will distinctly affect the risk of various infectious diseases.

In conclusion, real signals of climate variability and change characterised by a general trend of decreasing rainfall have been identified across all localities, although increased variability with intensified rainfall

has been noted over the past few decades, explaining the serious flooding in recent years (between 2010 and 2020). The results obtained in this study are consistent with those obtained in other regions of the globe. The disruptions in the spatio-temporal distribution of rainfall and the increasing temperature trend revealed are statistically significant, indicating a warming pattern with steps and jumps, allowing us to appreciate the magnitude of recent climate change (1981-2020). It is essential to extend such a study to other stations across the national territory to better understand the evolution of climate change and adjust public policies in key development sectors.

Acknowledgements

We wish to extend our deepest gratitude to the following institutions for their invaluable support in the accomplishment of this work:

1. The National Meteorological Agency of Chad, for generously providing essential meteorological data for this study.
2. The Ministry of Public Health of Chad for granting access to valuable epidemiological data.
3. The Central African Climate Application and Prediction Center (CAPC-AC), for their remarkable collaboration in the collection, storage, and processing of climatic data.

Their contribution has been a cornerstone in the development of the analyses presented and has greatly facilitated the understanding of the dynamics studied.

Conflict of Interest Statement

The authors of this article declare that there is no conflict of interest that could be perceived as influencing the results or interpretation of the data presented.

This research was conducted with complete independence, without any external influence that could compromise the scientific integrity of the work performed.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art007

Effects and Challenges with Implementation of Green Management in Public Sector Institutions in the Bono Region of Ghana

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Abstract

The push to adopt and implement green management in the business world has attracted global attention due its impact on the work environment. The main purpose of the study was to assess the effects and challenges associated with the adoption and implementation of green management among public sector institutions in the Bono region. A mixed-method was employed with a descriptive design to recruit participants through the use of stratified sampling technique. The quantitative data was collected using a 5-point Likert scale while a semi-structured interview guide was used to collect the qualitative data. After using SPSS version 23 software and thematic content technique to analyse the quantitative and qualitative data, the results showed that implementation of green management contributes to reduce energy consumption, improve waste generation and management, improve financial efficiency and enhance corporate image in public sector institutions. On the other hand, inadequate financial resources, lack of management support, inadequate knowledge and capacity building were found as the main challenges associated with the implementation of green management in public sector institutions. Based on the findings, the study concludes that the adoption and implementation of green management has positive effects on public sector institution but is faced with challenges.

Keywords*: Bono Region, Challenges, Effects, Green Management, Public Sector Institutions.*

Introduction

Background of the Study

It is notably evident that the green wave is currently surging through the business world in full force, and it's not expected to let up anytime soon. As a result, there has never been a better time to transform our office environment into a green workspace.

It is against this backdrop that environmental sustainability has become one of the major global concerns that has attracted the attention of world leaders in recent years. The world's environmental scientist on the Intergovernmental Panel on Climate Change has since 1988 reported on the state of awareness of climate change with evidence that suggests that the world stands to suffer the devastating consequence of global warming and other environmental issues due to rising sea levels, droughts, ocean acidification and loss of biodiversity [1].

In response to the challenging environmental issues, several efforts have been made by the world to find solutions to the menace. As a result, the Rio Earth Summit organized in 1992 devised the United Nations (UN) framework Convention on Climate Change to promote

Received: 27.05.2024 ***Accepted: 01.06.2024*** ***Published on: 30.07.2024***
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international political response to climate change [2]. Also, the Millennium Development Goals declared by the UN in 2000 committed member states to a global partnership to as part of the goals, to work toward ensuring environmental sustainability. In 2015, the Conference of the Parties (COP21) had 195 UN member states meeting in Paris where a legally binding agreement was signed by members to keep global warming below 2^0C [2]. Although, the world is yet to achieve environmental sustainability, green management is widely proposed as an effective mechanism that institutions and organizations should embrace to achieve their goals without causing harm to the environment.

The paradigm known as "green management" involves raising awareness of environmental issues, utilizing energy sources and eco-friendly technologies, reusing waste, and recycling operations that span throughout the activities of institutions and organizations [3]. The objectives of green management include making sure that operations are conducted with respect for the environment, preserving the environment in business objectives, visions, and goals, as well as operation functions, enabling continuous development, and selecting technologies following sustainability principles [4].

Due to environmental destruction arising from the activities of various sectors including transportation, manufacturing and mining resulting in adverse impacts on resources and human lives, businesses and organizations are now conscious that the environment needs to be protected and managed sustainably [5]. The adoption of green management which is largely focused on keeping a healthy environment for the present and the future is associated with several benefits. Many studies have attested to the positive effects associated with the adoption and implementation of green management [6]–[11]. However, other studies have acknowledged that the implementation of green management is confronted with several challenges [12]–[16].

In recent years, there has been a global shift towards adopting green management practices in public institutions [17]. This shift is driven by the recognition of the need for sustainable development and the mitigation of environmental impacts. Public institutions play a crucial role in promoting and implementing sustainable practices due to their scale, influence, and capacity for large-scale change. Green management practices in these institutions involve integrating environmental considerations into decision-making processes, adopting eco-friendly technologies, promoting energy efficiency, managing waste, conserving natural resources, and fostering environmental awareness.

Green management practices in public institutions are gaining momentum in Africa as the continent faces increasing environmental challenges, such as climate change, deforestation, and pollution. African governments have recognized the importance of adopting sustainable practices to preserve their natural resources and promote sustainable development as part of the Sustainable Development Goals. The 2015 Johannesburg Action Plan of the Forum on China-Africa Cooperation makes special mention of combating climate change and environmental preservation [18]. Several African countries have developed national green growth strategies, policies, and action plans to address these challenges. These initiatives focus on sustainable land and forest management, renewable energy, waste management, water conservation, and enhancing climate resilience.

In Ghana, there is a growing recognition of the importance of green management practices in public institutions. The country faces environmental challenges such as deforestation, water pollution, and inadequate waste management. The Government of Ghana has taken steps to address these issues by incorporating sustainability into its

development agenda. Initiatives such as the National Climate Change Policy [19], Renewable Energy Act [20], and Sustainable Development Goals (SDGs) [21] implementation highlight Ghana's commitment to green management practices.

With all the efforts made toward achieving environmental sustainability in Ghana, researchers have not paid attention to the effects and challenges associated with implementation of green management practices in public sector institutions. This has resulted in a paucity of knowledge and hence the need to conduct the current study.

Problem Statement

The adoption and implementation of green management practices in Ghana is essential given its abundant natural resources whose exploitation tends to create a negative impact on the environment. Lack of sustainable environmental practices is a risk of losing resources as well as causing harm to the national population. As a result, the subject of green management practice is of paramount importance to the socio-economic development of Ghana. Despite Ghana's efforts in recent years to mitigate climate change and promote sustainable development through green practices, there is limited research conducted to assess the effects and challenges associated with the adoption and implementation of green management in public sector institutions. This problem, if left unsolved would make it difficult for the country to understand the needed policy direction to achieve its green initiatives.

Purpose

The purpose of the study was to assess the effects and challenges associated with the adoption and implementation of green management in public sector institutions in the Bono Region of Ghana.

Limitation of the Study

One major limitation of the study is the lack of generalizability of the study findings to other contexts or countries. The study focused specifically on the Bono Region of Ghana and as a result, the findings may not apply to public institutions in other regions or countries with different socio-economic or cultural factors. This limitation should be acknowledged, and the results of the study should be interpreted within the context of Ghana specifically.

Schematic Diagram

Fig. 1 below is the schematic diagram showing the study process.

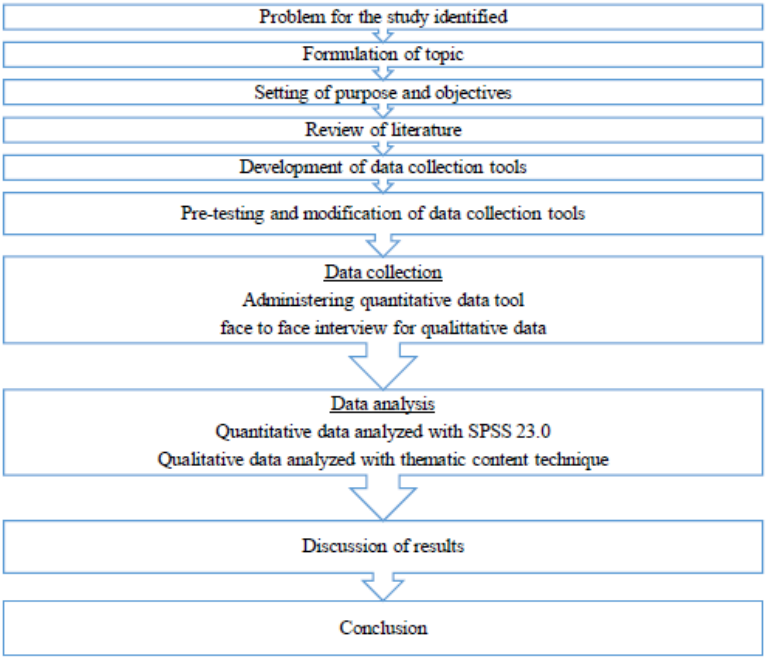

Figure 1. Schematic Diagram Showing the Study Process

Materials and Methods

Study Design and Setting

The Bono Region, one of the sixteen administrative regions in Ghana, is located in the middle portion of the country. The region is made up of twelve Municipal and District Assemblies (MDAs) and has Sunyani as the capital town [22]. With an abundance of natural resources, diverse landscapes, and a growing commitment to sustainable practices, the Bono Region has become a hub for green initiatives in public institutions.

The region covers an area of approximately 9,826 square kilometres (3,790 square miles) and is bordered by six other regions. The region's topography encompasses vast grasslands, forests, rivers, and hilly landscapes, contributing to its ecological diversity [22]. The dominant climate is tropical, characterized by two primary seasons: a wet season (April to October) and a dry season (November to March).

According to the 2020 Population and Housing Census conducted by the Ghana Statistical Service (GSS), the population of the region is 1,208,649 consisting of 596,676 males and 611,973 females with 708,481 being urban dwellers and 500,168 as rural population [23].

Bono Region is endowed with abundant natural resources, including fertile arable land suitable for agriculture, mineral deposits, and rich biodiversity. The region boasts a variety of crops such as cocoa, yam, maize, and oil palm, contributing significantly to Ghana's agricultural output. Additionally, its dense forests support timber and other non-timber forest products, emphasizing the importance of sustainable forest management practices. Public institutions in the Bono Region have the responsibility to lead in the implementation of green management practices to protect to promote sustainability and preserve the region's natural heritage thus making it suitable for the study.

Study Population, Sampling and Sample Size

The population of the study consisted of 2,147 employees of seven public sector institutions comprising of the Regional Coordination Council (RCC), University of Energy and Natural Resources (UNER), National Pension Regulatory Authority (NPRA), Ghana Education Service (GES),

Regional Hospital, Ghana Commercial Bank and Ghana Health Service (GHS) in the Bono region.

Stratified random sampling technique was used for the study where quantitative data of 328 participants and qualitative data of 15 respondents was collected for analysis.

Data Collection Tool and Procedure

A 5-point Likert scale and a semi-structured interview guide were used to respectively collect quantitative and qualitative data for the study. While both tools were pre-tested, reliability test was done to ensure that items with Cronbach alpha values less than 0.70 were dropped from the scale. The interview guide on the other hand was subjected to peer and expert review to ensure face and content validity respectively.

Prior permission and approval were sought from the authorities of the selected institutions before collection of data commenced. Participants were subsequently met and briefed about the study where comprehensive clarification was provided. The quantitative data tool was then administered to participants for completion from one institution to the other.

On the other hand, face to face interviews were held with respondents to collect qualitative data. All interviews were conducted in English and were recorded using audiotape recorders. A journal was also used to make field notes during interview sessions.

Data Analysis

The quantitative data collected for the study was processed and analyzed using SPSS version 23. A descriptive analysis of the data was done. The descriptive analysis focused on descriptive statistics such as mean, standard deviation, frequency and percentages as well as mode.

The qualitative data was analyzed manually using thematic content technique. Before the analysis, all recorded interview audio was transcribed verbatim. The scripts were then read multiple times to identify similar patterns which were grouped into themes and sub-themes. An in-depth description of the themes and sub-themes was done and supported with quotes from participants.

Results

Socio-Demographic Characteristics of Participants

Table 1 shows the socio-demographic characteristics of participants.

Descriptive Statistics

The results of the descriptive statistics of the quantitative data is as indicated in Table 2.

Table 1. Socio-Demographic Characteristics of Participants

Characteristics	Frequency	Percentage (%)
Gender		
Male	221	57.4
Female	107	32.6
Total	**328**	**100.0**
Age (Years)		
20-29	33	10.1
30-39	208	63.4
40-49	84	25.6
50 or more	3	0.9
Total	**328**	**100.00**

Marital status		
Married	176	53.7
Single	152	46.3
Total	**328**	**100.0**
Religion		
Christians	316	96.3
Muslims	12	3.7
Total	**328**	**100.0**
Education status		
PhD	31	9.5
Master's degree	93	28.4
First degree	157	47.9
HND	36	11.0
Basic education	11	3.4
Total	**328**	**100.0**
Institution of work		
NPRA	21	6.4
GHS	54	16.5
RCC	72	22.0
UNER	54	16.5
GES	60	18.3
Regional Hospital	30	9.1
GCB Bank	37	11.3
Total	**328**	**100.0**
Number of years at the institution		
0-2 years	25	7.6
3-5 years	155	47.3
6-8 years	77	23.5
9-11 years	14	4.3
12 years or more	57	17.4
Total	**328**	**100.0**

Table 2. Descriptive Statistics

Construct	**Mean**	**Mode**	**Std. de**	**Interpretation of results**
Effects of green management				
EG1: The adoption of green management practices has resulted in a reduction of energy consumption in this institution	3.44	4	1.00	Agree

EG2: Green Management practices have led to a decrease in the amount of waste generated in this institution	3.56	4	0.98	Agree
EG3: My institution has witnessed an improvement in waste management processes through the adoption of green management practices	3.56	4	0.93	Agree
EG4: My institution is seen as a leader in environmental sustainability because of the adoption of green management practices.	3.40	4	1.06	Neutral
Challenges of implementation green management				
CG1: Consumers are not aware of our institution's green management practices and its benefits	3.39	4	1.01	Neutral
CG2*:* There are inadequate financial resources allocated for the implementation of green management practices in this institution.	3.69	4	1.02	Agree
CG3: Consumers are unwilling to pay for premium services	3.63	4	0.99	Agree
CG4: There is inadequate support and commitment from top management toward the implementation of green management practices in this institution	3.57	4	1.02	Agree
CG5*:* There are insufficient training and capacity-building programs on green management practices in this institution	3.74	4	1.02	Agree
1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree				

Qualitative Results

Effects of Green Management Practices in Institutions

Concerning the effect of green management practices in institutions, there was a consensus among participants that it increases operational efficiency in many forms. The sub-themes

identified under this theme were financial efficiency, resource management and waste management. The opinions of participants expressed as contained in some of the statements below.

Financial Efficiency

Financial efficiency was noted among participants as one of the effects of the adoption and implementation of green management practices in their institutions. The majority of the participants believed adhering to green management practices has some financial benefits for their institutions. These effects were generally expressed about how they benefit in terms of saving energy, which implies their finances.

G3: *'I can tell for a fact that adoption and implementation of green practices have positive financial implications for our institution. Financially, we can save money from electricity through the use of energy-efficient bulbs and electrical gadgets. Although, I cannot tell the exact amount of money we save by adhering to this practice, it has contributed to financial efficiency".*

G9: "*Green practices have indeed financial benefits for our institution. This is because when we started buying only new fridges, we realized that we don't spend much on repairs like we used to do with our old fridges and again electricity consumption is low which leads to reduced cost of light bills. All these indirectly contribute to positively affect our finances".*

G10: "*I think green practices have a lot of effects on the institution. I say that it contributes to saving money for the institution. For instance, the energy bulbs are noted to consume less electricity which means we are not paying higher electricity bills, and this is good for our finances".*

Efficient Waste Management

Another effect of green management practices revealed by participants of the study was waste management. The majority of the study participants believed that green practices have an effect on the management of waste in the institution as they use biodegradable products and eco-friendly products for their operations.

G6: "*We are very mindful to buy eco-friendly products and most of these are biodegradable hence we don't have a problem with dealing with waste and its negative impact on the environment. As a result, green practice is good in terms of waste management".*

G11: "*Here we use water dispensers and reusable cups for drinking water. We have adopted this practice because we don't want individual staff to come to work with sachet water or bottled ones which will lead to waste after drinking the water. In that way, we are preventing the generation of plastic waste which may end up contributing to polluting the environment".*

Enhanced Image

Some of the study participants also observed that the adoption and implementation of green management practices have contributed to enhancing the image of their institutions. This was largely expressed in terms of the nature of the physical environment they maintain as an institution. Their observations were as indicated in the statements below.

G12: "*I will say the contribution of green management practice to our health is something that you cannot see with your eyes. As you can see the green grass and trees on our compound and how it has provided a conducive environment for us and visitors. I can say with confidence that because we practice keeping our environment green, people come here just to relax under the trees while some come for photo shoots during weddings and programs. It has impacted on our institution's image and makes it attractive to the general public".*

G13: "*One thing I have observed about this institution is that our visitors and the public are always happy about our green lawns and the*

trees. They openly praise us for such a serene atmosphere within our environment and I will attribute all this to our practice of keeping our environment green all the time. It has enhanced our image in the eyes of the public".

G15: "*In fact, we feel proud because of how our practice has attracted a lot of commendations from visitors and other institutions. We have intentionally kept our green grasses and trees and they have become a point of attraction to people. Other institutions come to learn our green practices and even pick some of our trees and flowers to grow on their compounds. We have a good public image because of our practice*".

Challenges in the Adoption and Implementation of Green Management Practices

Concerning the challenges faced by institutions in the adoption and implementation of green management practices, inadequate knowledge, lack of management commitment and lack of resources emerged as sub-themes.

Inadequate Knowledge

Inadequate knowledge about green management practices was noted by participants as one of the challenges faced in the adoption and implementation of the practice in institutions. According to the participants, their understanding of the management practice is limited thus impedes their capacity to increase the scope of adoption and implementation.

G4: "*Let me be frank with you that this study has opened my eyes about green management practices because I didn't even know that we do constitute it. This should tell you how we lack adequate knowledge about it and that is affecting its adoption and implementation. I know there many managers of institutions in this region that equally lack understanding of the concept and I believe that is a major challenge".*

G6: "*I think the knowledge of green management practice is very low among authorities of institutions and that is one of the challenges we face. Although we are implementing it, some of us did not know that it is a very important management concept that needs to be taken seriously. Because we lack adequate knowledge, we are not able to know exactly what to adopt for implementation in our institutions".*

G10: "*I will say our challenge is lack of knowledge. Just as the Bible says, lack of knowledge my people perish, I have realized that we don't have enough knowledge in terms of information about green management practice. Even as a top management member of the institution, I can tell you that this is the first time I have gotten information about green management practices. Even though we are implementing the practice, we did not know about it and that has limited the extent to which we are handling it. I believe if we had more information about it before as I have learned from this study, we would widen the level of adoption and implementation of it in the institution.*

Lack of Management Commitment

Another challenge that was identified among participants in the adoption and implementation of green management practices was the lack of commitment by the management of the institutions. The majority of the participants believe management was not doing much to implement green management practices in the institutions. The following were some of the statements expressed by participants in that regard.

G1: "*I think management has not done enough toward the adoption and implementation of green management practice in this institution. You know the decision of every organization is driven by the priority of top management and I can say that green management practices have not been the focus of management of this institution. It is a major*

challenge that is affecting the practice in this institution".

G2: "*I will say management of this institution has not given attention to the implementation of green management practices. Everything in this institution is centered on management and if they show commitment, it will be done. In the case of green management practice, I have not seen their commitment and that is a major challenge to executing practices like that".*

G5: "*Lack of commitment from management is the key challenge facing the adoption and implementation of green management practice in this institution. I am saying this because if they should give it priority, I can say that its implementation will be easy. I don't want to blame them because it could be that they don't understand the concept and that is why they are not committed to implementing it".*

Lack of Resources

Resources for implementing green management practices were also found among participants as a challenge. The majority of the participants believed that the adoption and implementation of green management practices in their institution are challenged because there is a lack of resources. The various opinions were shared in the statements below.

G5: "*One challenge that I can say is lack of resources. Both financial or material and human resources are challenges that are confronting this institution in terms of the adoption and implementation of green management practices. I don't think we have allocated any budget to protect our environment or train employees on sustainability practices and this is a challenge to the adoption and implementation of green management practices here".*

G10: "*I think there is a lack of financial resources toward the adoption and implementation of green management practice in this institution. This is a challenge that is hampering the implementation of the concept in our institution".*

G14: "*Green management practice requires resources before any institution can implement it successfully. In this institution, I will say that there is a lack of needed resources to make it work. We don't devote money or build the capacity of staff to implement the practice and it is our major challenge in terms of adoption and implementation of green management practices".*

Discussion

The study also sought to examine the effects of the adoption of green management practices in enhancing direct environmental sustainability in public institutions. The quantitative results of the study revealed that the adoption and implementation of green management practices have resulted in a reduction of energy consumption and, a decrease in waste generation and management in public sector institutions in the Bono region. The finding is in line with the results of studies by Hohne, Kusakana and Numbi [7] and Pujara et al. [8] where the adoption and implementation of green management practices had a positive impact on energy consumption, waste generation and management in organizations. The findings mean that Ghana can save more energy if green management practices are promoted across all sectors in the country. This would greatly impact the energy sector of the country and ensure a stable power supply for both domestic and commercial purposes. Given this, the finding has brought to light the need to promote green management practices as a measure to deal with the deficit in the power supply of the country.

Similarly, the results of the qualitative data identified themes such as financial efficiency, efficient waste management and enhanced image as the effects of the adoption and implementation of green management practices. Except for enhanced images, the results of the qualitative data are consistent with

the results of the quantitative data. The recognition of enhanced image as the effect of the adoption and implementation of green management practice is unique compared to the effects identified by other studies in the literature. However, it is an important finding as it would serve as the basis for institutions that need to enhance their image to adopt and implement green management practices.

The study also aimed to identify the challenges associated with the adoption and implementation of green management practices in public sector institutions in the Bono region. The results of the quantitative data indicate that inadequate financial resources, unwillingness of consumers to pay for premium services, inadequate support from top management, and lack of capacity building were identified as the challenges affecting the adoption and implementation of green management practices in public sector institutions. This finding supports the results of studies by Islam et al. [12], Ye, Liu and Wang [13], Waxin, Knuteson and Bartholomew [14] where lack of financial resources, lack of management support and lack of capacity of employees were found as major challenges to the adoption and implementation of green management practices.

The lack of financial resources for the implementation of green management practices identified by the study is a call for regulations to consider making provisions for the allocation of budgets towards environmental sustainability practices such as green management. This would compel institutions to be accountable for the adoption and implementation of green management practices. Also, concerning the challenge of management support and commitment, the result can be attributed to a lack of awareness among top management regarding the benefits of green management practices. As a result, they lack the inspiration to lead the promotion of green management practices in their institution. Given this, the finding is a significant call to create awareness about green management practices among top management of institutions. This by extension would also contribute to building the capacity of employees towards the implementation of green management practices.

Equations

Sample size for the study was determined using the Yamane formula given by.

$$\text{Sample size (n)} = \frac{N}{1+Ne^2}, \quad (1)$$

Where N = Population.

e = margin of error at 95%. confidence interval = 5% = 0.05.

Putting N = 2147 and e = 0.05 into Equation (1).

$$\text{Sample size, n} = \frac{2147}{1+2147(0.05)2} \quad (2)$$

$$= 337$$

Conclusion

In conclusion, implementation of green management in public sector institutions is associated with positive effects such as efficient energy consumption, improved waste generation and management and enhanced corporate image. However, the implementation of the practice is affected by challenges including lack of resources, knowledge and capacity building as well as lack of management support.

Acknowledgement

We would like to sincerely thank all heads of public sector institutions and all respondents who contributed to make this research successful.

Conflict of Interest

There is no conflict of interest as far as the conduct of the study is concerned.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art008

An Analysis of Factors Behind Variations in COVID-19 Infections Between Urban and Rural Areas of Zimbabwe in 2020

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Abstract

The purpose of this study is to examine the answers provided by Zimbabwean medical professionals to a questionnaire regarding the variables driving the disparities in COVID-19 infections in Zimbabwe's urban and rural areas in 2020. The objective is to create appropriate, context-specific disease prevention and control plans at the district and provincial levels. A questionnaire survey study design consisting of closed-ended questions was utilized to collect data from medical professionals in Zimbabwe, specifically nurses and doctors, at the district and provincial levels. Microsoft Excel was used to examine the data. The findings show that urban areas had a higher number of COVID-19 cases in 2020 compared to rural ones. According to the results of the survey, a few other important factors that were linked to the urban COVID-19 outbreak were population density, ease of access to ports of entry, and the use of public transportation. A greater number of COVID-19 infections may have been recorded in urban than rural regions as a result of incorrect patient addresses found in a number of COVID-19 infection data. Out of the total of 27 respondents, twenty-one strongly agreed that the COVID-19 outbreak was caused by population density, while the remaining respondents agreed. The opinion that being close to points of entry, including airports and land borders, facilitated the spread of COVID-19 was strongly agreed and agreed upon by 20/27 and 7/27 respondents, respectively. The claim that the method of public transportation contributed to the spread of COVID-19 in metropolitan areas was agreed and strongly agreed upon by 9/27 and 14/27 respondents, respectively. 8/27 respondents strongly agreed that the reason there were more COVID-19 instances in urban provinces than in rural provinces was because there were more entertainment venues or places in urban areas than in rural ones. This viewpoint was agreed upon by 12/27 respondents. The results of the study suggest that the COVID-19 outbreak in Zimbabwe's urban provinces may have been facilitated by factors such as population density, accessibility to ports of entry, use of public transportation, and the availability of more leisure options in urban regions than in rural ones.

Keywords: *Covid-19, Proximity, Ports of Entry, Rural Provinces, Spatial, Variations, Urban Provinces.*

Introduction

The first COVID-19 infections were reported in China in December 2019 [1]. COVID-19 rapidly changed and spread throughout the world, turning into a pandemic [2]. Following the confirmation of the first COVID-19 case on March 20, 2020 [3], Zimbabwe experienced a steady increase in COVID-19 cases. As of December 31, 2020 [4],

Received: 21.05.2024 ***Accepted: 27.06.2024*** ***Published on: 30.07.2024***
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there had been 13,867 cases, 11,250 recoveries, and 363 fatalities reported. As of December 19, 2023, the total number of COVID-19 cases and deaths in Zimbabwe was 265,975 and 5,730, respectively [5].

The COVID-19 public health emergency was officially declared over on May 5, 2023, by the Director General (DG) of the World Health Organization (WHO) [6, 7, 8]. However, the disease continued to pose a threat to global health because there was a chance that new infections could emerge and cause new waves of cases and fatalities [9] as some variants of SARS-CoV-2 are eminently lethal and have no geographical bounds [10]. As a result, it was stressed that all countries, including Zimbabwe, needed to remain on high alert in order to prevent further human casualties.

The disease monitoring and surveillance strategy of the Ministry of Health and Child Care (MOHCC) in Zimbabwe included the creation of Daily Situation Reports (SitReps) and the regular release of surveillance updates. COVID-19 infection rates varied geographically between urban and rural areas, with urban provinces reporting more cases than rural provinces, according to an examination of these data [11]. Even when COVID-19 control and preventive measures were uniformly adopted nationwide by the Zimbabwean government, this remained the situation. The aim of this research is to ascertain plausible reasons for the disparities in COVID-19 infection rates observed in Zimbabwe's rural and urban regions. A questionnaire survey consisting of closed-ended questions was employed to collect data, which was subsequently assessed for the purposes of offering appropriate context-specific preventive and control strategies.

Methods

Study design: The study design includes a questionnaire survey consisting of closed-ended questions on six possible COVID-19 infection contributory factors that was completed by medical professionals, including nursing officers and doctors.

Study population: Medical doctors and nursing officers employed at the district and provincial levels of Zimbabwe's healthcare system comprised the study population.

Sampling and sample size: All 43 provincial and district medical professionals from the six provinces that were chosen were expected to respond to the survey; the sample size of 43 represented all the key informants (government medical practitioners) from the six targeted provinces; if all these could be reached and their responses captured, valid results that could be extrapolated to represent the whole of Zimbabwe would be achieved. Six of Zimbabwe's ten provinces supplied responses for the study. Four of Zimbabwe's eight rural provinces were chosen at random, while two of the country's urban provinces were chosen on purpose.

Data collection: The standard questionnaire, which collected quantitative data, was emailed to the respondents and returned by email to the researcher. The online mailing feature of the questionnaire survey approach led to its selection. When it came to collecting a lot of data, this approach was thought to be economical [12]. The primary survey questions addressed six different possible explanations for the higher proportion of COVID-19 cases reported in urban regions compared to rural provinces. The medical professionals were asked the following questions: 1) Did any member of your own family suffer from COVID-19? 2) Did you at any point in time treat COVID-19 patients? 3) Did you at any point in time oversee/supervise the treatment of COVID-19 patients? 4) Do you agree with the observation that some provinces had higher COVID-19 cases in 2020 than others? 5) To what extent do you agree with factors mentioned below as having contributed to differences in COVID-19 infections between rural and urban provinces of Zimbabwe? Data collected through the questionnaire was used to

characterize medical practitioners' opinions regarding potential variables that may have contributed to the higher number of COVID-19 cases reported in urban regions compared to rural ones. For the core closed-ended questions on possible factors that might have led to more COVID-19 cases being recorded in urban than in rural provinces, a Likert scale was used. After that, Microsoft Excel was used to examine the data.

Inclusion and Exclusion Criteria

Only medical professionals (nurses and doctors) at the district and provincial levels of the healthcare system who were instrumental in managing COVID-19 in Zimbabwe were the subject of the study. These came from the six chosen provinces—four randomly chosen rural provinces and two intentionally chosen urban provinces. Given their reputation as respected experts in the field of public health and their crucial role in the management of COVID-19 in Zimbabwe, these medical doctors and nurses were chosen as study participants.

Data Collection and Analysis

To gather information from the respondents, a standardized questionnaire consisting of closed-ended questions was emailed to them. The questionnaire was placed inside a Microsoft Excel spreadsheet that was created to make data entry easier. Data validation was done in order to facilitate the entry of answers to questions that required the selection of answers from a variety of options. The filtering icon in Excel was used to go through data and make graphs and tables.

Permission and Ethical Considerations

The Ministry of Health and Child Care in Zimbabwe gave formal approval for the study to be conducted. Approved under MRCZ/A/3095, the Zimbabwe Medical Research Council provided ethical approval. Prior to gathering any data, signed consent from the respondents was sought.

Results

Response Rate

Of the 43 medical professionals who were supposed to be included in the study, twenty-seven (27) were able to reply; hence, 63% of respondents finished the survey, as indicated in Table 1. Given that survey questionnaires were emailed to respondents and returned to the researcher, a 63% response rate was deemed sufficient. Fincham [13], who contends that researchers should aim for response rates of roughly 60% for the majority of their studies, supports this point of view.

Table 1. Survey response rate

Name of Province	Expected Responses	Responses Received
Midlands	9	2
Bulawayo Metropolitan	5	5
Harare Metropolitan	5	5
Masvingo	8	3
Matabeleland South	8	5
Matabeleland North	8	7
Total	43	27

Background Information about the Respondents

Less than one-third of the responders, or 8/27 were women, and the remaining 19 were men. They had four to forty-two years of professional experience in their current field, and their ages ranged from thirty to sixty-two. Additionally, 19 of the 27 respondents held a first degree, whereas 8 of the 27 respondents held a master's degree.

Respondents' Background Information Related to COVID-19

All 27 respondents indicated they had personally observed or supervised the care of a COVID-19 patient; 26/27 respondents indicated at least one member of their family had been infected with the virus; a similar percentage indicated they had treated a COVID-19 patient at some point in the past; and all 27 respondents indicated that they agreed that there were more COVID-19 cases in urban provinces in 2020 than in rural provinces.

Proximity to Ports of Entry as a Contributor to the Spread of COVID-19

Among the twenty-seven responders, 20/27 indicated that they strongly agreed that being in close proximity to points of entry, including airports and land borders, contributed to the COVID-19 pandemic. The remaining 7/27 respondents indicated that they agreed with the finding as depicted in Figure 1.

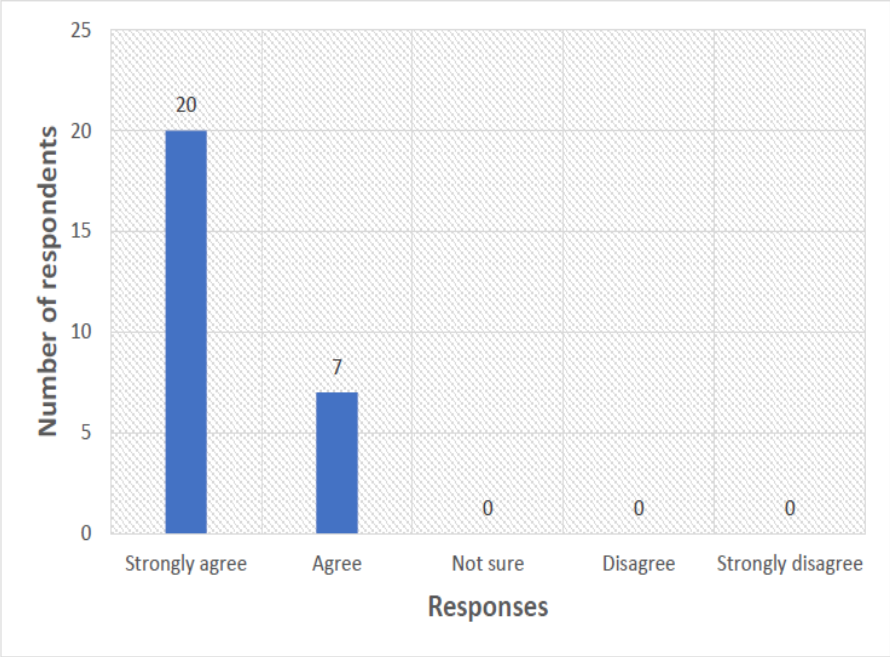

Figure 1. Respondents' Responses to Proximity to Ports of Entry as a Contributor to the Spread of Covid-19 in Zimbabwe, 2023

Population Density as a Contributor to the Spread of COVID-19

21/27 respondents indicated that they strongly agreed that the COVID-19 outbreak was caused by population density, while the remaining respondents indicated that they agreed.

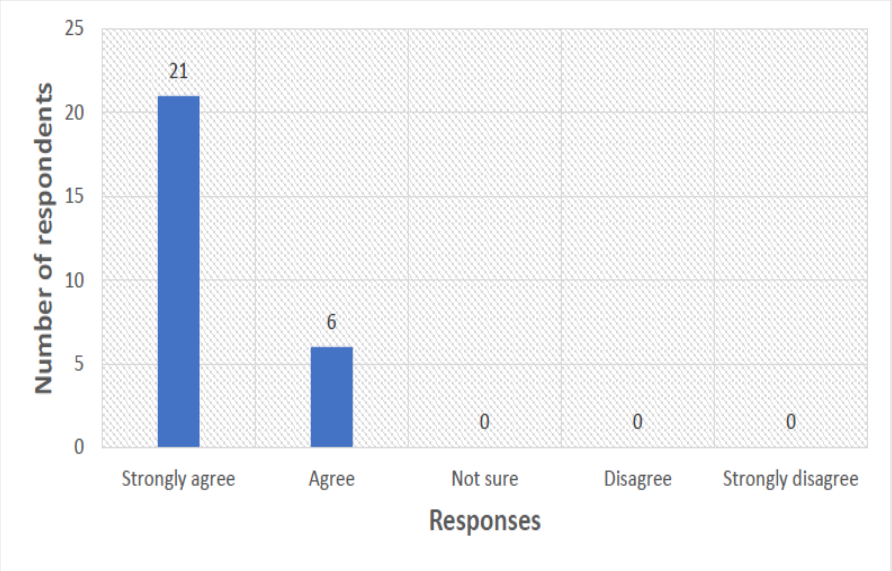

Figure 2. Participants' Responses to Population Density as a Contributor to the Spread of COVID-19 in Zimbabwe, 2023

Mode of Public Transport as a Contributor to the Spread of COVID-19

The following responses from respondents to the question of whether or not public transportation contributed to the spread of COVID-19 are displayed in Figure 3: 9/27 people agreed with the statement, 3/27 were unsure, 1/27 disagreed, and 14/27 strongly agreed.

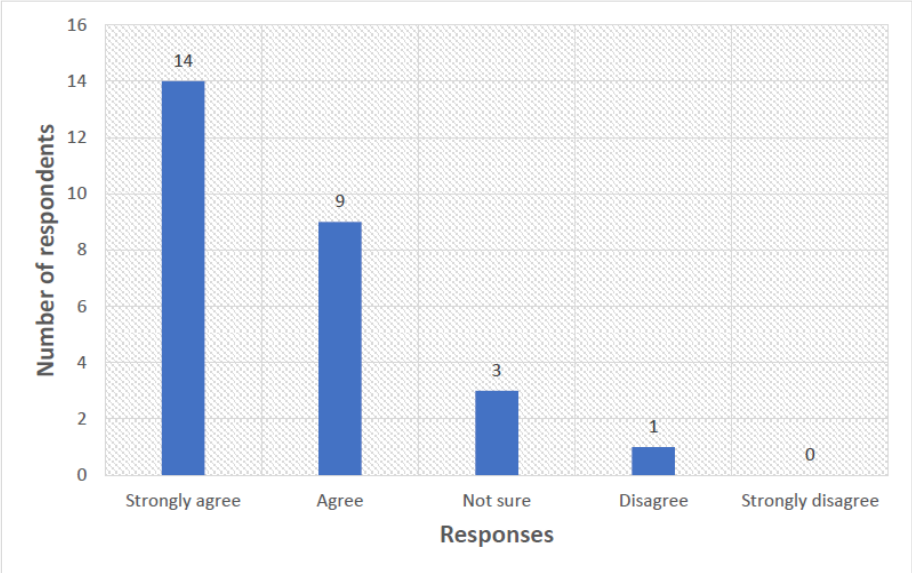

Figure 3. Mode of public transport as a contributor to the spread of COVID-19

Inaccurate Addresses from Patients as a Contributor to More Covid-19 Cases Recorded in Urban Areas Compared to Rural Areas

The following answers were given to the question of whether or not erroneous patient addresses caused more COVID-19 instances to be reported in urban than rural locations, as seen in Figure 4: 4/27 disagreed, 3/27 strongly disagreed, 11/27 were unsure, 6/27 strongly agreed, and 3/27 agreed.

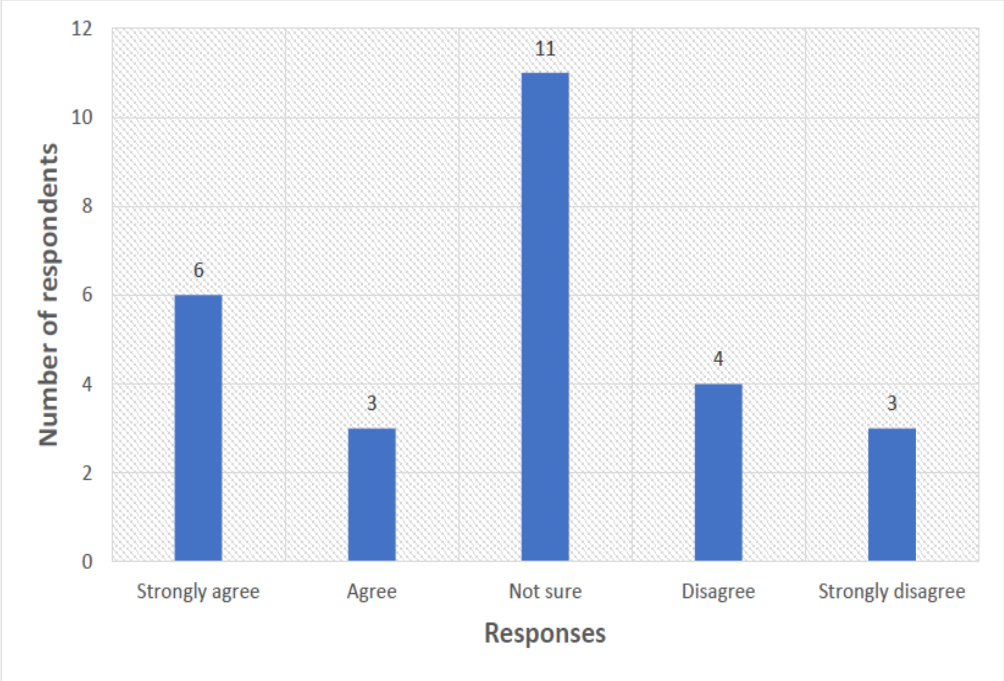

Figure 4. Inaccurate Patients' Addresses as a Contributor to Recording of More COVID-19 Cases in Urban Areas Compared to Rural Areas of Zimbabwe, 2023

Inaccurate COVID-19 Infection Records as a Contributor to More COVID-19 Cases Recorded in Urban Areas Compared to Rural Areas

Figure 5 presents the conclusions indicating a greater number of COVID-19 cases were recorded in urban regions than in rural areas due to inaccurate COVID-19 infection data. These findings represent the opinions of 5/27, 11/27, 7/27, 3/27, and 1/27 of the respondents, respectively.

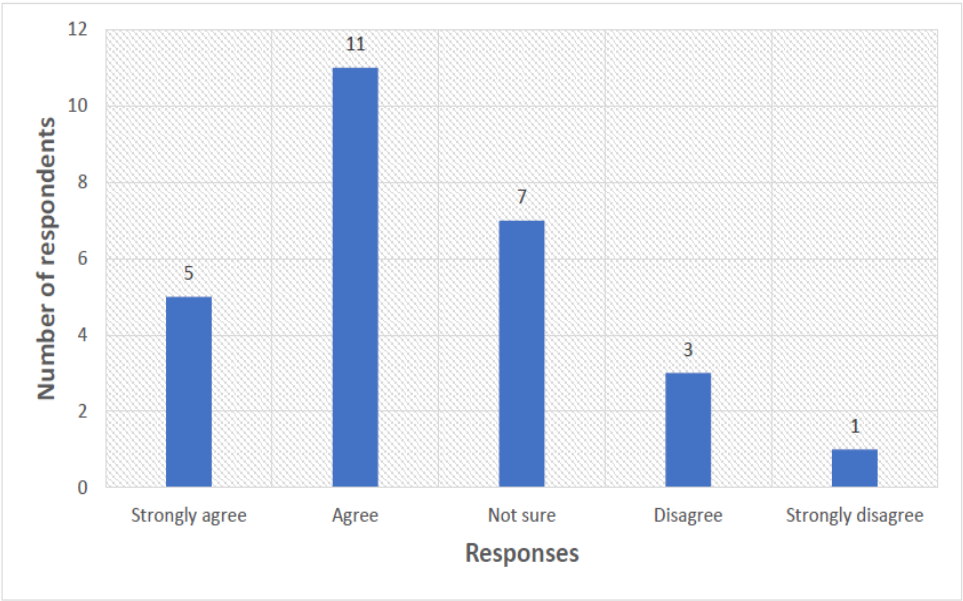

Figure 5. Inaccurate COVID-19 Infection Records as a Contributor to More COVID-19 Cases Recorded in Urban Areas Compared to Rural Areas of Zimbabwe, 2023

Availability of Places of Entertainment In Urban Areas Compared to Rural Areas as a Contributor to Higher Numbers of COVID-19 Cases in Urban Provinces Compared to Rural Provinces

Out of all the respondents, 8/27 indicated that they strongly agreed that the reason why there were more COVID-19 cases in urban provinces than in rural provinces was because there were more entertainment venues or places in urban areas than in rural counties. 12/27 respondents indicated that they agreed with the preceding assumption, as shown in Figure 6, while 5/27 and 2/27 respondents were unsure and disagreed with it respectively.

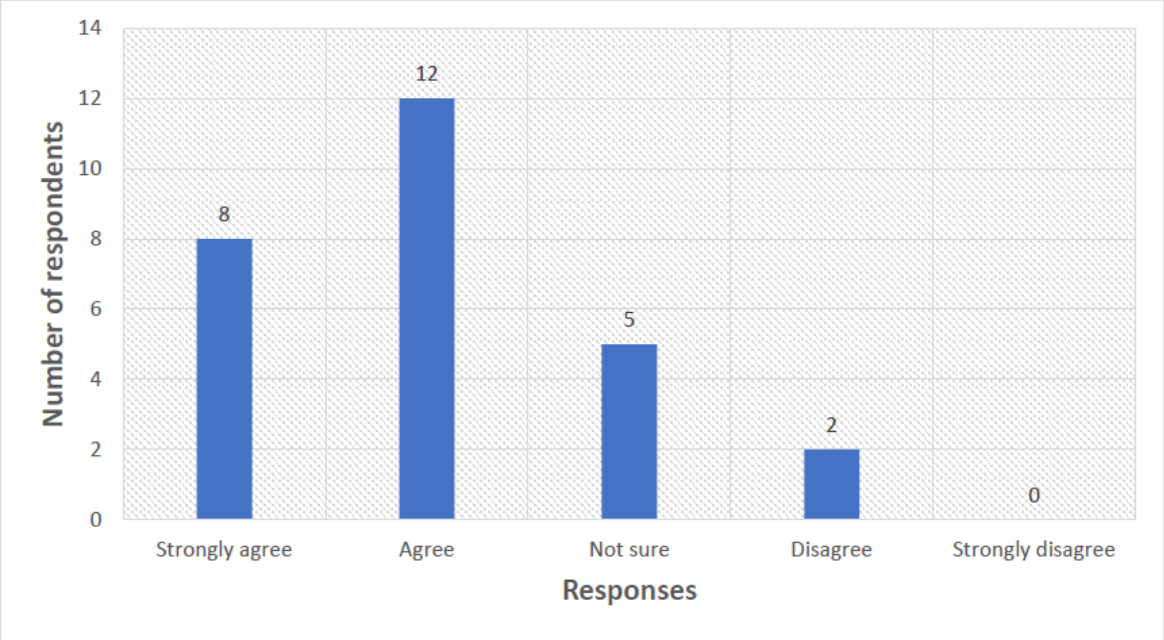

Figure 6. Availability of more entertainment places in urban areas compared to rural areas as a contributor to higher numbers of COVID-19 cases in urban provinces compared to rural provinces of Zimbabwe, 2023

Discussion

This study aimed to identify the reasons behind the higher number of COVID-19 cases reported in Zimbabwe's urban provinces in 2020 compared to the rural areas of the nation. To choose the appropriate course of action for the control and prevention of the disease, it is imperative to identify these characteristics. This will make it possible to develop and implement context-specific COVID-19 control and preventive measures that take into consideration the elements that have been discovered. The elements identified in this study will help us better understand the factors that lead to the spread of COVID-19, which will help policymakers and implementation partners develop solutions that are specific to the needs of both urban and rural areas.

According to the study's findings, all the 27 respondents indicated that metropolitan provinces had a higher number of COVID-19 cases in 2020 compared to rural ones. This finding is supported by findings from another study which found out that the number of cases reported was higher in provinces with higher overall levels of urbanization than in areas with lower levels of urbanization [1]. Additionally, the survey results indicate that the COVID-19 pandemic was mostly caused by the availability of more entertainment in urban areas, population density, use of public transport, and proximity to ports of entry. Furthermore, due to inaccurate patient addresses and insufficient COVID-19 infection records, there may have been more COVID-19 cases reported in urban regions than in rural ones.

Experts in medicine indicated that the number of COVID-19 cases in urban provinces was higher than in rural ones. Because of their proximity to ports of entry, Zimbabwe's metropolitan provinces saw a higher number of COVID-19 cases than their rural equivalents, as the findings section above illustrates. The urban provinces, which include the metropolitan cities of Bulawayo and Harare, are situated nearer ports of entry than their rural equivalents. The busiest airport in the country, Robert Gabriel Mugabe International Airport, is located in the Harare metropolitan area. The second busiest airport in the country, Joshua Mqabuko Nkomo International Airport, is located in the province of Bulawayo. The principal land border between South Africa and Zimbabwe, the Beitbridge border post, also allows for more unfettered reciprocal movement.

Beitbridge border post is the busiest land border, and with more COVID-19 cases being reported from South Africa than Zimbabwe, this meant that Bulawayo metropolitan province which is located closer to the border remained at high risk. The second wave of the COVID-19 epidemic struck Zimbabwe from December 2020 to January 2021 [14], severely impairing public health after the country's initial stringent restrictions that forbade travel abroad. Three primary factors contributed to the wave's propagation: increased mobility, human complacency, and inadequate border surveillance [14]. The importance of being close to ports of entry in the virus's spread is further highlighted by a different US study that found counties within 25 miles of an airport had 1.392 times the rate of COVID-19 cases and 1.545 times the rate of COVID-19 deaths compared to counties more than 50 miles from an airport [15]. Our findings are consistent with those of Zhang and colleagues, who found a favorable relationship between the frequency of air travel and high-speed rail services from Wuhan, China, and the number of COVID-19 cases in the destination cities [16].

The COVID-19 outbreak in Zimbabwe was found to be influenced by population density as well. In Zimbabwe, the population density in the urban provinces is higher than that in the rural areas. Manicaland province, one of Zimbabwe's eight rural provinces, has 56 inhabitants per square kilometer, compared to 2,783 and 1,390 in the urban provinces of Bulawayo and Harare, respectively [17]. In greater metropolitan regions, the danger of disease outbreaks and rapid disease spread is increased by higher population densities and congested living circumstances [18]. In addition, current research on urban political ecologies shows a substantial correlation between different forms of urbanization and a higher risk of infectious diseases [19]. Furthermore, some studies indicate that population density rather than population growth has a greater impact on the transmission of infectious diseases [20, 21]. Another study conducted in Malaysia also found that population density played a role in the spread of COVID-19 cases, which lends more credence to the idea that it does so [22]. Although a few studies have found no correlation between population density and COVID-19 infections like the one by Uddin and Ahmed [23], most of the studies have generally produced similar results that indicate a positive correlation between COVID-19 infections and population density.

The research additionally demonstrated that the COVID-19 epidemic was influenced by the use of public transportation. This could also explain why there were more COVID-19 cases reported in cities than in rural areas. Compared to those who live in rural areas, urban residents use public transportation more frequently. The COVID-19 outbreak, especially in metropolitan areas, may have been significantly influenced by the usage of public transit in addition to other variables such as not donning face masks. The assertion is consistent with multiple research findings that suggest public transportation may serve as a conduit for viral

transmission [24], prompting regulatory or voluntary initiatives to suspend or limit its use [25]. Nonetheless, a lot of individuals rely on public transit as their primary or only means of mobility, which increases risk inequality and the virus's ongoing spread [26, 27]. Shen et al. [28] have provided additional support for the results of this study by pointing out that restricted places like public transportation vehicles can facilitate the spread of infectious diseases from person to person. As a result, numerous nations have documented numerous clusters of cases involving respiratory viruses, such as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infections, on public transportation vehicles [28]. A Nottingham study found that taking public transportation within five days of the onset of symptoms raised the risk of contracting general influenza by a factor of six. Within five days after the onset of symptoms, most people do not have the flu but are still contagious, which raises the risk of contracting influenza [29]. According to other investigations, COVID-19 was contracted while riding a bus [30]. Recent research for SARS-CoV-2 revealed a large and significant correlation between COVID-19 and train travel [31].

One possible explanation for the higher prevalence of COVID-19 in urban areas compared to rural provinces is the greater availability of leisure and entertainment options in metropolitan areas. In Zimbabwe, people frequently go to nightclubs, sports bars, and soccer stadiums for entertainment. People in metropolitan areas continued to patronize these entertainment venues in spite of the movement restrictions put in place by the Zimbabwean government through lock downs. These locations are usually packed, which raises the possibility of COVID-19 infections and deaths. These findings are consistent with studies on the transmissibility of COVID-19, which found that indoor congregate settings were more favorable for the virus's spread [32].

These settings are similar to overcrowding homes in that multiple individuals share a small area, there is less ventilation, and a significant amount of time is spent with the same group of individuals [33]. According to a study done on the 2013 Hajj, people who are crowded are more likely to contract infections like influenza, coronavirus, and rhinovirus [34]. Social distancing has been widely regarded as a preventive and control measure for COVID-19 since the virus is mostly spread through close contact and by droplets or aerosols emitted when people cough, sneeze, or talk [35, 36]. The COVID-19 pandemic drove people indoors, which had a disastrous impact on all social meeting places, including bars, beaches, sports facilities, and event locations [37]. The folks that visit these places were impacted by this. It became necessary to limit gatherings in these contexts because COVID-19 spread so easily because it was almost hard to maintain the necessary social distance [37].

The higher number of COVID-19 cases in urban areas compared to rural provinces may also be explained by erroneous COVID-19 records. People who live in rural areas of Zimbabwe usually use traditional medicines when they are sick. This finding is supported by Ngarivhume and companions [38], who contend that most people, especially in rural regions, cure ailments like malaria with traditional plant-based remedies. Due to this, a sizable fraction of COVID-19 cases in isolated provinces would not have been recorded, reported, or authenticated. In contrast, people who live in cities often go to hospitals as soon as they are sick, whether it's from an infection or something else.

The inaccurate COVID-19 data may have resulted from patients' failure to disclose their actual residential addresses to healthcare practitioners, particularly in urban provinces. People who are sent for specialist care from rural to metropolitan areas frequently provide the residential addresses of their relatives who live in towns. Because of this, there's a strong

chance that some COVID-19 patients from rural regions were wrongly classified as urban instances.

Conclusion

The study's conclusions show that the COVID-19 pandemic's urbanization in Zimbabwe was largely caused by the number of entertainment venues that are more readily available in urban areas than in rural ones, population density, accessibility to ports of entry, and use of public transport. Given that more COVID-19 cases were reported in urban areas than in rural ones, there may have been variations in COVID-19 infection rates between urban and rural locations. Perhaps because of inaccurate addresses and insufficient COVID-19 infection records, more COVID-19 cases were reported in urban provinces than in rural ones. Most patients usually provide the addresses of their city-dwelling relatives to the medical staff. Instead of adopting a broad strategy to manage COVID-19, the report advises the Zimbabwean government to create location-specific control and preventative measures for the current and forthcoming pandemics. Given the higher incidence of disease in urban regions, these places ought to receive more funding and care.

Acknowledgements

The authors express their gratitude to the Ministry of Health and Child Care in Zimbabwe for granting permission to conduct this study. Additionally, I would like to thank my supervisors for all of their guidance and support throughout this project.

Conflict of Interest Statement

The authors claim they don't have any conflicting agendas. All co-authors have evaluated the paper and attested to its accuracy; they have no conflicts of interest to report. We certify that the material is wholly original with no intention of being published by another publication.

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Texila International Journal of Academic Research
ISSN : 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art009

On Deep Learning Approaches for Single-Turn Text-to-SQL Parsing: Concepts, Methods, and Future Directions

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Abstract

This literature review delves into deep learning techniques for text-to-SQL parsing, exploring datasets, evaluation metrics, models, and methodologies. The study aims to provide a comprehensive overview of the field, analyzing strengths, weaknesses, accuracy, practical applications, and scalability of various approaches. By examining the current landscape and future directions, this work serves as a valuable resource for researchers, industry professionals, and enthusiasts interested in Natural Language Processing and neural semantic parsing.

Keywords: *Deep Learning, Natural Language Processing, Neural Semantic Parsing, Pretrained Language Model, Prompt Engineering, Single-Turn Text-To-SQL, Seq2seq, Transformers.*

Introduction

The field of Natural Language Interfaces to Databases (NLIDB) plays a crucial role in bridging the gap between human users and complex database systems. One of the key tasks within NLIDB is Text-to-SQL, which involves transforming natural language queries into executable SQL queries that can retrieve information from databases. This task is essential for enabling users to interact with databases using everyday language, eliminating the need for knowledge of complex query languages.

Text-to-SQL has garnered significant attention due to its practical applications in various domains, including information retrieval, data analysis, and decision-making processes. By enabling users to express their information needs in natural language, Text-to-SQL systems enhance the accessibility and usability of databases for a wide range of users, including those without technical expertise in SQL query writing.

Advancements in deep learning [1, 2, 11–15, 3–10][16–18][19–21] have revolutionized the Text-to-SQL task [22–24], leading to the development of sophisticated models capable of understanding the semantic nuances of natural language queries and generating accurate SQL representations. These models leverage techniques such as Seq-to-seq frameworks, Transformer-based approaches, pre-trained models, and Prompt Engineering strategies to improve the accuracy and efficiency of Text-to-SQL systems.

Despite advancements in text-to-SQL models, there is a lack of comprehensive analysis comparing different architectures and methodologies. This hinders a holistic understanding of the field and future model development. In addition, the diversity and complexity of datasets used for training and evaluating text-to-SQL models vary significantly, affecting model performance and generalization ability. In this work, we try to respond to these questions:

1. what are the best practices for dataset curation and utilization in the text-to-SQL domain?
2. What are the strengths and weaknesses of the current text-to-SQL models and architectures, and how do different

Received: 07.06.2024 ***Accepted: 09.07.2024*** ***Published on: 30.07.2024***

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methodologies compare in terms of accuracy, scalability, and practical applications?

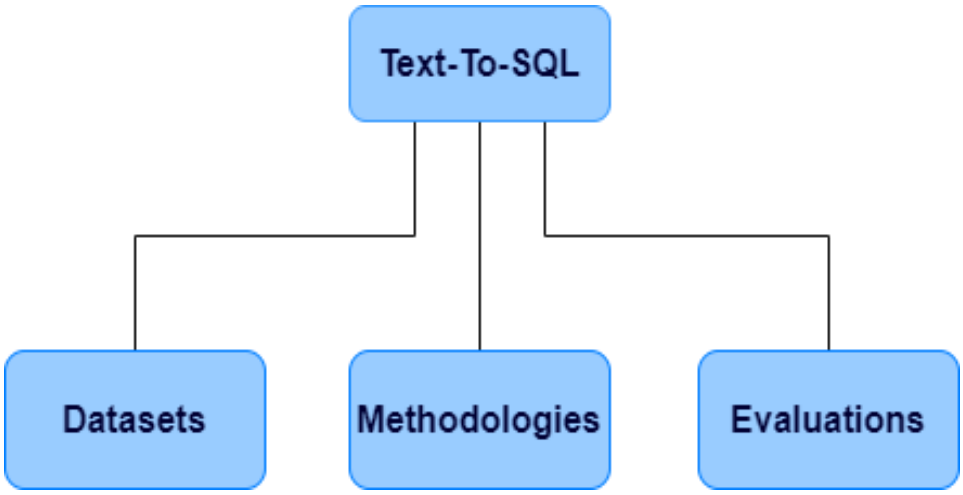

Figure 1: High-level Topology for Text-to-SQL

This work aims to review deep learning techniques used in the field of Text-to-SQL i.e. the dataset, the evaluation, and models. Our objective is to

1. create a high-level map (Fig1.) that providing a comprehensive review of text-to-SQL.
2. provide an analysis of each component of this map.
3. discuss the future direction in the field of text-to-SQL.

Initially, we suggest **4D as the** best practice for dataset curation, encompassing **D**iversity of Schema, **D**iversity (Complexity) of Queries, **D**ata Size and Quality, and **D**omain Specificity, to evaluate a text-to-SQL dataset. Subsequently, we perform a **SWAPS analysis**, focusing on **S**trengths, **W**eaknesses, **A**ccuracy, **P**ractical Applications, and **S**calability of various text-to-SQL deep learning approaches. This dual analysis framework serves as a valuable resource for academia, industry professionals, and individuals interested in delving into the realms of Natural Language Processing (NLP), neural semantic parsing, or Text-to-SQL. By offering insights into dataset characteristics and deep learning model assessments, this resource aims to guide advancements in the field and facilitate informed decision-making for researchers, practitioners, and enthusiasts seeking to explore the intricacies of NLIDB technologies.

The rest of this paper is organized as follows: In the second section, we formally define the text-to-SQL problem and examine the prevalent architecture in deep learning approaches, specifically the sequence-to-sequence (seq-to-seq) architecture. We elucidate the encoder-decoder framework, detailing each constituent component: the encoder, the attention mechanism, and the decoder. The third section provides an in-depth analysis of the datasets employed in single-turn text-to-SQL tasks. We discuss their characteristics, advantages, and domains, distinguishing between single-domain and cross-domain datasets.

The fourth section scrutinizes the evaluation metrics used in text-to-SQL challenges, focusing on the two principal metrics: exact match accuracy (**EM**) and Execution accuracy (**EX**). Achieving high exact-match accuracy is challenging due to the complex syntax and structure of SQL queries. Small variations or even semantically equivalent queries with different syntax can result in a lower score. On the other hand, EM requires access to the actual database and the ability to execute queries, which might not always be feasible or scalable.

Additionally, databases must be kept consistent to ensure fair evaluation.

The fifth section categorizes and examines the methodologies utilized in text-to-SQL, which we have grouped into four categories: seq-to-seq models, transformer-based models, pre-trained text-to-SQL models, prompt engineering techniques, particularly in the context of emerging Large Language Models (LLMs).

The final section before the conclusion outlines potential future research directions, informed by our investigation and a review of relevant literature.

Background

Problem Formulation

Given a natural language question $\mathbf{Q=q1…q_{|Q|}}$, a database schema $\mathbf{S = <C, T>}$ with columns $\mathbf{C= \{c1, …, c_{|C|} \}}$ and tables $\mathbf{T=\{ t1,…, t_{|T|} \}}$. The problem of text-to-SQL involves converting natural language queries expressed in text into executable SQL queries that can be used to retrieve information from a database.

The objective of text-to-SQL is to predict the SQL query $\boldsymbol{y}$ from the input $\mathbf{<Q, S>}$

The tasks and challenges are to build a model that:

1. Understands **Semantic Understanding**: The model needs to understand the semantic meaning of the natural language query. This involves parsing the input to identify entities, relationships, and conditions.
2. Generates **SQL Query**: Once the semantic understanding is achieved, the model must generate the corresponding SQL query. This includes selecting the appropriate tables, columns, conditions, and other SQL syntax elements.
3. Handles **Ambiguity**: Natural language queries can be ambiguous. The model should handle ambiguity and uncertainty to provide accurate and contextually appropriate SQL queries.
4. Manages **Variability in Language**: Users can express the same query in various ways. The model should be robust to different ways of asking the same question.

The most used model in such a challenge is an encoder and decoder architecture with attention mechanisms.

Encoder-Decoder Framework

The encoder-decoder model is a fundamental architecture used in sequence-to-sequence learning[6], particularly in tasks such as machine translation. This framework is used with attention mechanism [25–28], so we have 3 main components:

Encoder: The encoder is responsible for processing the input sequence and creating a fixed-size context vector that captures the relevant information from the input. Each element of the input sequence is encoded into a hidden representation.

1. Embedding Layer: Converts input tokens (words or sub words) into continuous vector representations. Provides a dense representation of the input words.
2. Recurrent Neural Network (RNN) [29–31] or Transformer Layers [15]: RNN: Captures sequential dependencies in the input. Transformer: Allows for parallel processing of input sequences. Each step processes one token and updates the hidden state.
3. Hidden States: At each time step, the encoder produces a hidden state vector that summarizes the information up to that point in the input sequence.

The final hidden states are used as the context vectors that encode the entire input sequence.

Attention Mechanism [25, 27, 28]:

The attention mechanism allows the decoder to focus on different parts of the input sequence while generating each element of the output sequence. It helps in handling long-range

dependencies and improves the model's ability to capture context.

1. Attention Scores: Calculates attention scores for each pair of encoder hidden states and the current hidden state of the decoder. Indicates how much focus should be given to each position in the input sequence when generating the current output element.
2. Context Vector: A weighted sum of the encoder's hidden states based on the attention scores. Provides a dynamic representation of the relevant parts of the input sequence for the current decoding step.

Decoder

The decoder generates the output sequence based on the context vector from the attention mechanism and the previously generated elements of the output sequence.

1. Embedding Layer: Converts the previously generated output tokens into continuous vector representations. Recurrent Neural Network (RNN) or Transformer Layers:
2. RNN: Captures sequential dependencies in the output. Transformer: Allows for parallel processing of output sequences.
3. Hidden States: At each decoding step, the decoder updates its hidden state based on the previously generated tokens and the context vector from the attention mechanism.
4. Output Layer: Generates the probability distribution over the vocabulary for the next token in the output sequence. A SoftMax[32] activation function is commonly used to produce these probabilities.

The model is trained using pairs of input and output sequences. The training objective is to minimize the difference between the predicted output sequence and the target sequence.

The encoder processes the input sequence, the attention mechanism captures relevant information, and the decoder generates the output sequence. The attention mechanism allows the model to focus on different parts of the input sequence during the decoding process, enhancing its ability to handle various types of input-output relationships.

Text-To-SQL Dataset

In this section, we delve into the intricacies of the Text-to-SQL dataset, a foundational component in the realm of Natural Language Interfaces to Databases (NLIDB). The dataset serves as a crucial resource for training and evaluating Text-to-SQL models, providing a diverse range of queries and schemas that challenge the semantic understanding and query generation capabilities of deep learning systems.

We begin by exploring the high-level topology of the Text-to-SQL dataset (Fig2.), shedding light on its structure, composition, and relevance to real-world applications. Through a detailed examination of key datasets such as GeoQuery and Restaurants, we uncover the unique characteristics and challenges posed by each dataset, ranging from geographical information to restaurant details.

Furthermore, we analyze the role of datasets in shaping the performance and generalizability of Text-to-SQL models, emphasizing the importance of dataset quality, size, and complexity in driving advancements in NLIDB technologies. By unraveling the nuances of Text-to-SQL datasets, we aim to provide a comprehensive understanding of the foundational elements that underpin the development and evaluation of state-of-the-art Text-to-SQL systems.

Here below some Text-To-SQL datasets:

GeoQuery [33]

The GeoQuery dataset is focused on U.S. geography and contains approximately 800 Prolog facts asserting relational tables for basic information about U.S. states. This includes information such as population, area, capital city, neighboring states, major rivers, major

cities, and the highest and lowest points along with their elevations.

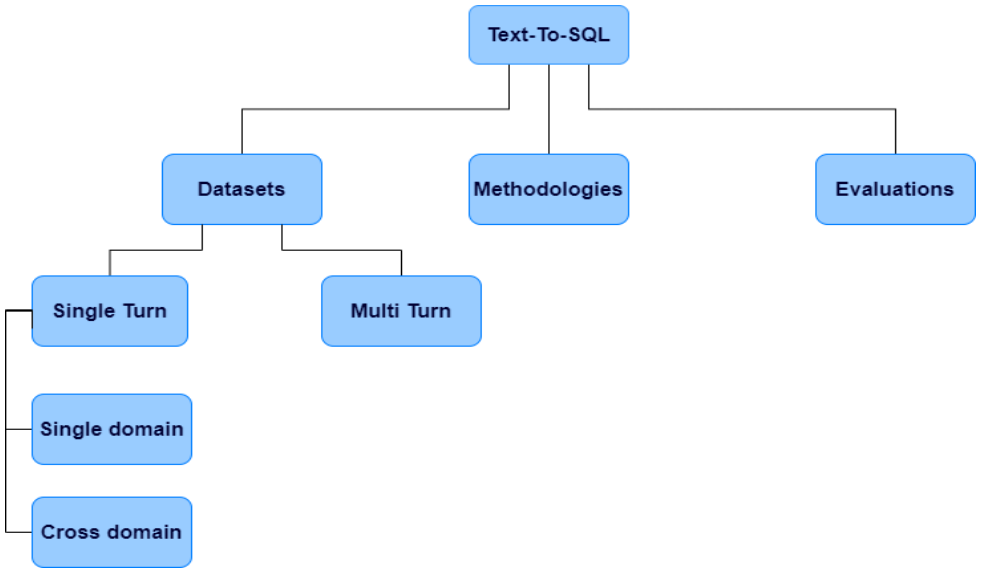

Figure 2. High-level Topology for text-to-SQL with Dataset Details

Restaurants [34]

The Restaurant dataset contains information about thousands of restaurants in Northern California, including the name of the restaurant, its location, its specialty, and a guidebook rating. The dataset was used in the context of a probabilistic framework for semantic shift-reduce parsing, which was applied using a hand-built grammar constructed to reflect typical queries in this domain and translated into a logic form resembling SQL. The algorithm used for the Restaurant dataset was TABULATE, an ILP method motivated by combining the advantages of two ILP approaches in CHILLIN. The dataset was one of three domains used to demonstrate the performance of the new approach, with the other two domains being U.S. Geography and Job query systems. The results of the experiments show that the probabilistic framework achieved near-perfect accuracy in both recall and precision in the Restaurant domain, given only roughly 30% of the training data.

Scholar [35]

The SCHOLAR dataset is a semantic parsing dataset for academic database searches. It comprises natural language utterances labeled with SQL queries, specifically designed for querying an academic database. The dataset includes 816 labeled utterances, divided into a 600/216 train/test split. Additionally, the dataset is accompanied by a database containing academic papers with their authors, citations, journals, keywords, and datasets used.

WikiSQL [36]

The WikiSQL dataset is a crucial component of the Seq2SQL project, providing a large corpus of hand-annotated instances of natural language questions, SQL queries, and SQL tables extracted from Wikipedia. This dataset is an order of magnitude larger than previous semantic parsing datasets, containing 80,654 examples and 24,241 tables. The tables used in WikiSQL are available in both raw JSON format and as an SQL database, making it a comprehensive and valuable resource for training and evaluating natural language interfaces for databases. The collection of WikiSQL involved a paraphrase phase and a verification phase. During the paraphrase phase, tables extracted from Wikipedia were used, and small tables were removed based on specific criteria to ensure the quality and

relevance of the data. The dataset was then crowd-sourced on Amazon Mechanical Turk, where workers paraphrased generated questions for the tables. The paraphrases were subsequently verified by other workers to ensure accuracy and variation. This meticulous process resulted in a high-quality dataset suitable for training and evaluating natural language interfaces for databases. Overall, WikiSQL serves as a valuable resource for developing and testing natural language interfaces for databases, providing a diverse and realistic collection of questions, SQL queries, and SQL tables extracted from the web.

ParaphraseBench [37]

ParaphraseBench is a benchmark dataset curated as part of the DBPal project to test the robustness of natural language interfaces for databases (NLIDBs) against different linguistic variations. It consists of 290 pairs of NL-SQL queries that model a medical database with one table containing patient attributes such as name, age, and disease. The queries are grouped into categories based on the linguistic variation used in the NL query, including naive, syntactic paraphrases, morphological paraphrases, lexical paraphrases, and missing information. The benchmark is available online and can be used to evaluate the performance of NLIDBs.

Spider [38]

The Spider dataset is a large-scale, human-labeled dataset designed for complex and cross-domain semantic parsing and text-to-SQL tasks. It consists of over 10,000 questions and 5,600 unique complex SQL queries on 200 databases, covering 138 different domains. The dataset was annotated by 11 college students and is distinct from previous semantic parsing tasks in that it requires models to generalize well to both new SQL queries and new database schemas.

This makes it a challenging and realistic semantic parsing task, presenting ample opportunities for future research and improvement in the field of natural language processing.

The Spider dataset is unique in that it contains databases with multiple tables in different domains and complex SQL queries, testing the ability of a system to generalize not only to new SQL queries and database schemas but also to new domains. It addresses the need for a large and high-quality dataset for a new complex and cross-domain semantic parsing task, providing a valuable resource for researchers and practitioners in the field.

The dataset and task are publicly available, allowing for experimentation and development of state-of-the-art models to tackle the challenges presented by the Spider dataset. It has the potential to benefit both the natural language processing and database communities, offering opportunities for advancements in semantic parsing and text-to-SQL tasks.

CSpider [39] Chinese Version of Spider

Spider-SSP [40]

Spider-SSP refers to a specific split of the SPIDER dataset, which is a non-synthetic text-to-SQL dataset containing 10,181 questions and 5,693 unique SQL queries across 138 domains. The Spider-SSP split consists of 3,282 training examples and 1,094 test examples, and it includes various subsets such as a random split, a split based on source length, a TMCD split, and a template split. The primary evaluation of models on Spider-SSP involves the text-to-SQL task, which presents challenges related to schema linking and modeling complex SQL syntax. The PDF discusses the results of different models, including T5-Base, T5-3B, NQG-T5-Base, and NQG-T5-3B, on the Spider-SSP split, highlighting the performance of NQG-T5 despite the complex nature of SQL syntax. The findings suggest that while the text-to-SQL task is not well modeled by the NQG grammar due to SQL's complex syntax, NQG-T5 still performs well by relying on T5. Overall, Spider-SSP serves as a valuable benchmark for

evaluating the performance of semantic parsing models in handling natural language variation and compositional generalization challenges.

Spider-Syn [41]

Spider-Syn is a curated dataset derived from the Spider benchmark, modifying NL questions by substituting schema-related words with selected synonyms. This alteration disrupts the direct correspondence between questions and table schemas, leading to a substantial accuracy drop. Proposed defenses, such as incorporating synonym annotations and adversarial training, show effectiveness, with the former being notably impactful.

In Spider-Syn, a total of 5672 questions have been altered compared to the original Spider dataset. Among these modifications, 5634 cases involve changes to the schema item words, while modifications to the cell value words occur in only 27 cases. The alterations are achieved through the replacement of approximately 492 different words or phrases in the questions, utilizing 273 synonymous words and 189 synonymous phrases.

On average, there is almost one change per question in the Spider-Syn examples, with approximately 7.7 words or phrases modified per domain. Notably, the dataset preserves 2201 original Spider questions in the training set and 161 in the development set.

During the modification process between the training and development sets, 52 words or phrases were consistently modified, representing 35% of the changes observed in the development set. This highlights a degree of overlap in the alterations made between these two sets.

Spider-DK [42]

Spider-DK is a human-curated dataset. It is based on the Spider benchmark, which is commonly used for evaluating text-to-SQL translation models. In Spider-DK, NL (natural language) questions are selected from the original Spider dataset, and some samples are modified by adding domain knowledge that reflects real-world question paraphrases. The goal of Spider-DK is to investigate the robustness of text-to-SQL models when faced with questions requiring rarely observed domain knowledge.

Critera2SQL [43]

This dataset is unique in that it focuses on eligibility criteria from clinical trials related to diseases such as Sepsis, Heart attack, Diabetes, and Alzheimer's. It contains 2003 eligibility criteria along with their corresponding SQL queries, covering 984 concepts.

The dataset includes eligibility criteria with varying levels of complexity, encompassing cases such as Order-sensitive, Counting-based, and Boolean-type criteria. These criteria pose challenges that are specific to the medical domain and are not typically addressed in general natural-language-to-SQL datasets.

To create the dataset, the authors collected eligibility criteria from clinical trials registered in Clinicaltrials.gov, focusing on specific keywords related to the diseases of interest. The criteria were preprocessed to ensure clarity and compatibility with electronic health record tables. A concept set was extracted from the eligibility criteria for generating column names in synthetic patient-record tables and for SQL annotations.

The SQL annotations in the dataset were created by SQL experts, following a standardized structure of SELECT statements with **WHERE** clauses. Annotators filled in the conditions part of the WHERE clause based on the eligibility criteria, with column names matching the terms used in the criteria. The dataset also includes additional very long eligibility criteria to enhance coverage of counting-based cases.

Overall, the Criteria2SQL dataset provides a valuable resource for training and evaluating models that aim to automatically parse eligibility criteria and generate corresponding

SQL queries, facilitating the process of cohort definition for clinical research.

SQUALL [44]

SQUALL is a dataset enriching 11,276 English-language Wiki Table Questions with manually created SQL equivalents and alignments between SQL and question fragments.

XSP [45]

The Cross-Database Semantic Parsing (XSP) dataset is a collection of datasets used to evaluate systems that map natural language utterances to executable SQL queries in databases that were not seen during training. Unlike traditional Semantic Parsing tasks that focus on single-database scenarios, XSP introduces additional challenges such as generalizing to new schema structures, domain-specific phrases, and database conventions. In XSP, the training examples consist of input-output pairs ({x(l), y(l), D(l)i}) and evaluation examples consist of input-output pairs ({x(l), y(l), D(l)j}), where each D represents a database. Importantly, the training and evaluation datasets do not overlap, adding complexity to the generalization process.

The XSP dataset aims to address the limitations of traditional Semantic Parsing tasks by evaluating systems on diverse datasets that were originally designed for single-database semantic parsing. By repurposing well-studied datasets like GeoQuery and ATIS in the XSP context, researchers can uncover new generalization challenges and assess the system's ability to adapt to unseen databases with varying schema structures and language use.

The XSP dataset provides a comprehensive evaluation setup for cross-database semantic parsing systems, highlighting the importance of diverse training and evaluation datasets to improve the generalization capabilities of models in this challenging domain.

SEOSS-Queries [46]

The SEOSS-Queries dataset is a comprehensive resource designed to facilitate text-to-SQL and question-answering tasks in the field of software engineering. Here is a description of the dataset:

Objective: The main objective of the SEOSS-Queries dataset is to address the information needs of stakeholders involved in software development projects. It aims to assist in making informed decisions by providing a structured collection of natural language utterances and corresponding SQL queries.

Compilation: The dataset was compiled by extracting natural language utterances and SQL queries from various sources, including previous studies, software projects, issue-tracking tools, and expert surveys. The data collection process involved analyzing literature, stakeholder questions, and content from 33 software projects to refine and orchestrate the queries.

Contents: Natural Language Utterances: The dataset consists of 1,162 English utterances that translate into 166 SQL queries. Each query is accompanied by four precise utterances and three more general ones. Additionally, there are 393,086 labeled utterances extracted from issue tracker comments.

Data Format: The dataset is structured with raw data in a format suitable for training and evaluating text-to-SQL models.

Accessibility: The data is publicly available through the Figshare repository under a specific identification number.

Value and Applications: The SEOSS-Queries dataset provides a valuable resource for machine learning scientists and researchers to train and evaluate text-to-SQL models in the software engineering domain. Stakeholders, such as developers, can leverage text-to-SQL models trained on this dataset to query database information efficiently for decision-making. The dataset can be utilized in the fields of Machine Learning and Natural Language Processing (NLP) for tasks such as

classification, clustering, and analyzing developers' information needs. The SEOSS-Queries dataset offers a rich collection of natural language utterances and SQL queries tailored to address the information needs of stakeholders in software engineering projects, providing a valuable resource for research and practical applications in the field.

FIBEN [47]

The FIBEN dataset is a significant component of the ATHENA++ system, designed to facilitate the handling of complex business intelligence queries through natural language. Here is a detailed description of the FIBEN dataset:

Composition: The FIBEN dataset is constructed by combining two financial datasets, namely the SEC and TPoX datasets.

Complexity: It is noted for its complexity, with a significantly larger number of tables per database schema compared to other benchmarks. This complexity mirrors that of an actual financial data warehouse, providing a realistic environment for query evaluation.

Ontologies: The FIBEN dataset is based on a combination of two financial ontologies, namely the Financial Industry Business Ontology (FIBO) and the Financial Report Ontology (FRO). These ontologies contribute to the domain complexity required to express real-world financial business intelligence queries effectively.

Query Types: The dataset contains 300 natural language queries, each corresponding to 237 distinct SQL queries. These queries cover a wide range of nested query types, ensuring a comprehensive evaluation of the system's capabilities.

Query Generation: The natural language queries in the FIBEN dataset are typical analytical queries crafted by business intelligence experts. These experts were tasked with creating queries that encompass all four nested query types, along with various SQL query constructs, ensuring a diverse and challenging query set.

Availability: The benchmark queries of the FIBEN dataset are accessible at the following link: https://github.com/IBM/fiben-benchmark

The FIBEN dataset serves as a robust benchmark for evaluating the performance of NLIDB systems, particularly in handling complex financial business intelligence queries. Its comprehensive nature and realistic representation of financial data make it a valuable resource for advancing natural language interfaces to databases.

CSS [48]

CSS, a large-scale Cross-Schema Chinese text-to-SQL medical dataset, addresses the challenges of cross-domain and single-domain text-to-SQL tasks by proposing a cross-schema text-to-SQL task. CSS consists of 4,340 question/SQL pairs across 2 databases, expanded to 19 databases with 29,280 examples for generalized model training. The dataset also serves as a significant corpus for single-domain Chinese text-to-SQL studies, and benchmarking baselines showcase its potential and utility.

Aclanthology [49]

The ACL Anthology dataset is a collection of more than 40,000 research articles published in computational linguistic events, including conferences, workshops, and journals. It represents one of the largest collections of natural language processing research papers and provides a comprehensive resource for researchers in the field. The dataset is used to construct the Computational Linguistic Knowledge Graph (CLKG). The CLKG construction methodology involves processing full-text PDFs, extracting metadata and structure information, and constructing a heterogeneous graph consisting of four entities: author, paper, venue, and field. CLKG facilitates high-quality search and exploration

of current research progress in the computational linguistics field.

DuSQL [50]

DuSQL is a comprehensive industry-oriented dataset for natural language interface to databases. It contains a huge number of question/SQL pairs covering a wide range of domains such as cities, singers, movies, animals, etc. It is much larger than other complex datasets and covers about 70% of information from Baike. DuSQL conforms to the distribution of SQL queries in real applications and contains enough question/SQL pairs for all common types. It is constructed based on a thorough quality control process and conforms to various evaluation metrics. Overall, DuSQL is a pragmatic and valuable dataset for natural language interaction with databases.

KaggleDBQA [51]

The KaggleDBQA dataset contains a total of 1,687 questions, split across eight databases. Each question is paired with at least one SQL query that corresponds to the correct answer to the question. The questions are constructed to be similar to those that a user might ask of a database, where the user has limited knowledge of the database schema and terminology. The queries are annotated with the table and column names that they use, allowing for more accurate evaluation of model performance. The dataset includes a "few-shot" evaluation setting, where a model is trained on a small number of examples and evaluated on a separate set of questions, to simulate a more realistic scenario where a model is given limited training data before being deployed in a new application.

Dataset Influence on Performance and Generalization

Different types of datasets play a crucial role in influencing the performance and generalization of text-to-SQL models. Table 1. presents an overview of text-to-SQL benchmarks, showcasing various datasets used for training and evaluating text-to-SQL models, highlighting the diversity in dataset characteristics that can influence model performance and generalization.

1. **Diversity of Schemas**: Datasets with diverse database schemas help models generalize better to unseen databases by exposing them to a wide range of structures and query types.
2. **Diversity (Complexity) of Queries**: Datasets containing complex and varied natural language queries challenge models to handle diverse linguistic patterns, enhancing their generalization capabilities.
3. **Data Size and Quality**: Larger datasets with high-quality annotations contribute to improved model performance by providing more training examples and reducing overfitting.
4. **Domain Specificity**: Domain-specific datasets focus on particular industries or topics, allowing models to specialize in specific domains but may limit generalization to other domains.

Table 1. Overview of text-to-SQL Benchmarks

				#Domain	#SQL	#DB	#Tables		
1	GenQuery	Single Turn	en	1	247	1	6	880	Single domain
2	Restaurants	Single Turn	en	1	378	1	3	525	Single domain
3	Scholar	Single Turn	en	1	193	1	7	817	Single domain
4	WikiSQL	Single Turn	en		77840	26521	1	80654	Single domain
5	ParaphraseBench	Single Turn	en	1			1	290	Single domain
6	Spider	Single Turn		138	5693	200	1020	10181	cross-domain
7	CSpider	Single Turn	zh	138	5693	200	1020	10181	cross-domain

8	Critera2SQL	Single Turn	en	1				2003	Single domain
9	SQUALL	Single Turn	en		11276	2108	2108	15620	cross-domain
10	XSP	Single Turn	en						cross-domain
11	Spider-Syn	Single Turn	en		4525	160	876	8034	cross-domain
12	Spider-DK	Single Turn	en		283	10	48	535	cross-domain
13	SEOSS-Queries	Single Turn			166			1162	
14	FIBEN	Single Turn	en	1	237	1		300	Single domain
15	CSS	Single Turn	en			19		29280	cross-domain
16	DuSQL	Single Turn	zh		23797	200	820	23797	cross-domain
17	KaggleDBQA	Single Turn	en		1687	8		1687	

Best Practices for Dataset Curation and Utilization

1. **Diverse Schema Representation**: Curate datasets with a variety of database schemas to expose models to different structures and improve generalization.
2. **Data Augmentation**: Augment datasets by generating variations of existing queries and schemas to increase diversity and robustness in model training.
3. **Quality Annotations**: Ensure high-quality annotations in datasets to provide accurate ground truth for training models effectively.
4. **Cross-Domain Training**: Incorporate datasets from multiple domains to train models on diverse data sources, enhancing their ability to generalize across different domains.
5. **Regular Updates**: Continuously update and expand datasets to reflect evolving database structures and query patterns, ensuring models remain relevant and adaptable to new challenges.

To meet all these requirement, [52] proposes The UNITE benchmark comprises 18 publicly available text-to-SQL datasets covering various domains, including Wikipedia, healthcare, education, geography, transportation, software engineering, and finance.

Evaluation Metrics

Metrics that consider the semantic meaning of the generated SQL query. This includes evaluating whether the generated query correctly captures the user's intent.

Execution Accuracy

1. Definition: Measures the percentage of generated SQL queries that execute successfully on the corresponding database.
2. Calculation: The number of correctly executed queries divided by the total number of queries.

$$\mathbf{score}\ (\mathbf{V}, \mathbf{V^{hat}}) = \begin{cases} 1, V = V^{hat} \\ 0, V \neq V^{hat} \end{cases}$$

$$\mathbf{EX} = \frac{\sum_{n=1}^{N} score(V, V^{hat})}{N}$$

Exact Match Accuracy

1. Definition: Measures the percentage of generated SQL queries that exactly match the reference (ground truth) SQL queries.
2. Calculation: The number of queries with an exact match divided by the total number of queries.

$$\mathbf{score}(\mathbf{y}, \mathbf{y^{hat}}) = \begin{cases} 1, y = y^{hat} \\ 0, y \neq y^{hat} \end{cases}$$

$$\mathbf{EM} = \frac{\sum_{n=1}^{N} score(y, y^{hat})}{N}$$

Single-Turn Common Approach

The transformation of natural language text into SQL queries, commonly referred to as

Text-to-SQL, is an important task at the intersection of natural language processing (NLP) and databases. This task has significantly benefited from advancements in deep learning technologies. The methodologies can be broadly categorized into **Seq-to-seq models, Transformer-based approaches, pre-trained models, and Prompt Engineering strategies**. Each of these approaches has contributed uniquely to the progress in text-to-SQL research.

Tabel 2. gives cons and pros of each approach.

Seq-to-seq Text to SQL

Pure Seq-to-Seq

Sequence-to-sequence (Seq-to-seq) frameworks are among the pioneering techniques applied to the Text-to-SQL task. These models utilize an encoder-decoder architecture to transform natural language input into SQL queries. The encoder processes the input sentence into a fixed-length context vector, and the decoder generates the corresponding SQL query based on this context. [53] introduced data recombination techniques to improve robustness and versatility in Seq-to-seq models for semantic parsing. They showcased how the models could effectively generalize to a variety of inputs by recombining training data to form novel combinations.

One significant advancement in Seq-to-seq modeling is the Seq2SQL model by [36], which combines sequence-to-sequence neural networks with reinforcement learning to optimize SQL generation. This combination addresses the challenge of ensuring that generated queries are both accurate and efficiently structured. Reinforcement learning enables the model to fine-tune its outputs by maximizing rewards based on the correctness of the SQL query. This approach demonstrated substantial improvements in execution accuracy and logical form accuracy over traditional supervised learning methods.

[54] further explored the feasibility of building an effective semantic parser with minimal annotated data, emphasizing the practicality of such models in real-world applications. Their work demonstrated the potential of creating robust models for translating natural language to SQL, even with limited training data.

Seq-to-tree [55,56,65–70,57–64]

Coarse-to-Fine Decoding

[62] introduce a structure-aware neural architecture with a coarse-to-fine decoding approach for semantic parsing [56,60,64,65,70]. This method involves generating a rough sketch of the meaning representation first, followed by filling in the details. This two-stage process allows the model to handle low-level information more effectively and results in competitive performance across various domains, despite using relatively simple decoders.

Grammar-Based Decoding

Grammar-based decoders [57,61,66,67,69] are particularly adept at capturing the syntactic rules of SQL. [61] propose a Syntactic Neural Model for general-purpose code generation that uses a grammar model to capture the underlying syntax of the target programming language. This grammar-oriented approach has shown effectiveness in scaling the generation of complex programs from natural language, achieving improved results over traditional code generation techniques.

In a similar vein, [66] presents TRANX, a transition-based neural abstract syntax parser that leverages an abstract syntax description language. TRANX demonstrates high accuracy by utilizing the syntax of the target meaning representation to constrain the output space, thereby enhancing the generalizability and effectiveness of the decoder in semantic parsing and code generation tasks.

Table 2. SWAPS Analysis of Different Group

	Strengths	**Weaknesses**	**Accuracy**	**Practical Applications**	**Scalability**
Seq2SQL Model	Combines sequence-to-sequence neural networks with reinforcement learning for optimized SQL generation, leading to improved execution accuracy and logical form accuracy	May struggle with handling complex schemas and long-range dependencies	Demonstrated substantial improvements in accuracy over traditional supervised learning methods	Effective for generating accurate and structured SQL queries, suitable for various real-world applications	May face challenges in scaling to handle complex schemas efficiently
Transformer-based Methods	Revolutionized NLP tasks, including Text-to-SQL, by capturing long-range dependencies effectively	May require significant computational resources and data for training	Demonstrated high accuracy in handling complex schemas and dependencies	Suitable for tasks requiring understanding and generation of SQL queries from natural language inputs	Can be scalable but may require optimization for efficiency in large-scale applications.
Prompt Engineering and Pretrained Models	Enhance model adaptability, contextual understanding, and performance in generating SQL queries	May rely heavily on pre-training data and prompt engineering for optimal performance.	Significantly improves model performance in SQL query generation	Offers practical solutions for real-world Text-to-SQL tasks with minimal training data	Can be scalable with proper engineering and optimization

However, Seq-to-seq or Seq-To-Tree Text-To-SQL models, even with attention mechanism [56] [71], have limitations in handling complex schemas and long-range dependencies in text, which has paved the way for exploring more advanced architectures like transformers.

1. **Transformer-Based Methods**

Transformers have revolutionized natural language processing (NLP) tasks, including text-to-SQL, by enabling the modeling of long-range dependencies and parallelized training. The self-attention mechanisms of transformer models allow them to capture dependencies between tokens in a sentence, making them exceptionally suitable for understanding and generating SQL queries from natural language inputs.

[72] introduced BERT (Bidirectional Encoder Representations from Transformers), which set new benchmarks in NLP by leveraging deep bidirectional context understanding. BERT's attention mechanisms enable it to model intricate relationships in input data, critical for tasks like Text-to-SQL. BERT's pre-training on extensive corpora results in rich contextual embeddings that improve the model's understanding and generation of language.

[73] proposed TypeSQL, which uniquely incorporates type information from the database schema into the transformer model. By resolving ambiguities in natural language queries through type annotations, TypeSQL ensures more accurate and contextually relevant SQL queries. This approach significantly improves the model's performance in understanding and processing various database schema types. [74]

emphasized the importance of encoding database structures using graph neural networks. [75] introduced BRIDGE, a sequential architecture leveraging BERT to model dependencies between natural language questions and relational databases.

Following BERT and its variants[76–79], [80] developed RAT-SQL (Relation-Aware Transformer for SQL), incorporating relation-aware self-attention mechanisms to encode complex schema information and context. This model extends BERT by integrating relational data understanding with a transformer architecture, enhancing accuracy in generating SQL queries by mapping schema relations alongside the input text. Other variants of RAT-SQL[81] [82] [83, 84] arise after the original RAT-SQL. [85] introduced LGESQL, a line graph-enhanced model that integrates local and non-local relations within the graph iteration.

The advancements in transformer-based methods have demonstrated their capacity to handle complex schemas and long-range dependencies effectively, making them robust solutions for the Text-to-SQL challenge.

2. **Pretrained Text-to-SQL Models**

Pretrained language models have shown immense potential in various NLP tasks, including Text-to-SQL. These models leverage pre-trained embeddings encapsulating rich language semantics and syntax, enabling effective understanding and generation of SQL queries with limited task-specific training. [86] introduced PICARD, a method for constraining large pre-trained language model decoders through incremental parsing, significantly enhancing performance on challenging benchmarks like Spider.

[87] introduced TaPas, a model built on BERT to process and generate queries from structured table data. TaPas employs weak supervision and pre-trained BERT embeddings, enhancing the model's robustness in SQL generation. This approach excels in scenarios involving tables, effectively interpreting structured data to generate SQL queries.

[17] demonstrated the efficacy of pre-trained language models for semantic parsing, showing that fine-tuning these models on task-specific data significantly outperforms traditional methods. Pre-trained embeddings provide rich linguistic understanding, allowing the model to handle diverse and complex queries effectively.

[88] presents a Structure-Grounded pretraining framework (StruG) for text-to-SQ that can effectively learn to capture text-table alignment based on a parallel text-table corpus. Another significant model is StructBERT by [89]**,** which integrates structural information from SQL grammar into the BERT model, enabling the handling of complex SQL queries more effectively. StructBERT's design incorporates both syntactic and semantic aspects, resulting in improved performance on challenging text-to-SQL benchmarks.

Other researchers have focused on novel pre-training and encoding techniques to enhance text-to-SQL models. [90] presented a grammar pre-training method (GP) to decode deep relations between questions and databases, while [91] introduced GraPPa, a grammar-augmented pre-training approach for table semantic parsing.

These pre-trained models exemplify the power of leveraging extensive pre-training to achieve high performance in SQL query generation, even with minimal task-specific supervision.

3. **Prompt Engineering**

Prompt engineering is an innovative technique that leverages pre-trained large language models[16,18,97,98,76,77,79,92–96] for various tasks, including Text-to-SQL. This method involves designing specific input prompts to guide pre-trained models in performing desired tasks with minimal task-specific training data, harnessing the extensive knowledge embedded in these models.

[98] showcased the capabilities of GPT-3 through prompt engineering, demonstrating that GPT-3 can perform various tasks, including Text-to-SQL, using few-shot learning

with well-crafted prompts. This approach allows models to understand and execute complex tasks with minimal additional training, highlighting the power of large-scale pretraining.

[99] explored the use of cloze-style prompts for few-shot learning in text classification and natural language inference, showing their effectiveness in improving model performance. Their approach indirectly benefits SQL query generation by enhancing the model's adaptability and contextual understanding. [100] emphasized the effectiveness of prompt engineering in adapting pre-trained models to new tasks with minimal task-specific data. Their research demonstrated significant improvements in SQL query generation by leveraging prompt engineering to enhance model performance.

[101] proposed DIN-SQL, which decomposes the text-to-SQL task into smaller sub-tasks to improve LLM performance. [102] developed DialSQL, a dialogue-based framework that enhances structured query generation through user interaction and validation.

Prompt engineering represents a flexible and powerful method, enabling high performance in text-to-SQL tasks with minimal training data. This approach maximizes the capabilities of large pre-trained models, offering practical solutions for real-world applications.

Future Directions

Although previous methods have made significant strides, there are still several obstacles in creating high-quality text-to-SQL parsers. Building on the research presented in this manuscript, we identify several avenues for future investigation in the text-to-SQL parsing domain:

1. **Enhanced Generalizability**: Future research could focus on improving model generalizability to unseen databases. Developing models that can effectively adapt to new database schemas with minimal fine-tuning could lead to more versatile and widely applicable text-to-SQL systems.

[103] initially found that existing text-to-SQL datasets are too structured to effectively assess the potential for generalization. Therefore, they developed a framework to generate text-to-SQL data for testing generalizability. The outcomes of their experiments indicate a lack of model generalization. Furthermore, the analysis suggests that overfitting of natural language and database schema patterns is the root cause of this issue. This generalizability can be reached either by adding extra training data to bring more unseen patterns in the evaluation stage[103] or with the Large Language Model for Text-to-SQL as proposed by [104].

2. **Interpretability** [105] **and Robustness**: There is a growing need for text-to-SQL models to be more interpretable and robust. Research efforts could concentrate on developing models that not only generate accurate SQL queries but also provide explanations for their decisions, enhancing transparency and trust in the system's outputs.

3. **Human Interaction Integration**: Leveraging human interaction for error correction and validation in text-to-SQL systems could be a promising direction. Developing interactive frameworks that allow users to provide feedback on generated queries and refine them collaboratively could improve the overall accuracy and user experience of such systems.

4. **Multi-Modal Data Integration**: Integrating multiple modalities of data, such as text, images, and audio, into text-to-SQL models could open up new possibilities for more comprehensive and contextually rich query generation. Research in this area could explore how different data types can be effectively combined to enhance the understanding and generation of SQL queries.

5. **Efficiency and Scalability**: Future advancements in text-to-SQL research could focus on developing more efficient and scalable

models. Improving the computational efficiency of models while maintaining high performance could enable the deployment of text-to-SQL systems in real-time applications and large-scale databases.

Conclusion

In conclusion, this literature review highlights the significance of deep learning in advancing text-to-SQL parsing, emphasizing the need for comprehensive dataset curation, model evaluation, and future research directions. The analysis of strengths and weaknesses, along with a focus on accuracy and scalability, underscores the importance of informed decision-making in developing effective NLIDB technologies. As the field continues to evolve, addressing challenges such as generalizability, interpretability, and human interaction integration will be crucial for enhancing the usability and trustworthiness of text-to-SQL systems in diverse applications.

Acknowledgments

We would like to thank Christian BOPE for his leadership talks and guidance that shaped this review. We also thank anonymous reviewers for their crucial input.

Conflict of Interest Statement

All authors declare that they have no conflicts of interest.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art010

Planning, Implementation and Monitoring of a Nationwide Campaign to Deliver Long-Lasting Insecticidal Nets in the Gambia

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Abstract

In 2022, The Gambia conducted a nationwide long-lasting insecticidal nets (LLINs) distribution campaign. This article describes the planning, implementation and monitoring of the campaign. The campaign was jointly conducted with Senegal as part of cross border collaboration towards malaria elimination. A cross-sectional descriptive design was used for reporting the campaign. It was a collaborative approach, involving government and non-governmental organizations and communities. The DHIS2 tracker was used for digital data collection with mobile phone devices to register households and issue coupons for one LLIN per two persons as distribution criterion. The campaign was implemented in two phases, household registration and distribution phases. This approach allowed registration and distribution of LLINs at the same time along the borders of the two countries and for continuous improvement of implementation quality. A total of 1,164,552 LLINs were actually distributed between June to July 2022, corresponding to 90% of projected LLIN needs. This result is an indication of a national coverage of 72% of the registered population, lower than the universal campaign coverage of 80%. The joint coordination and planning process among campaign players allowed the national malaria control program (NMCP) and partners to successfully conduct a synchronized campaign with the neighbouring country Senegal. This campaign has increased access to LLINs in households which is likely to result in increased LLIN use with continuous education on the benefits. Consequently, a reduction of the malaria burden in the country, thus contributing to the achievement of the country's goal of malaria elimination.

Keywords*: Distribution Campaign, Long-Lasting Insecticidal Nets, Malaria, The Gambia.*

Introduction

Malaria is a disease of major public health concern in The Gambia and the entire population is at risk [1]. Transmission is perennial with seasonal variation. The Gambia made significant progress in the reduction of malaria morbidity and mortality over the years. This was achieved through scaling up of key interventions among the general population as a result of increased funding and partnership. The National Malaria Strategic Plan (NMSP) 2021-2025 seeks to consolidate the gains made moving The Gambia towards malaria elimination achieving zero locally acquired cases of malaria and zero deaths by 2025 [2, 3].

The use of LLINs is one of the core interventions under the integrated vector management component of the NMSP. The intervention is delivered through routine distribution at health facility level targeting children under one year and pregnant women. Additionally, mass LLIN distribution campaigns which are conducted every two/three years to reach universal coverage targets among the general population as

Received: 07.05.2024 ***Accepted: 30.05.2024*** ***Published on: 30.07.2024***
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recommended by WHO [4]. Hence, the reason for conducting the 2022 mass LLIN distribution campaign. The campaign was led by Ministry of Health (MOH) through the National Malaria Control Program (NMCP) and implemented with partners.

Given the importance of cross border collaboration in malaria elimination, The Ministries of Health for The Gambia and Senegal signed a memorandum of understanding in 2019 to conduct joint initiatives towards malaria elimination. Hence, both countries agreed to synchronize the 2022 mass LLIN campaign, being the second after 2019 campaign. Consequently, joint planning meetings were held in both countries to harmonize the campaign implementation process. In The Gambia, the campaign had the following objectives [5]

1. Provide 1,057,309 LLIN to every two persons in 5 health regions (North Bank East Region, North Bank West Region, Western Region 1, Western Region 2, and Lower River Region) over a period of 45 days to improve access to LLINs.
2. Provide 346,720 piperonyl butoxide (PBO) nets to every two persons in Central River Region (CRR) and Upper River Region (URR) over a period of 45 days to improve access to LLINs.
3. Mobilize communities and advocate for high-level political support in malaria control in general and the distribution of LLINs.

Hence, this article is meant to describe the entire process of the 2022 LLIN distribution campaign in The Gambia. The specific objectives are: (i) to describe the planning process; (ii) to describe the implementation and monitoring outcomes; (iii) to document and share challenges, lessons learnt and recommendations for future campaigns.

Methodology

A cross-sectional and descriptive design was used for reporting the planning, implementation and monitoring of the 2022 mass LLIN distribution campaign. The description is divided into three sections: planning and coordination, implementation and monitoring components. The campaign was a collaborative approach, involving government and non-governmental organizations, civil society partners, regional and district authorities and communities. The District Health Information System 2 (DHIS2) tracker was used for digital data collection with mobile phone devices to register households and issue coupons for one LLIN per two persons as distribution criterion. The campaign was implemented in two phases, household registration phase and distribution phase, see below flow chart showing campaign process in figure 1. This approach allowed registration and distribution of LLINs at the same time along the borders of the two countries. This is important to ensure adequate coverage of LLINs in the border communities and also, allowing continuous improvement of implementation quality by applying lessons learnt from each phase.

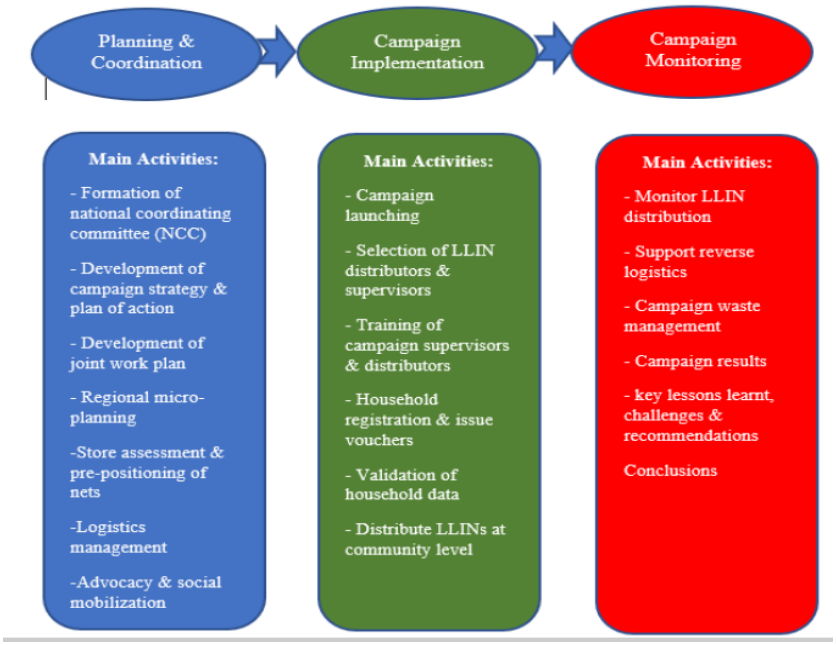

Figure 1. Flow Chart of Campaign Process

Planning and Coordination

Effective planning and coordination are important elements for any successful LLIN campaign [6, 7]. Mass distribution activities require intense and constant action to be successful. Coordination of activities and partners is critical for ensuring that planning and implementation remain on schedule. The planning and coordination process harnessed the participation of in-country skills, personnel, and resources to achieve the set objectives of the campaign. The NMCP team took leadership of the planning and coordination process of the campaign. In-house preparatory meetings were held at NMCP prior to the main planning meetings with partners and stakeholders. The following key activities were accomplished under the planning and coordination component of the campaign.

Formation of a National Coordinating Committee

At the national level, campaign planning and coordination was led by the National Coordinating Committee (NCC), as highlighted in the campaign strategy [5]. The composition and formation as well as defining roles and responsibilities of the NCC was based on the comparative strengths of partners within the country Roll Back Malaria (RBM) partnership. The committee comprised MOH personnel from different technical programs and directorates as well as partners from other government departments, non-governmental organizations (NGOs), the private sector, the United Nations (UN) agencies and Country Coordinating Mechanism (CCM) of the Global Fund grants. A broad range membership was meant to ensure that partners bring specific expertise to facilitate effective planning and implementation of the campaign. Membership of the NCC was formally established by MOH to take responsibility for overall planning and coordination of campaign activities. The CCM Executive Secretary was chair of the NCC with NMCP and Catholic Relief Services (CRS) playing key roles as lead institutions for the campaign. The NCC met frequently to discuss campaign issues. However, it was noted that no fixed meeting schedule was developed and shared among members to ensure that meetings are held as planned and for follow up actions. Inadequate documentation of NCC meeting notes and reports for campaign related activities. Early formation of NCC is important to the success of the campaign as it allows

planning to begin early and ensures involvement of key partners in all phases of the campaign planning and implementation. A minimum of six months is required for campaign planning. However, the NCC was lately established giving it limited time for planning of the whole campaign process. Key roles and responsibilities of the NCC as defined in the 2022 national ITN distribution strategy [5] included the following:

1. Validate campaign plan, timeline and budget, including human resources and logistic requirements.
2. Track progress of sub-committees against the established timeline.
3. Validate the guidelines and data, supervision and monitoring tools for the campaign.
4. Coordinate central and regional planning processes of the campaign.
5. Validate the campaign micro-plans of the regions.
6. Oversee supervision and monitoring of campaign activities.
7. Resolve major bottlenecks arising in the campaign.
8. Ensure post-distribution campaign activities are conducted.

Development of the Campaign Strategy and Plan of Action

The framework for the campaign strategy was developed and planning meetings were conducted to review and finalize the campaign strategy. The campaign strategy clearly defined the means by which individuals will be allocated LLINs which is by counting the number of people in a household and allocating one LLIN to every two persons in a household and issuing a voucher as means of identification at the fixed distribution points.

Different sub-groups were formed based on partner expertise to review the different components of the strategy such as LLIN needs quantification, communication, logistics, monitoring & evaluation. Hence, a second draft campaign strategy was produced. The strategy was subjected to further review by external team of Alliance for Malaria Prevention (AMP) and the Global Fund. Comments received were reviewed and incorporated by NMCP and partners and a final strategy including a detailed plan of action was produced which guided the entire campaign process.

Development of Joint Work-Plan

Given the fact that malaria disease knows no boundaries and the importance of cross border collaboration in malaria elimination for neighbouring countries [8, 9]. The Gambia and Senegal are closely collaborating in different intervention areas particularly in the context of malaria elimination. The two countries agreed to synchronize mass LLIN distribution campaigns since 2019 and as such the 2022 campaign was the second synchronized campaign. The national malaria programs of the two counties coordinated and planned campaign activities jointly. Joint planning meetings were held at different levels in both countries. This led to the development of joint workplans as well as monitoring plans for the harmonization of key activities during implementation.

At the regional and district levels, cross border joint planning meeting was held and attended by key partners like the non-government organizations, Security Personnel, Customs Border Officers, Local Government Authorities, Regional Health Directorates, and other high level government officials of both countries in a bid to enhance smooth planning and implementation of the campaign. However, consultations between the Regional Health Directorates (RHD) of the two countries on campaign planning and coordination were limited.

During the development process, all communities, and settlements as well as health facilities bordering the two countries were mapped out. The mapping of communities also guided identification of distribution points

along the borders. The outputs of the joint work-plan included pre-campaign, campaign, and post campaign activities with timelines. The joint work-plan was periodically reviewed and updated by the two countries as necessitated by the prevailing circumstances. See below table 1 joint workplan of the campaign.

Regional Micro-Planning

RHDs are the arms of the MOH responsible for planning, coordination, implementation, monitoring, and supervision of health programs at the sub-national level. Hence, engaging the operational levels of the health system is critical for a successful campaign [10, 11]. As such, RHDs were responsible for conducting microplanning for the campaign at regional and district levels. The joint planning sessions were coordinated by the RHDs, and participants included health facility staff, Public Health Officers, Community Health Nurses, NGOs operating at regional level, local government partners, and key community volunteers.

Prior to the conduct of the regional microplanning, the NMCP and partners held preparatory meetings at the NMCP office to agree on the format and agenda for the regional microplanning process. Planning templates were developed and used by the regions to input all needed data for the campaign microplanning. The template captured key variables required for effective planning and implementation. It also helped to standardize the planning outputs for easy harmonization. The microplanning process included putting together relevant information required for the campaign at regional, district and community levels.

These included lists of settlements, population estimates, personnel required for implementation, transportation needs, availability of storage facilities at different levels, number of days required, fuel, other supplies required, data recording and reporting tools, and social mobilization. The microplanning meetings were held at the regional offices. The micro plans developed by the seven health regions were then consolidated to form one composite plan. This was further validated at the NCC level and a master plan for the campaign was produced. See below table 2 consolidated micro-plan of the campaign.

Procurement of LLINs

Under the current Global Fund New Funding Model 3 (NFM3) grant, the quantities of LLINs required by year for both routine and campaign were already quantified based on most recent population projection. These quantifications were reviewed at the macro level as well as during the microplanning process at regional level to determine the amount of LLINs required by each health region.

Table 1. Joint Workplan of the Campaign

No.	Activity	Time frame		Implementation Phases
		Start Date	End Date	
1	Training of Supervisors	23rd May	24th May	Registration
2	Training of Distributors at regional level	27th May	28th May	
3	Deployment of teams to clusters in the border areas	29th May	30th May	
4	Registration of households together with Senegal on the border communities	31st May	8th June	
5	Validation of data from the household registration	10th June	11th June	

6	Registration of households in the interior of the country: WR1 and part of WC2	12th June	20th June	
7	Validation of data from household registration	21st June	22nd June	
8	Distribution of LLINs together with Senegal on the border communities	23rd June	30th June	Distribution
9	Distribution of LLINs in the interior of the country: WR1 and part of WR2	1st July	7th July	
10	Validation of campaign results	11th July	12th July	

Table 2. Consolidated Micro Plan of the Campaign

The Gambia Mass LLIN Campaign 2022 Summary Micro plan												
Health region	**MLLIN class**	**Phase**	**No. of district**	**No. clusters**	**No. Cluster store**	**No. villages under PPS/cluster store**	**No. distribution points**	**NQC pop 2022**	**No. Households**	**No. LLIN allocated**	**No. Bales**	**No. Distribution points**
URR	URR	Phase 1	7	64	64	435	577	297,491	34,944	165,225	3,295	565
CRR	CRR-S	Phase 1	7	41	40	399	335	142,712	17,378	82,208	1,644	335
CRR	CRR-N	Phase 1	5	32	32	339	353	116,851	13,747	65,083	1,302	353
LRR	LRR	Phase 1	6	30	30	157	186	83,428	9,815	46,416	928	186
NBWR	NBWR	Phase 1	3	28	28	156	185	134,360	15,807	74,720	1,494	185
NBER	NBER	Phase 1	4	37	28	189	220	137,549	16,182	76,514	1,513	211
WR2	K/Central	Phase 1	1	11	11	73	74	235,011	27,648	130,600	2,612	75
WR2	K/South	Phase 1	1	12	12	73	82	173,573	20,420	96,458	1,929	82
WR2	K/East	Phase 1	1	9	9	40	49	67,639	7,958	37,597	752	40
WR2	Fonis	Phase 1	5	23	23	172	234	118,198	13,906	70,272	1,315	234
WR1	WR1	Phase 2	5	55	55	324	338	1,025,566	120,655	569,933	11,399	338
Total			**45**	**342**	**332**	**2,267**	**2,633**	**2,537,379**	**298,461**	**1,415,026**	**28,200**	**2,604**

The quantifications included standard LLINs for five health regions as well as Piperonyl butoxide (PBO) nets for two regions (CRR and URR). The change in net in these two regions was because of insecticide resistance established in the eastern part of the country [12]. Procurement of LLINs were done using the Global Fund Voluntary Procurement

Mechanism (VPM) facility. A total of 1,057,309 standard LLINs and 346,720 PBO nets were procured for the campaign and delivered to MOH. The National Pharmaceutical Services (NPS) of the MOH consequently cleared the LLINs and delivered the products to the CRS central warehouse in Kanifing. The different LLINs were separately stored at the central warehouse to avoid mixing. As part of risk mitigation efforts, smoke alarms and fire extinguishers were provided in the stores for safety.

CRS as sub recipient responsible for the LLIN distribution of the malaria Global Fund grant took all necessary steps to ensure security of the LLINs at the central warehouse. Inventory control systems were put in place to tract LLIN movements from the central warehouse to the regional and community stores and eventually to the distribution sites.

Store Assessment and Pre-Positioning of LLINs

Prior to the transportation of the LLINs to the regional and community stores, an assessment of the stores at these levels was conducted by CRS and NMCP to determine availability and suitability of these stores. Community stores were identified with the help of village heads (Alkalos) for storage of LLINs. A main challenge was obtaining stores in the urban areas therefore the CRS warehouses were also used to supply nets in urban areas for distribution. Overall, 342 community stores were assessed and used as net supply points during the campaign. In addition, store hands were also provided for loading and off-loading of nets and gathering waste during distribution. Prior to the campaign, the quantities required in each of the community stores were determined during micro planning. See below table 3 - showing the number of community stores.

LLINs were thereafter transported from the CRS warehouse and prepositioned to the regional and community stores by hired transporters as per the campaign distribution plan. CRS was responsible for the inventory and tracking of LLINs along the supply chain from the central warehouse to the community stores in the regions.

Table 4. Showing the Number of Community Stores

Health Region	No. of Districts	No. Pre-positioning sites
Upper River Region	7	64
Central River Region South	7	41
Central River Region North	5	32
Lower River Region	6	30
North Bank West Region	3	28
North Bank East Region	4	37
Western Region 2 Central	1	11

Western Region 2 South	1	12
Western Region 2 East	1	9
Western Region 2 Fonis	5	23
Western Region 1	5	55
Total	**45**	**342**

However, in process monitoring on the community stores conducted during the campaign highlighted key observations that need to be addressed in subsequent campaigns. These included the following:

1. LLINs were not escorted by designated officers during transportation to the community stores.
2. No receipt or delivery notes were issued or signed upon delivery at the community stores visited.
3. Delivery dates were not communicated to community members responsible for the stores to make themselves available to receive the LLINs.
4. Some of the community stores did not have adequate space for storage of LLINs.
5. LLINs in some community stores were not well arranged and labeled.

Logistics Management

Logistics are important components of any campaign. As such, a sub-committee within the NCC was formed to determine and oversee logistics management at the macro level. The detail logistics required for the campaign were determined during the micro planning at the regional level based on the campaign strategy. The logistics plan included human resource, vehicles, mobile phone devices for data collection, social & behaviour change communication (SBCC) materials etc. required to efficiently implement the campaign. However, vehicle mobilization from government and partners could not mobilize adequate quantities and therefore additional vehicles were hired.

The sub-committee ensured that the required materials for the LLIN distribution were provided to the campaign teams through their respective district and regional supervisors prior to the campaign. Each district supervisor was allocated a vehicle to support team movements during registration and distribution. Fueling for campaign was managed with the use of vouchers. Fuel vouchers were taken to a contracted petroleum dealer (Jah Oil) with fuel dumps and filling stations in all regions of the country.

Advocacy and Social Mobilization

Communication is a vital activity before, during and after an LLIN campaign [13, 14]. The NCC communication subcommittee was responsible for promoting campaign activities and ensuring that there is understanding and support for the campaign among partners and the general population. Key communication activities conducted included:

Advocacy targeting political leaders, local government authorities and key partners to foster political will and support for the campaign as well as resource mobilization at national and regional level.

Social Mobilization at community level to mobilize community support and participation for the campaign. These activities focused on sensitizing communities about campaign strategy, dates for household registration and LLIN distribution, distribution points and importance of LLIN use. The subcommittee used different channels of communication at various levels including radio, social media, influential community leaders, traditional communicators,

and community volunteers. At the regional level, social mobilization activities included community sensitization meetings targeting different segments of the community. The local press significantly contributed to social mobilization activities. The campaign strategy guided communication activities and that messages were clear and supportive of MOH campaign efforts. The subcommittee actively worked with private radio stations at different levels and free radio airtime was provided for social mobilization activities. A WhatsApp group was also created by the subcommittee and updates on communication activities were regularly posted to keep the larger campaign group aware of the campaign activities that were going on at different levels.

Campaign Budget and Financing

The Global Fund financed the 2022 mass LLIN distribution campaign. In the NFM3 grant (i.e., 1st July 2021 to 30th June 2024), mass LLIN campaign was part of the key activities costed under the multi-prevention component. The total campaign budget at the macro level was US$1,023,906 but following the microplanning and consolidation of the microplanning budgets the final campaign budget increased to US$1,074,722. The consolidated budget was reviewed and approved by the Global Fund. The main cost drivers of the budget were allowances for campaign teams, fuel, procurement of other campaign logistics and hire of private vehicles to support implementation. In-country partners supported the campaign by providing human resources and logistics to support campaign activities. At the regional level, other partners like PATH/MACEPA, WHO and AMP provided support through technical assistance for planning, implementation, and monitoring of the campaign.

Campaign Implementation

Campaign Launching

Malaria elimination requires advocacy at the highest level to galvanize political support and commitment [11, 15]. As a synchronized cross border campaign, the launching was done to attract much attention in both countries and internationally. A high-level launching was conducted to give it the desired prominence and galvanize community participation and involvement. The campaign was launched in Karang, a border town in Senegal on the 8th May 2022. It was a high-level launching attended by the Ministers of Health of The Gambia and Senegal, Honourable Dr Ahmadou Lamin Samateh and Honourable Abdoulie Diouf Sarr respectively. The ministers were each accompanied by high level delegations comprising UN partners, government officials, other RBM partners, community leaders and various representatives from both countries.

In their launching statements, both ministers affirmed their support for malaria elimination to enable the two countries reach malaria elimination objectives enshrined in their malaria strategic plans. The ministers also reiterated the importance of cross border collaboration in malaria elimination to sustain and consolidate the gains made in the two countries. Given the importance of the media in disseminating health messages [16, 17], the launching had good media coverage to facilitate information dissemination in both print and electronic media as well as community radios. Other speakers included WHO, Plan International, the Global Fund, CRS, and community influential leaders. All speakers echoed the fact that malaria is a public health concern and emphasized the need to accelerate efforts to reach universal coverage targets, scale-up of best practices, strengthening cross-border collaboration, resource mobilization and effective utilization of malaria interventions by populations leading to eventual elimination.

Traditional communicators, popular local musicians and students were given opportunity to disseminate key malaria messages through songs, poems and drama performances during the event. As a symbolic gesture marking the official launch of the campaign, LLINs were issued to a community member from each country by the Honourable Ministers of Health.

Selection of LLINs Distributors and Supervisors

The selection criteria for the campaign volunteers were developed, reviewed, and finalized at the NCC level. Subsequently, the criteria were used to identify suitable participants as campaign teams and supervisors. Basically, consideration was given to participants of the previous campaigns and gender considerations. The supervisors were selected from among NMCP, CRS, RHDs and implementing partner staff. In total, 912 distributors and 114 supervisors were identified.

Training of Campaign Supervisors and Distributors

Training is an important element in the implementation process as it builds the capacities of the field staff and volunteers for effective implementation. In order to ensure consistency and provide guidance during training process, training contents with clearly defined concepts based on the campaign strategy were reviewed and finalized. Emerging issues like COVID-19 prevention measures and lessons learnt from the 2019 campaign were also incorporated into the training guide.

Training for the campaign was conducted in two phases: training of trainers (TOT) and stepdown trainings held at regional level. For the TOT, participants were central level supervisors meant to provide training support to the regional health staff. A total of 114 supervisors were trained for two days. Important to note that regional stepdown trainings were also conducted immediately after the TOT targeting data collectors and net distributors. A total of 912 data collectors and net distributors were trained and this included use of mobile devices for data collection.

Registration of Households and Issuing of LLIN Vouchers

Following the training of data collectors and net distributors at regional level, the registration of household commenced. Household registration was conducted in two phases. Phase I registration started simultaneously in all the regions bordering Senegal from 31st May to 8th June 2022. Phase II covered the interior part of the country which was from the 12th to 20th June 2022. The approach used was house-to-house visit conducted by campaign teams to count and register all the people resident in the country. The following targets were set for teams to reach per day:

1. 44 households per team per day in the urban areas.
2. 43 households per team per day in the rural areas.

Teams of two enumerators were posted in the different districts and mobile devices with in-built DHIS2 tracker were used to capture data. Village clustering conducted during the microplanning was used to assign campaign teams based on population size and geographical location. Data collected during the registration included; name of household head, total number of people living in the household, and number of LLINs to be issued per household. Each household registered was issued a voucher which contains a QR code. These vouchers were to be presented to the campaign teams to be issued nets during the distribution phase. Household registration was conducted concurrently with community sensitization on the campaign.

Validation of Data from Household Registration

Following the completion of the household registration, a one-day validation workshop was

held at the NMCP office and was attended by regional supervisors, IT team, partners and consultants. The meeting was meant to review and validate the data collected during the household registration. Findings of the review indicated that in certain regions, there were variances in the number of targeted households by region compared to the number of households registered during the process. Hence, recommendations were made to address the issues identified during the registration as well as data collected. See below table 5 - Validated household registration data.

Distribution of LLINs

Phase I of the distribution of LLINs started from 23rd – 29th June 2022 simultaneously along the borders of the two countries while phase II started from the 1st – 7th July 2022. In both phases, campaign teams used fixed-post distribution strategy within communities where people issued with vouchers during the registration collect their nets. Distribution teams moved in vehicles from one community to another as per the established movement plan. Teams transport nets in their vehicles from the pre-positioning sites to the identified static locations in each community and returned any leftover nets to the pre-positioning sites at the end of each day. In certain instances, team movements were hindered by lack of fuel in some hired commercial vehicles. Communities were informed about the distribution strategy and dates using different channels of communication including community radios, traditional communicators, influential community leaders and campaign volunteers.

The campaign teams comprised two volunteers, a data collector and a net distributor. The distribution sites were organized to ensure a smooth process, safety of the commodities and campaign teams. Community volunteers (store hand) supported the distribution teams with site organization as well as handling of the LLINs. COVID-19 prevention measures were observed during the distribution. Campaign teams were provided with face mask and hands sanitizers. Campaign teams also re-sensitized communities during net distribution on the importance of consistent use as well as caring for the nets.

Campaign Monitoring

Monitoring and supervision are crucial during mass LLIN distribution to ensure quality of activities and success in the roll out of the campaign [18, 19]. Supervision was important during the LLIN distribution, particularly on the first days when the majority of beneficiaries came to the distribution sites to receive their nets, with potential crowd control issues.

The AMP Toolkit, 2021 [10] was adapted and used by supervisors to monitor the campaign. Monitoring and supervision were conducted during the campaign by the central, regional levels and team supervisors. Monitoring process also looked at social mobilization activities, logistics and supply management issues at central, regional and community levels. It was meant to enhance the implementation process as certain issues identified were addressed onsite. Additionally, monitoring and supervision aided in ensuring that communities were reached and people were aware of distribution dates and points. Feedback was also provided to the campaign supervisors and NMCP team to address key issues identified as the campaign progressed.

Campaign Waste Management

The packaging for the LLINs procured for the campaign using the VPM facility came in bails of 50 without any plastic pre-packaging thus significantly reducing the amount of waste generated during the campaign. This was a lesson learnt from the previous 2019 campaign which generated significant amount of plastic waste, thus had posed prodigious disposal challenges. During the training, the teams were sensitized to pack all the empty bails and ropes cut from the bails at the distribution sites. These wastes were collected daily and transported to

the community stores and eventually transported to the centralized sites identified for final disposal using the MOH incinerators.

Results

Net distribution data collected electronically was synced daily in the DHIS2 tracker which was subsequently reviewed and analyzed. This enabled review of coverage data by districts. A total of 3,179,189 people were registered countrywide corresponding to a total of 1,678,319 actual LLIN need. This is above the country's population projection of 2,527,251 and a corresponding total of 1,404,047 projected LLIN need. A total of 1,164,552 LLINs were actually distributed between June to July 2022, corresponding to 90% of projected LLIN needs. This result is an indication of national coverage of 72% of the registered population. A further analysis of the results showed that 83% of the campaign target of the standard nets (i.e. 876,394/1,057,309) and PBO nets (i.e. 288,158/346,720) have been distributed. Additionally, only 33% of the 42 districts achieved the universal campaign coverage of 80%. See details of the results in table 4 below.

Discussion

A nationwide LLIN distribution campaign is conducted every three years in The Gambia since 2011. However, to synchronize mass net distribution campaign with Senegal as part of cross border collaboration towards malaria elimination, the 2022 was the second joint campaign with Senegal following the first one which was conducted in 2019. The distribution campaign is a key strategy to achieving universal campaign coverage. The 2022 mass distribution campaign conducted resulted to a distribution of 72% of LLIN needs based on household registration data, covering 90% of the projected population. Based on the household registration, a total of 1,678,319 LLIN needs was established compared to a total of 1,404,047 projected LLIN need. Hence, a variance of 24% between projected and registered population need. A further review or analysis is therefore necessary to better estimate the real population need.

Micro planning was conducted simultaneously in all the seven health regions in the country. This was a hectic exercise, as it required ensuring that all the regional stakeholders remained strongly engaged and highly active during all the campaign phases. Real time communication through various channels (WhatsApp, email, telephone) enabled the central level team to coordinate with all the regional level teams and provide necessary and appropriate technical support, even when not physically present in some instances.

Training of campaign teams was conducted in two phases, i.e., a TOT and stepdown trainings. This approach provided a useful opportunity to segment supervisors from distributors who were indeed at different capacity levels since supervisors were mostly heath workers and understand better the reasons for conducting such a campaign. Whilst the stepdown training participants were mostly volunteers (non-health workers) and need greater depth of training in simplified format for better comprehension. The training approach also provided another opportunity to use and address lessons learnt from the TOT during the stepdown trainings. Additionally, incorporating COVID-19 prevention measures during the training was equally helpful to equip the campaign teams to take adequate measures to protect themselves and communities during household registration and distribution. The criteria of selection developed prior to the campaign helped in identifying suitable campaign participants, most of whom participated in the previous campaign and therefore familiarity with the household registration and distribution processes were ensured.

Conducting house-to-house registration throughout the country was tedious but quite

important and ensured that no community was left out. But the fact that some of the compounds were closed during the day for work and school related activities made it prudent for a re-visit to those compounds in the evening. This experience was more prominent in the urban grossly populated areas. Hence, close monitoring and supervision was required to ensure good coverage and quality of the data collected. Furthermore, monitoring and supervision during the registration process was vital to identify issues and provide corrective actions. There were different levels of supervisors during the registration to ensure that all areas were reached and that there were no duplications/gaps. However, supervision at the level of the teams were sub-optimal leading to the following key observations:

1.Variations between projected number of households per region and total number of households registered during the registration exercise.

2.Difficulties in accessing certain households in the urban areas to register them due to the fact that most go out for work or other businesses during the day.

3.Volunteers not sensitizing household heads adequately on the importance of giving accurate data on the number of people per house leading to perceived over estimations.

4.Some volunteers count number of beds instead of number of people per household.

Conducting household registration in phases also helped synchronize registration along the borders of the two countries. Campaign teams were able to meet at the border and ensured that all households were reached. This process also enabled streamline communication and synergy during registration.

LLIN distribution strategy used a fixed post system and communities were expected to visit pre-positioned distribution sites with their coupons issued them during registration to receive their nets. Hence, continuous sensitization during the process was quite important for communities to know when and where to collect their nets. The campaign communication messages included reminding communities of the process for receiving the nets, who should collect the nets, distribution dates, as well as hours that the distribution sites were opened. Despite community sensitizations, children were observed to be collecting nets in some distribution centres. Due to the variances between the total projected population and total registered population, inadequate quantities of nets were pre-positioned in some distribution sites resulting to temporal shortages of nets in those sites. Logistics management challenges were also realized notably inadequate number of vehicles also contributing to net shortages and delays in movement of campaign teams. Hiring of some commercial vehicles became an option but monitoring of fuel allocated posed some challenges.

Table 4. Results of Coverage by District

Region	**District**	**Pop Projection**	**Registered Pop**	**Pop Variance (%)**	**LLIN Projected need**	**Actual LLIN need**	**LLIN Need var (%)**	**Actual LLIN sent to District**	**LLIN Distributed by district**	**Projected Coverage**	**Actual Coverage**
Central River	Janjanbureh	4,332	5,455	26%	2,407	2,903	21%	2,400	2,474	103%	85%
Central River	Lower Fulladou West	50,148	71,156	42%	27,860	37,304	34%	27,900	25,417	91%	68%

Central River	Lower Saloum	18,459	25,781	40%	10,256	13,502	32%	10,450	11,291	110%	84%
Central River	Niamina Dankunku	6,955	10,260	48%	3,865	5,381	39%	3,950	4668	121%	87%
Central River	Niamina East	27,830	36,898	33%	15,462	19,353	25%	15,200	10,271	66%	53%
Central River	Niamina West	8,165	12,096	48%	4,537	6,374	40%	2,100	3,911	86%	61%
Central River	Niani	33,873	41,658	23%	18,819	21,656	15%	18,950	15,68	83%	72%
Central River	Nianija	11,803	16,196	37%	6,558	8,441	29%	6,900	6,965	106%	83%
Central River	Sami	29,118	42,685	47%	16,177	22,076	36%	16,400	13,978	86%	63%
Central River	Upper Fulladou West	55,494	65,824	19%	30,830	34,530	12%	27,400	25,483	83%	74%
Central River	Upper Saloum	22,316	32,741	47%	12,398	17,003	37%	12,350	12,085	97%	71%
Lower River	Jarra Central	9,287	13,304	43%	5,160	7,020	36%	5,150	6,273	122%	89%
Lower River	Jarra East	17,851	27,068	52%	9,918	14,196	43%	7,950	9,829	99%	69%
Lower River	Jarra West	29,185	42,956	47%	16,214	23,271	44%	16,150	20,015	123%	86%
Lower River	Kiang Central	9,643	13,002	35%	5,357	6,994	31%	4,650	6,593	123%	94%
Lower River	Kiang East	7,572	11,914	57%	4,207	6,420	53%	2,400	5,453	130%	89%
Lower River	Kiang West	16,689	20,097	20%	9,272	10,671	15%	9,400	9,030	97%	89%
North Bank East	Central Badibu	24,129	31,472	30%	13,405	16,627	24%	13,400	10,529	79%	63%
North Bank East	Lower Badibu	22,235	32,731	47%	12,357	17,221	39%	12,400	9,208	75%	53%
North Bank East	Sabach Sanjal	29,374	42,665	45%	16,319	22,284	37%	16,250	12,086	74%	54%
North Bank East	Upper Badibu	60,189	100,150	66%	33,439	52,823	58%	34,450	30,855	92%	58%

North Bank West	Jokadu	27,621	35,336	28%	15,345	18,492	21%	15,250	14,355	94%	78%
North Bank West	Lower Nuimi	70,627	97,954	38%	39,262	51,397	31%	37,400	40,540	103%	79%
North Bank West	Upper Nuimi	38,228	46,736	22%	21,238	24,451	15%	21,600	21,329	100%	87%
Upper River	Basse(Fulla du East)	61,862	78,880	28%	34,368	42,048	22%	34,400	33,875	99%	81%
Upper River	Jimara	54,755	64,187	17%	30,420	33,263	9%	31,850	29,515	97%	89%
Upper River	Kantora	48,321	64,525	34%	26,846	34,422	28%	26,400	26943	100%	78%
Upper River	Sandu	29,807	43,901	47%	16,560	22,813	38%	16,750	15,138	91%	66%
Upper River	Tumana	46,875	53,360	14%	26,042	28,146	8%	26,750	25,169	97%	89%
Upper River	Wuli East	29,748	35,761	20%	16,527	18,355	11%	16,200	13,588	82%	74%
Upper River	Wuli West	27,498	37,971	38%	15,277	19,882	30%	18,700	11,769	77%	59%
Western 1	Banjul City	27,857	35,094	26%	15,476	18,726	21%	17,150	12,631	82%	67%
Western 1	Kanifing Municipality	435,050	516,405	19%	241,695	274,456	14%	254,250	181,860	75%	66%
Western 1	Kombo North	558,930	715,099	28%	310,517	377,058	21%	311,600	250,802	81%	67%
Western 2	Foni Bintang Karanai	28,194	27,031	-4%	15,664	14,270	-9%	10,050	16,618	106%	116%
Western 2	Foni Bondali	12,480	16,652	33%	6,934	8,560	23%	7,250	5,529	80%	65%
Western 2	Foni Brefet	23,918	22,015	-8%	13,288	11,529	-13%	12,050	5,880	44%	51%
Western 2	Foni Jarrol	11,336	10,393	-8%	6,298	5,540	-12%	6,250	1,821	29%	33%
Western 2	Foni Kansala	23,263	29,282	26%	12,924	15,254	18%	12,650	7,112	55%	47%
Western 2	Kombo Central	230,618	254,813	10%	128,122	135,598	6%	129,750	92,765	72%	68%
Western 2	Kombo East	69,715	86,206	24%	38,731	45,054	16%	37,600	31,217	81%	69%

Western 2	Kombo South	175,859	211,839	20%	97,700	112,955	16%	96,450	74,064	76%	66%
Total		**2,577,251**	**3,179,189**	**31%**	**1,404,047**	**1,678,319**	**24%**	**1,406,550**	**1,164,552**	**90%**	**72%**

Lessons learnt, Challenges, Recommendations and Conclusion

Lessons Learnt

1. Use of social media (WhatsApp) platform helped to enhance communication among campaign teams, bottlenecks identified, and solutions proposed for quick remedial actions. It also helped in keeping the central level and supervisors informed about the campaign.
2. Multi-stakeholder involvement (security, regional administration, and other relevant organizations) helped ease cross-border movements and for smooth distribution in border communities.
3. Phased approach to the campaign allowed synchronization of both registration & distribution phase of the campaign along cross-border communities in both countries.
4. Constant monitoring and supervision are crucial for the success of the campaign.
5. Good supply chain management is necessary for the success of campaigns.
6. Involvement of community volunteers in the campaign improved mobilization and acceptance at community level.
7. Harmonization of campaign messages helped streamline cross-border communication for community mobilization and participation in the campaign.

Challenges

1. Limited time between planning and implementation of the campaign.
2. Inadequate social mobilization activities to keep communities aware of the campaign.
3. Inadequate supervision of teams during household registration and distribution.
4. Few households were left out during household registration and distribution due to sub-optimal performance of campaign teams and lack of access to some compounds particularly in the urban areas.
5. Logistics management issues making LLIN unavailable at some distribution points in some instances during the net distribution phase.
6. Hire of commercial vehicles with the risk of utilizing campaign fuel for commercial purposes.
7. Children sent to collect nets at the distribution centres affected sensitization on proper LLIN use .
8. Variances between total projected population and total registered population for better planning and pre-positioning of LLINs prior to the campaign.

Recommendations

1. Conduct post campaign evaluation to understand the reason(s) for the low coverage and conduct mop-up and fill-in net distribution in areas with low coverage.
2. Evaluate the cross-border LLIN campaign to learn lessons and make recommendations for future synchronize campaign.
3. Strengthen monitoring and supervision during implementation to ensure that campaign teams perform optimally and that all challenges identified on-site are addressed for more effective performance.
4. Training for volunteers should be conducted separately by component (household registration, data collection, LLIN distribution) to enhance effectiveness and better campaign performance.

5. Logistics management should be improved to ensure timely team movements and all required logistics including availability of LLINs at distribution points throughout the campaign.
6. Social mobilization and community sensitization activities should be intensified before and during campaign to ensure that households are well informed about key campaign activities and also children are not sent to receive LLINs.
7. Investigate and address the factors responsible for the variances between the total projected population and total registered population for better planning and pre-positioning of LLINs prior to the campaign.

Conclusion

The joint coordination and planning allowed the NMCP and partners to successfully conduct a nationwide campaign synchronized with the neighbouring country Senegal. The high-level engagement and support from government greatly contributed to the successful completion of the campaign. This distribution campaign has increased access to LLINs in households since over a million nets were distributed which is likely to result in increased LLIN use with continuous education on the benefits. Consequently, a reduction of the malaria burden in the country and ultimately contributing to the achievement of the country's goal of malaria elimination.

Ethics Approval and Informed Consent

This article makes use of secondary data and is not subject to ethics approval. Administrative approval was obtained from the National Malaria Control Program.

Conflict of Interest

I declare that there is no conflict of interest.

Acknowledgements

The authors would like to applaud the contributions of the NMCP, and partners involved in the campaign implementation countrywide. Additionally, special acknowledgement is extended to the regional and district authorities for their advocacy efforts and more importantly the community members for their active participation in the campaign.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art011

Knowledge and Uptake of Measles Vaccination Second Dose (MCV2) among Children under 5 in Ebonyi State, Southeastern Nigeria

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Abstract

Measles, a viral highly contagious infection, has posed significant threats to the lives of children globally. Introduction of Measles-Containing Vaccines has significantly reduced the burden of measles and prevented outbreaks of measles disease and averted deaths of children under 5 years old. This study aimed at examining the knowledge of health care providers of the measles-containing vaccine second dose (MCV2) in Ebonyi State, ascertain the level of uptake, explore the barriers and challenges, and propose the strategies that can be recommended to mitigate the challenges. A purposive sampling approach was employed that sought to identify specific groups of study participants who possessed the characteristics of, or lived in settings relevant to, the social phenomenon under study. Nurses, CHEWs, and other health practitioners who have in one/many way(s) rendered immunization services were included. Data collection was in the form of audio recordings of focused group discussions with study participants on the research subject using a validated interview guide. The result showed low uptake of MCV 2 across the facilities in the State, ignorance, forgetfulness and misconceptions among other factors are responsible for low uptake. Suggested ways to increase the uptake include periodic tracking and intensification of routine immunization, factoring engagement of adhoc health workers into facility business plan, and increased incentives. The study participants' knowledge and perception of factors affecting uptake of MCV2 among under 5 children in Ebonyi State is consistent with evidence produced by other studies on the subject matter.

Keywords: *Knowledge, Low, MCV2, Uptake.*

Introduction

Measles disease, a viral highly contagious infection, has posed a significant threat to the lives of children globally. The introduction of Measles-Containing Vaccines has significantly reduced the burden of measles and prevented outbreaks of measles disease [1] and averts deaths of children under 5 years old [2]. However, the second dose (measles-containing vaccine (MCV2)) was introduced to secure complete protection against the disease and provides herds immunity [3]. Ebonyi Health Management Information System records show consistently low uptake of the second

Received: 01.06.2024 ***Accepted: 08.07.2024*** ***Published on: 30.07.2024***

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dose among children under 5 (Ebonyi State DHIS 2 data of 2020-2022).

This research aims to unravel the effects of knowledge, attitudes, and perceptions of parents and caregivers on the Uptake of Measles Vaccination Second Dose (MCV2) among Children Under 5 in Ebonyi State, Southeastern Nigeria, and contribute to the existing body of knowledge on immunization programs and public health. Through an in-depth exploration of these factors, we can gain valuable insights and propose evidence-based solutions to address the challenges faced in the vaccination coverage of measles MCV 2 among children under 5 in Ebonyi State.

The findings of this study will not only provide a comprehensive understanding of the specific barriers to vaccination but also inform policymakers, healthcare providers, and stakeholders on the necessary interventions and strategies needed to improve the uptake of the second dose of measles vaccination. Ultimately, the goal is to enhance the overall immunization coverage and protect children from the devastating consequences of measles in Ebonyi State, Southeast Nigeria.

This study sought to examine the knowledge of health care providers of the measles-containing vaccine second dose (MCV2) in Ebonyi State, ascertain the level of uptake of the MCV 2 vaccine in Ebonyi State, explore the barriers and challenges faced by parents and caregivers in accessing and receiving the MCV 2 vaccine in Ebonyi State, and propose the strategies that can be recommended to immunization Stakeholders for improved vaccine uptake.

Research Questions

1. What is the coverage of measles vaccination second dose and the role of healthcare systems?
2. To what extent does knowledge of healthcare providers contribute to the uptake of Measles vaccination second dose?
3. What are the barriers and challenges faced by parents and caregivers in accessing and receiving the MCV 2 vaccine in Ebonyi State?
4. What strategies can be recommended to immunization Stakeholders for improved vaccine uptake?

Significance

This research effort seeks to identify factors contributing to the poor uptake of the second dose of MCV. Findings from this study will invariably be used to improve the uptake of the second dose measles vaccine (MCV 2) and consequently contribute to the elimination of measles in Ebonyi state.

Literature Review

Vaccination was seen as one of the most effective public health interventions [4-6] , and that uptake of vaccination services does not only depend on the quality of these services but also on some other factors which include knowledge and attitude of the parents. The team also discovered that delays in the uptake of immunization services were mainly due to insufficient information about the importance of vaccination, child illness, negative knowledge about the vaccines and vaccine deficiency [6].

Implementing the World Health Organization's (WHO)-recommended immunization schedule [7] has resulted in declining morbidity and mortality associated with vaccine-preventable diseases (VPDs). The immunization coverage rate is considered a surrogate measure of protection [5]. Of the estimated 19.5 million infants not reached with routine immunization services worldwide in 2016, 60% of them live in 10 countries including Nigeria. Of serious concern is the abysmally low full immunization coverage in Nigeria with a concomitant high mortality largely attributed to vaccine-preventable diseases [7].

Studies have produced evidence that incomplete immunization is a significant public health problem [8] and [5] as well as that low coverage rates can affect herd immunity, and therefore pose a threat to outbreaks. Children depend on their parents and, or caregivers to access immunization services, which means that caregivers play a critical role in ensuring full compliance with immunization schedules and achievement of full immunization status [9].

A study has it that various reports revealed that VPDs account for 25% of deaths occurring annually among children less than 5 years of age [10]. Children who are exposed to these preventable diseases usually suffer from numerous growth and developmental squeals [11] and [12]. Thus, VPDs create a significant economic and social crisis among individuals, families, and communities [10].

Ethiopian Mini Demographic and Health Survey in 2019 [13] showed that the under-five mortality rate was 55 deaths per 1000 live births, close to 2 in 10 children (19%) have not received any vaccinations at all and only 4 out of 10 children (43%) have received all basic vaccinations [10].

A community-based cross-sectional study on the Factors Associated with Low Coverage of the Second Dose of Measles Containing Vaccine (MCV) among Children Aged 19-59 Months, in Alego-Usonga Sub-County, Kenya, came up with the evidence that there was low MCV2 coverage which they concluded to be significantly associated with low MCV2 vaccination, lack of caregiver awareness of MCV2, and vaccine stock-outs were the major reasons for non-vaccination with MCV 2 among other identified factors [14].

Other studies revealed several factors that are related to low immunization status to include: economic status, settlement type, age and sex of a child, long-distance to a health facility, poor access to immunization service, poor health infrastructure, poor awareness of mothers/caregivers, mothers' perception to the accessibility of vaccines, missed opportunity, place of delivery, living altitude, inadequate human resource for health, and high staff turnover [15] and [16].

A similar study in Nigeria observed that though immunization is proven to be the most successful and cost-effective public health intervention in reducing childhood morbidity and mortality [6] (as it averts 2 to 3 million deaths every year), the global vaccination coverage has remained stalled at 86% from 2010, without any changes during the past years [7].

Inadequate knowledge of immunization and the perception of caregivers have been reported to be among hindrances to vaccination uptake [17, 18]. This means that there is a need to equip the public with the requisite knowledge about vaccination against VPDs, the recommended schedule, and the benefits of getting every child to be fully immunized [19].

A study that assessed the knowledge, attitude, and practices of caregivers on childhood immunization, observed that there are still issues of vaccine hesitancy especially in caregivers whose responsibility it is to protect their children from VPDs [18]. This has negatively affected the overall vaccine coverage in disease-endemic areas such as sub-Saharan Africa. Poor knowledge of vaccination and its benefits among caregivers have been reported in the community [18], a situation that affected their adherence to vaccination schedules, and consequent incomplete immunization of children in the community by their caregivers. Another study by [20] assessing the knowledge level among Saudi Parents about vaccination showed that 73.3% of parents reported having a good understanding of childhood immunization, and 9% were aware that regular vaccinations shield kids from infectious diseases and associated repercussions.

Equipping mothers with the prerequisite knowledge about the benefits of

immunization, which invariably impacts their attitude and encourages their participation in vaccination services, is a major contributor to achieving vaccination coverage and uptake [17]. A gradual decline in the uptake of vaccines, due to caregivers' failure has been reported [3] in [18], even though vaccines are known to provide herd immunity by preventing infectious diseases in the adult population Most studies on the effects of knowledge, attitudes, and perceptions of parents and caregivers on the Uptake of Measles Vaccination Second Dose (MCV2) among Children Under, including the literature reviewed in this study, are each a national or inter-countries study. The few that did subnational studies left a knowledge gap in Ebonyi State, Southeastern Nigeria. This research is, therefore, designed to fill this gap.

Materials and Methods

Participants

In this study, a purposive sampling approach was employed that sought to identify specific groups of study participants who possessed the characteristics of, or lived in settings relevant to, the social phenomenon under study. In this case, only the nurses CHEWs, and other health practitioners who have in one/many way(s) rendered immunization services were included [21]. Data collection was in the form of audio recordings of focused group discussions with study participants on the research subject using a validated interview guide. The duration of engagement with the study participants through the discussion sessions was sufficiently long. The recorded conversations, including nonverbal observations, were transcribed verbatim by the researcher by a single transcription approach. Transcribed data was stored in a secure personal laptop computer. Meticulous records of the interview conversations and observations, together with documentation of the process of analysis in detail, ensured the credibility of the data analysis [22].

Procedure

Focus group discussions were held until saturation of new information was relatively reached, as in qualitative research sample size can never be predetermined [23]. To be sure we did not miss any 'significant' information, one additional focus group session was held after theoretical saturation was estimated. All focus groups were organized at the health facility at a time and date convenient for the health practitioners and researchers team. Before each focus group, all participants were asked to complete a short questionnaire containing demographic characteristics which include sex, age, educational status, cadre, and years of experience (see Table 1). Furthermore, an explanation about the aim of the study was given and an informed consent (in which participants' anonymity and confidentiality were assured) was signed by each participant. Each focus group lasted between 90 and 120 minutes (including follow-up questions that were not included in this paper) and was facilitated by a moderator and an assistant moderator (observer), who took notes during the discussions and made sure the moderator did not overlook any participants trying to add comments. All focus group discussions were audiotaped with the permission of the participants. Drinks and snacks were provided during the focus group discussions. Afterward, all students received an incentive (a lunch voucher). The study was approved by the Research Ethics Review Committee of Ebonyi State Ministry of Health, Abakaliki.

Question Guide

According to the recommended focus group methodology [23], a semi-structured question guide (see Table 1) was developed by the researcher, aiming to unravel the effect of knowledge, attitude, and practice of parents

and caregivers on the uptake of MCV2. As mentioned before, this paper will only focus on the knowledge, attitude, and practice of parents and caregivers on the uptake of MCV2. After intensive collaboration with experts with ample focus group experience, the questions were carefully developed using appropriate literature [23]. When the development was completed, the question guide was tested within and revised by the researchers. The question guide consisted of opening and introductory questions which allowed participants to get acquainted and feel connected, and to start the discussion of the topic. Transition and key questions were used to respectively, guide the group toward the main part of the discussion and to focus on the purpose of this study, that is, identifying factors that affect the uptake of MCV2. For obvious reasons, the greatest share of the group discussions focused on the key questions. Finally, participants were asked to share ideas concerning health promotion as well as intervention strategies to counter the low uptake of MCV2 among caregivers and parents. During the focus group discussions, the moderator followed the question guide but asked side questions to obtain more in-depth information about the topics, and showed enough flexibility to allow open discussions between the health practitioners.

Data Analysis

IBM SPSS Statistics Version 25 was used to analyze and calculate descriptive statistics of the focus group sample. Data obtained from the audio tapes were transcribed verbatim in Microsoft Word using Express Scribe and Windows Media Player. All quotes were encoded using the qualitative software program Nvivo 11. Using an inductive thematic approach, data (quotes) were examined for recurrent instances of some kind, which were then systematically identified across the data set, and grouped together by means of a coding system (= content analysis) [24]. Similar codes were grouped together into more general concepts (sub-categories) and further categorized into main categories. To ensure the reliability of data interpretations, analyses were carried out independently by two researchers. Doubts or disagreements were discussed with two other researchers until a consensus was reached.

Table 1. Focus Group Question Guide

Question type	**Question**
Opening	• Can we identify ourselves?
Introduction	• Describe your knowledge of the immunization schedule.
Key	• How many doses of MCV do we have?
	• What is the age and antigen for the fully immunized child(ren)?
	• Are there times or circumstances in which the MCV is contraindicated?
	• What are the reasons for defaulting the MCV 2 by
	-Mother/caregivers?
	-Health Care Workers?
	-Health system?
	• How is MCV coverage in your facilities?
	• Which type of settlements houses more of the defaulter - Rural.-Semi-Urban, Urban?
Ending	• What are your challenges?
	• How can we mitigate the challenges and improve uptake.

Result

In this study, the estimated point of saturation was observed after the fourth focus group session. One additional focus group discussion was conducted to be sure true saturation was established. In total, five focus group discussions were conducted, consisting of five to seven participants per group. The sample (n = 30) consisted of 3 (10.0) male and 27 (90.0) female health practitioners. The majority of them, 12 (40.0%) were between 41 – 50 years of age, and 10 (33.3%) were more than 50 years. More than half of the proportion of the participants 19 (63.3%) were CHEWs and all of them have more than 10 years of experience. Additional sample characteristics are described in Table 2.

Table 2. Characteristics of Focus Group Participants (n = 30)

Characteristics	**Frequency**	**Percentage**
Sex		
Male	3	10.0
Female	27	90.0
Age Group		
20 – 30yrs	1	3.3
31 – 40yrs	7	23.3
41 – 50yrs	12	40.0
51 years & above	10	33.3
Educational Status		
Cadre Nurse	2	6.7
CHEWs	19	63.3
Others	14	46.7
Years of Service		
10yrs & above	30	100.0

The thematic index summarizes the key findings in this study. Eight themes were constructed from the study analysis in line with the study objectives (Table 3).

Table 3. Themes, Codes, and Categories

Study Objectives	**Themes**	**Codes and categories**
Knowledge of MCV	1.1 First antigen	1.1.1. Immediately at birth
	1.2 Doses of MCV	1.2.1 Doses of MCV
	1.3 Duration of MCV	1.2.1 Duration of first dose of MCV
		1.2.2 Duration of second dose of MCV
		1.2.3 Missed schedule
Uptake of MCV2	2.1 Contraindications	2.1.1 Contraindications
	2.2 Reactions	2.2.2 Reaction to the first dose d
	2.3 Reason for defaulting	2.3.3 Reason for defaulting
Challenges to uptake of MCV2	3.1 Challenges	3.1.1 Challenges to uptake of MCV2
A possible solution to low uptake of MCV2	4.1 Possible solution	4.1.1 Possible solution to low uptake of MCV2

Knowledge of MCV

First Antigen

The majority of the health practitioners interviewed were able to list at least one antigen given to infants after birth. One of them mentioned 3 which were BCG, OPV0, and HPV0. Every other person either repeated all of these or fewer.

Doses of MCV

When asked how many times the measles-containing vaccines are supposed to be given to a child, almost all the participants shouted "*Two*". One of them even repeated the same in his own words, "*Yes it is two times*".

Duration of MCV

Participants agreed that a child is supposed to take the first MCV at nine months of birth. A particular participant retorted, "*It is at the ninth month, and we meant nine months from birth*". On the supposed time for the second vaccine, all the health practitioners agreed that it would be in the 15th month. One of the participants expressed her opinion, thus: "*first dose is supposed to be at 9 months and the second dose at 15th month. Even if the woman comes a little later, 10th month, 11th month, the person should still come back at 15 months for the second dose.*"

Uptake of MCV 2

All the healthcare workers in attendance, responding to the question of level of uptake, unanimously echoed "*We have low coverage of the MCV 2 in our facilities*".

Contraindications

Some study participants also expressed their opinions about times or circumstances in which the measles-containing vaccine may not be administered. All of them agreed that at one point or the other, there are circumstances in which they may not have to give a child measles vaccines. Their suggestions were, "*When the child has critical signs of measles infection like rashes all over the body*". Another participant contributed that it could be, "*when there are sores in the mouth and mucus membrane*". Every contraindication mentioned always received affirmation from every other participant. Other participants also mentioned "*evidence of high fever, and presence of conjunctivitis*."

Reation of the First Dose

When a woman is coming for a second dose, but the child had an anaphylactic reaction to the first one or has not received any vaccine till 23 months of their baby. The participants opined, "*You know that when we are talking about R.I., we have a target, and our target is 23 months. So, by the time this child is more than 23 months old and shows up, you are not going to give any such child any measles-containing vaccine.*" But one of the participants came up with a contrary opinion to this; 'when there is a campaign,' "*Okay. Nine months. Okay. So, when there is a campaign. like a measles campaign? Yes, once a child is less than five years old. That child can be vaccinated*."

Reasons for Defaulting

One of the participants said that while she was interviewing some mothers, they advanced the following reasons for defaulting: *(a) I forgot to come back for the second dose of the vaccine. (b) I was not aware, neither was I informed about the second dose. This is a gap in health workers' attitudes and practices. (c) My husband prevented me from coming for the vaccine, especially the second dose, since the child has taken the first dose. (d) Some of the women claimed to be busy either as farmers or businesswomen.*

Other reasons for defaulting as perceived by the participants included: when the child had had previous adverse reaction to vaccines, it could discourage the mother from coming for the complete dose(they take it as false health claims); accessibility of the health facility;

lack of transport fare to go to the facility to uptake the MCV 2, and also when there is delay in receiving the vaccine from the health workers for any reason, or, failure to access because there were not enough clients to warrant opening a new vial of the vaccine.

If there is any occurrence of the disease and the child survives, the mother assumes that the child has acquired natural immunity against measles infection. Sometimes there could be vaccine stock-out, rumors of fake vaccines, communal crises, and relocation of family or family crises.

Another health practitioner gave her reason to be that the parents no longer take any interest in immunization after the first dose of the measles vaccine, which is taken at 9 months. Another participant said that failure to take-up MCV2 can be attributed to the absence of the mother/caregiver, "*The mother might be traveling… The mother might be sick … The mother might also travel or relocate, so, the mother is no longer in that environment, so there is nobody to bring that child"*. Some caregivers would like to go to another facility to access services.

One of the participants said, "*Before we did give nursing mothers a gift of ITN after the first dose of the measles vaccine, now, we are telling them, if you do not receive the second dose, we will not give you the gift you're supposed to give to children for attaining the fully immunized status*." A different reason suggested by one of the participants was that it could come from the husband of the mother/caregiver, "*So even the husband might feel that he has taken the first dose, so he does not need another one. So, their spouses used to stop them.*"

Some mothers forget, and some lose interest as soon as they have taken the child to the health facility for the first dose. Some say that they are busy. When the child had had an Adverse Event Following Immunization (AEFI), a situation when a child had a measles-like infection even after receiving the first dose could also be a reason.

Challenges

There are many challenges encountered by health workers in the discharge of their duties generally and in ensuring the administration of MCV2 to eligible children. These challenges could come from the Healthcare system, the caregivers, or, from the happenings, and even the security situation. The majority of the health practitioners lamented the paucity of funds and other resources, *"so lack of logistics*". Another diverse challenge is the distance between health facilities and the location of the caregivers and even those of the healthcare providers. The healthcare providers also decried the lack of adequate human resources for health.

Possible Solutions

Suggestions on how to increase the uptake of MCV2 by the caregivers from the participants may be through campaigns by the government *"Like what used to happen during campaigns. You know, the government used to hire adhoc workers. Let me say hire. I will call it a hire. That is employing the health workers. Engage health workers. Okay. And also, when you engage them to help and track those women, they can find a way and just track them.*" One of the participants suggested tracking the supposed beneficiary, *"It is the strategy that is helping us to reach them now. But you know, it is not easy when one or two people are going house to house."* Participants, responding to the follow-up question of what they can do by themselves to mitigate the challenges as well as caregivers' reasons for defaulting, to ensure good immunization coverage, advanced the following: *(a) Changing the time of giving the incentive (ITN) to the caregivers from 9 months to 15 months, after the second dose is taken. (b) Factoring the engagement of adhoc health workers into their Business Plans. (c)*

Being more deliberate in health-educating mothers and caregivers on the need to take up a second dose of MCV 2 to have the child fully immunized. (d) Employing the use of the Tickler System to remind caregivers of their immunization appointments and to track defaulters. (e) Periodic baby tracking and intensification of routine immunization targeting settlements with a higher number of defaulters.

Discussion

This study sought to ascertain the knowledge and uptake of measles vaccination second dose(MCV 2) The results show that ignorance of the second dose is the most significant barrier affecting the uptake of the second dose of measles vaccine in addition to forgetfulness, unavailability of the vaccine in the facility, assumption that the first dose is adequate for the child, relocation, frequent cancellation of immunization sessions, being indisposed to go the facility and children getting sick after the first dose.

The study which was conducted among Health Facility workers who have been experienced in the work and of cause, demonstrated good knowledge of Measles-Containing vaccine by correctly responding to the interview guide items, designed to assess the knowledge level of the participants. The participants had good grasp of the WHO recommended immunization schedule which includes the measles-containing vaccine doses.

On the coverage of MCV2 all participating health workers unanimously echoed “We have low coverage of the MCV 2 in our facilities” thus confirming the State DHIS 2 immunization data. This result is consistent with the conclusion of a research team [14], in their study on the "Factors Associated with Low Coverage of the Second Dose of Measles Containing Vaccine (MCV) among Children Aged 19-59 Months, in Alego-Usonga Sub-County, Kenya" produced evidence that showed that lack of caregiver awareness of MCV2 and vaccine stock-outs were the major reasons for non-vaccination with MCV 2, and [9] identified failure of caregivers to take their children to the facility for vaccination as part of the reason for low coverage.

Ignorance appeared to be the most dominant factor: a vice that can only be overcome with knowledge, efforts should be channeled into putting out relevant information about the availability and necessity of the vaccine (MCV2) through direct communication. The ability to present relevant and available information to people, ensuring that the right information reaches the end user will help in militating ignorance of the second dose of the measles vaccine. [25] in their review state that certain aspects of community engagement itself, such as conducting stakeholder consultations, holding community dialogues or involving community leaders were associated with better immunization outcomes. Their research proved that community engagement interventions hold promise for improving child immunization coverage in LMICs. Involving communities in decision-making processes, fostering trust in vaccines, and addressing local barriers to immunization, are interventions that can contribute to achieving equitable immunization coverage and reducing vaccine-preventable diseases in vulnerable populations. In conclusion, they stated that community engagement interventions are successful in improving outcomes related to routine child immunization [26] identified caregivers' ignorance of recommended ages for first and second doses, health facility vaccination sessions scheduled to hold once or twice weekly intervals, vaccine stock-out, refusal of health service providers to open multi-dose vials for a single child and long waiting times as being associated with poor uptake of MR2 vaccine.

Responses from the participants of the focused group discussions show forgetfulness, children getting sick after the first dose and

assumption that the first dose is enough for the child as factors that affect the uptake of (MCV2). Many parents and caregivers tend to forget immunization schedules and assume that the first dose is sufficient for the child due to busy work schedules while some tend to develop apathy because the child got sick after the first dose. Health care workers were seen as the primary source of vaccine information to caregivers and community [27, 28] suggested that provider-parent communication is important to achieving childhood vaccine coverage. Appreciating that a child's provider plays a key role in parental vaccine decision-making and is a trusted source of vaccine information, contrary to expectation, many healthcare providers did not give a rationale for the vaccine(s) recommended neither did they discuss the potential side effects of the recommended vaccines and how to manage it. Therefore, the need to train healthcare providers on how to effectively communicate with patients about the vaccine (relevance and schedules), addressing concerns and providing evidence-based information to help individuals make informed decisions about vaccination.

Some caregivers complained that they were prevented by their husbands from taking the baby back to the facility for the second dose of measles vaccines, This evidence is consistent with the result of the study conducted by [29] in which they stated that 'lack of consensus among parents affects uptake of vaccinations. They also observed that some parents held misconceptions about the risks associated with new vaccines and preferred natural immunity over vaccination, the majority expressed concerns about the potential adverse effects of vaccines but recognized their effectiveness in strengthening the immune system. Other studies [30] and [31] incriminated parents' objection, disagreement, or concern about immunization safety, long-distance walking, and long waiting times at the health facility as the most common factors responsible for missed opportunities and incomplete immunization.

These results are consistent with previous studies on parental attitudes toward vaccination. For example, a review by [32] found that most parents agreed that vaccines are important for their child's health. Similarly, another study aimed to assess parents' attitudes toward the human papillomavirus vaccine found that most parents recognized the importance of vaccination in preventing infectious diseases [33]. However, similar to this study, other researchers have also found that misconceptions and concerns about vaccines remain prevalent among some parents.

This study revealed that 51.8% of parents believed that new vaccines carry more risks than old vaccines, which is similar to findings reported by previous studies [34] Moreover, 69.1% of parents objected to their child receiving more than five types of vaccines during a single doctor's visit, which is higher than the rate reported in a previous study [35].

In contrast, the study found that 61.1% of parents disagreed that a high number of vaccines during the first two years of life might weaken their child's immune system, which aligns with previous findings [36]. Besides, 54.2% of parents disagreed that vaccines are given against non-dangerous diseases, a belief previously reported in different populations [37].

Regarding the belief that a high number of vaccines during the first two years of life can weaken a child's immune system, 61.1% of parents disagreed or strongly disagreed. This finding is consistent with previous studies that showed that this belief was more prevalent among vaccine-hesitant parents and those who refused vaccination [38].

Concerning worries about the potential side effects of vaccines, our study found that 44.5% of parents agreed with this statement. This finding is in line with another study, which found that many parents have concerns about

vaccine safety [39]. The desire for more comprehensive information about vaccines to alleviate concerns was expressed by the majority of parents (78.7%) in our study. This finding is supported by previous studies which have suggested that effective communication between healthcare providers and parents is crucial in addressing vaccine hesitancy [40] and [41].

The results revealed that respondents with a first child had higher vaccine hesitancy than those with other children. This finding is consistent with previous research that has reported that first-time parents are more likely to be vaccine-hesitant than parents with more than one child [42]. Thus, there is a need for targeted strategies to address vaccine hesitancy among first-time parents. Although the association between income and hesitancy was not statistically significant, previous studies have reported mixed results regarding the association between family income and vaccine hesitancy.

However, the study found a statistically significant association between educational level and vaccine hesitancy. Respondents with a secondary school education showed a higher percentage of vaccine hesitancy than those with a university degree. This result aligns with previous studies that reported a negative correlation between educational level and vaccine hesitancy [43].

The belief that it is better for children to build immunity through natural infection has decreased from a quarter of the parents in a previous study [44] to 11.7% in this study. It is concerning that despite the overwhelming evidence that vaccines are safe and effective, some parents continue to hold misconceptions and hesitations toward vaccination.

As important as the MCV is for disease prevention, side effects which range from mild to severe have been reported during measles vaccination campaign in Ebonyi State. (Ebonyi State Measles Campaign Call-in data, 2023). THL (2024), on contraindications for MMR vaccination listed; Fever, suspected allergic reaction, Pregnancy and breastfeeding, Illness or medication that weakens the immune system Immunoglobulin treatment or transfusion, Thrombocytopenia, or low platelet count, as a contraindication to an MMR vaccination. These are in perfect agreement with those mentioned by participants during the FGDs. It was however said that the above listed are not absolute contraindications to further vaccinations. Caution should however be applied to ensure that the benefits of the protection afforded by the vaccination against measles and rubella are greater than the risk of thrombocytopenia reoccurrence. (THL,2024) The risk of coming down with thrombocytopenia caused by rubella or measles pathogens is said to be at least, ten times as high as the risk of developing thrombocytopenia resulting from the MMR vaccine.

Conclusion

The study participants' knowledge and perception of factors affecting uptake of MCV2 among under 5 children in Ebonyi State is consistent with evidence produced by other studies on the subject matter. The role of knowledge on the uptake of MCV 2 stood out in the discussions.

Participants, responding to the follow-up question of what they can do by themselves to mitigate the challenges as well as caregivers' reasons for defaulting, to ensure good immunization coverage, suggested; Changing the time of giving the incentive (ITN) to the caregivers from 9 months to 15 months, after the second dose is taken; Factoring engagement of adhoc health workers into their Business Plans to address inadequate human resource for health; Being more deliberate in health-educating mothers and caregivers on the need to take up a second dose of MCV 2 to have the child fully immunized; Employing the use of the Tickler System to remind caregivers of their immunization appointments

and to track defaulters; and Periodic baby tracking and intensification of routine immunization targeting settlements with a higher number of defaulters.

Conflict of Interest

The authors declare that there are no commercial or financial relationships that could be construed as a potential conflict of interest, while the research was conducted.

Acknowledgments

I wish to express my profound gratitude to very special persons whose support and contributions made it possible for me to successfully carry out and publish this work.

My special thanks go to Dr. Raj Goel Sonika, my Texila American University Co-Guide and, and Dr Olaiya Abiodun Paul my local guide, for providing technical guidance to me throughout this research. Many thanks to Dr. Parameswari S, for following up with me in every step of the way, sending mails, WhatsApp messages, calls and responding to my frequent requests and calls.

My special thanks go to Dr Moses Ikenna Ekuma, the Ebonyi State Honourable Commissioner for Health, Dr Miracle Amaechi Ogbu. the Programme Manager Ebonyi State Emergency Routine Immunization Coordination Center (SERICC), for providing an enabling environment for me to undertake this study. I owe a lot to the health workers of Afikpo North, Edda, Oahukwu and Ishielu LGAs, for volunteering to participate in the focused group discussions (FGD), My thanks go to Mr. Arinze Obasi, Dr Makwuachukwu Ojide, Dr Onyinyechi Grace Okoro and Mr. James Orioha, for spending their precious time to review this work.

My special thanks go to my husband, Elder James Okeoma Okoro and my children, for understanding and bearing with me, and taking up my domestic duties while this study lasted.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art012

Perspectives of Administrators, Middle Managers and Classroom Teachers of Competency-based Leadership Training Initiatives on Self-efficacy

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Abstract

The primary aim of this study is to determine whether or not middle managers' self-efficacy levels impact their leadership effectiveness and to also determine to what extent competency-based training needs exist among middle managers. Additionally, the study seeks to ascertain whether a compulsory competency-based approach to middle managers training can be taken to resolve training needs. Studies have shown that self-efficacy, the extent to which an individual believes tasks can be accomplished, is a fairly new concept, worth researching, as it adds much value to the areas of education and psychology. Effective leadership at all educational organizations is paramount to guarantee greater success in Jamaican schools. Middle managers in primary and secondary schools in Jamaica are senior teachers, with Posts of Special Responsibilities (POSR); these leaders hold strategic leadership posts and execute multiple job functions. The overall purpose of this research is to encourage research and bring about greater awareness to the area of middle managers' self-efficacy, leadership and competency-based training in public schools in Jamaica. Exploring this concept, the research will seek to address areas of concern, provide much-needed information and support structures aimed at exploring the areas of concern, address training needs, and serve as a pointer for further research. The researcher seeks to collect the viewpoints of administrators, middle managers and classroom teachers in Jamaican public schools; using a structured and quantitative research approach, specifically employing a survey method.

Keywords: *Competency-based Training, Jamaican Public Schools, Leadership, Middle Managers, Post of Special Responsibilities, Self-efficacy*

Introduction

The research sought to investigate to determine whether or not the self-efficacy levels of middle managers impact their leadership effectiveness and to determine as well the extent to which competency-based training needs exist among middle managers; based on the perspectives of administrators, middle managers and classroom teachers. Self-efficacy has an impact on a person's reactions and thought patterns as it relates to the extent to which an individual believes a task can be accomplished [8]. An individual's belief to perform tasks and achieve goals, the perception of one's competence and effectiveness is the main focus of self-efficacy [2]. This study sought to explore more about the concept of self-efficacy in relation to middle managers' leadership and competency training.

Self-efficacy is a relatively new theory that has proven insightful in exploring how individuals perceive and approach challenges, tasks and goals. Self-efficacy is considered a new concept and was originally purported by Albert Bandura in his Social Cognitive Theory in the late 20th century [1]. Self-efficacy is used to predict behavioural outcomes, especially in the areas of Psychology and Education. The concept of self-efficacy is considered to be a good measurement as well as an effective way

Received: 03.06.2024 ***Accepted: 26.06.2024*** ***Published on: 30.07.2024***
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to predict behavioural outcomes when compared to other motivational constructs [3]. Self-efficacy has been credited as a useful concept in assessing how one is likely to perform in key areas. Self-efficacy has a role as a causal variable in performance and achievement [1]. It is proposed that high self-efficacy is the belief that one can perform well at a task, and the same is often realized. If one thinks contrary to such beliefs, having doubts in their capabilities, that person may be considered to have low self-efficacy; which can have a negative impact on task completion and accomplishment.

Success across various domains and life in general can be attributed to an individual's self-efficacy level. Research has shown that 28% of an employee's improvements in performance could be attributed to their self-efficacy [20]. Leadership and leadership development can benefit largely from the exploration of self-efficacy as there are benefits to be achieved. **S**elf-efficacy is listed as an essential characteristic of effective leadership in many studies [1]). Self-efficacy is helpful in leader selection in many organizations, as it is a good indicator. Individuals often behave according to their mental assets-that are their skills, intelligence, emotions, beliefs, values, attitudes and knowledge [23]. It is important for the concept of mental assets to be explored, in relation to leaders and their effectiveness in organizations and the results utilised to effect change.

This study also sought to examine the theoretical frameworks relating to **s**elf-efficacy, leadership and organizational theories; which are important for providing a solid theoretical background for the research. The research explores the intertwining of the theories and related concepts to gain valuable insights. Uncovering meaningful connections, the research can be utilized to enact meaningful change to enhance middle managers' leadership and overall effectiveness in schools.

Leadership is an area of concern in educational institutions in Jamaica and needs direct focus. School leadership is deemed to be weak in schools in Jamaica and this problem could be lessened if the best persons were selected to become leaders and the required training provided [13]. There is a great need to strengthen leadership at the middle management level as middle leaders have yet to receive such concentrated efforts to improve their leadership skill sets. There is much importance in employing strategies to enhance the self-efficacy of middle managers as this is beneficial to their performance and has an important ancillary benefit of improving the organization [22].

Leadership happens at all levels of society, organization and culture and has a fundamental impact on all areas and sectors. Leadership is multifaceted and is considered to be the most complex phenomenon in which much research has been conducted and applied over the years. Yet the concept of leadership remains a relatively new phenomenon [6]. One of the popular definitions of leadership defines leadership as being influence; the impact one person has over another. Another definition of leadership as purported by Maxwell is simply influence, nothing more and nothing less [16]. Influence, as it relates to leadership in organizations, is a true driving force of exerting energy through focused and deliberate efforts to bring about impact. Leadership is described as an evolutionary phenomenon, a construct that has moved in stages; from being hierarchical, power-based and productivity-driven; to incorporating features of transformation, service, collaboration, relationships and ethics [14]. The concept of leadership is not considered to be static as it continues to evolve and the various meanings and viewpoints are extensive.

Not so long ago, leaders largely could have done their jobs effectively while ignoring the world around them. Today's leaders have many different roles and are now required to

understand the broader context within which schools operate [19]. We now exist in a complex world, a VUCA environment; a time of much volatility, uncertainty, complexity and ambiguity. Leadership has changed to become more complex, volatile and unpredictable [13]. Some leaders find such situations threatening and have led many middle managers to question the validity or need for emerging trends and demands. Such diversity makes new demands not only on the school system but also on leadership [10]. Leadership is complex and ever-changing. As we proceed into the future and are faced with more uncertainty and ambiguity, there are extended issues to be faced with leadership. Leaders require extreme character and training [7]. Leadership development has to be well-structured and purposeful. Understanding more of the developmental concept of VUCA is an essential aspect of living and leading in the future [7]. Educational leaders must be able to navigate successfully through chaos and challenges and cope with stress to lead in times of rapid change and turmoil.

The need for leadership education is based on the increased call and need for greater leadership in schools. Leadership education has become the educational reform strategy of the 21st century [17]. This is an important subject and requires deliberate attention to bring about the desired outcomes. Middle managers are crucial to the effective functioning of organizations and their importance cannot be overemphasized [22]. It is with this understanding that structured training opportunities should be presented to enhance their leadership skill sets. A horizontal approach is used largely to assist in the development of leaders and is not sufficient to address the issue of leadership development; there needs to be “more focus and vertical development” [13]. Vertical development takes a more developmental approach, which goes through different stages and is powered by one’s interest, determination and confidence.

Nothing can stop a person with the required knowledge, skill sets, desire and self-efficacy from becoming an adroit and astute leader. The need for effective leadership is underscored as a real need in organizations; everything rises and falls on leadership [12]. The needs of the times call for excellent leadership. Effective leadership is recognized as key to the success of an organization [18]. How will this be achieved? To facilitate the development of leaders, various researchers have stated the need for developmental programs [11]. Developmental programmes seek to chart the desired outcomes by presenting the avenues through which new ideas can be transferred, new behaviour can be learnt and emotional growth can occur.

Education needs to come into alignment with the wider world. Leader preparatory programs are more than urgent; their demand is at an all-time high in today’s superficially connected but highly fragmented educational world [11]. Leadership levels need to be raised in organizations. It is imperative to raise leadership levels abilities to increase levels of leadership in organizations [16] Educators must have a clear knowledge of their roles as well as the commitment to execute as excellent educators are greatly needed in schools today [15]. Leaders being well equipped will, in turn, be able to increase the level of resilience of not only themselves but of those around them [9]. We are now at a time where we need better leaders; better leaders will assist greatly in bringing about better results.

It is important to have leaders learning about how to best perform their various tasks through being immersed in real life experiences and situations. Middle managers can learn much through observational learning which can increase their levels of self-efficacy. Middle managers stand a greater chance of being able to complete tasks when given the opportunity to observe, in comparison to having no observation experience of said tasks. Observational learning occurs when individuals

display new behaviours; that they had no possibility of doing previously but did as a result of observation [5]. An individual's past experiences, viewed as successful, serve to increase the self-efficacy of the individual and the opposite is also true. It would therefore mean that a middle manager with more successful experiences will have a greater level of self-efficacy [4]. It is important to note that for middle managers to develop self-efficacy to a desired level, then their frequency of successful experiences must increase.

Education needs more leaders who are evolutionary. Studies have revealed that while organizations expect new leadership capabilities, they are still largely promoting traditional models and mindsets [12]. The knowledge, skill sets, aptitudes and competencies required for middle manager positions, should be based on key competencies structures that are established and used across the sector. One way to achieve greater coherence in school leadership is through purposeful action and interaction; working on capacity, clarity, precision of practice, transparency, monitoring of progress, and continuous correction [21]. The mindset should be to be more and do more. Transformation requires knowledge, the necessary skill sets, competencies and mindset renewal [1]. We are then left to not only ask but also to find out; can structured competency-based approaches assist in developing more capable and effective middle leaders in Jamaica?

Materials and Methods

The data was garnered from administrators, middle managers and classroom teachers of Jamaican public schools using the survey approach. The instrument utilized to gather the data was an online questionnaire. The researcher sought to use the stratified sampling technique using a randomized approach. Administrators, middle managers and classroom teachers included in the study are employed in their respective roles with the Ministry of Education for at least one (1) year. The researcher sought to ensure that the participants represented all seven regions within the Ministry of Education. The sample size consisted of twenty-three (23) educators from each grouping (administrators, middle managers and classroom teachers). Participants who did not match the requirements were excluded from the study. The SPSS as a statistical analysis and data management tool was used to analyze the data. The research utilized descriptive statistics (mean, median, mode) and inferential statistics to interpret the findings.

Results

The research sought to examine the participants' perspectives on three core questions. The strongly agree and agree responses were combined to form an overall agreement statement. This proved helpful in understanding the general sentiment among the responders, analyzing the data sets and identifying possible trends and patterns. The analysis of survey responses highlighted variations in the participants' perceptions across different questions.

Question # 1

"Structured competency-based leadership programmes are needed in education to ensure teachers are adequately prepared to operate in leadership" The data garnered shows that all categories of the participants believe that competency-based leadership programmes are needed. 90.0% of principals gave their perspectives as strongly agree and agree (63.3% and 26.7% respectively). 85.8% of middle managers gave their perspectives as strongly agree and agree (54.5% and 31.3% respectively). 63.7% of class teachers gave their perspectives as strongly agree and agree (27.3% and 36.4% respectively) See Table 1 and Figure 1.

Question 1 had the lowest mean score of 79.83%, suggesting that respondents rated it

less favourably when compared to the other questions. It had the highest standard deviation of 11.53%, indicating greater variability in the responses compared to the other research questions. While Question 1 received a lower mean score, its higher standard deviation indicates that the responses of the participants varied widely. This suggests that there may be differing opinions or experiences related to this question that warrant further investigation or targeted interventions. This is seen more so at the classroom teacher level. This may be a result of limited interaction with the concept at their level.

Table 1. Need for Structured Training Programmes

Participant Group	Strongly Agree (%)	Agree (%)	Total (%)
Principals	63.3	26.7	90
Middle Managers	54.5	31.3	85.8
Classroom Teachers	27.3	36.4	63.70

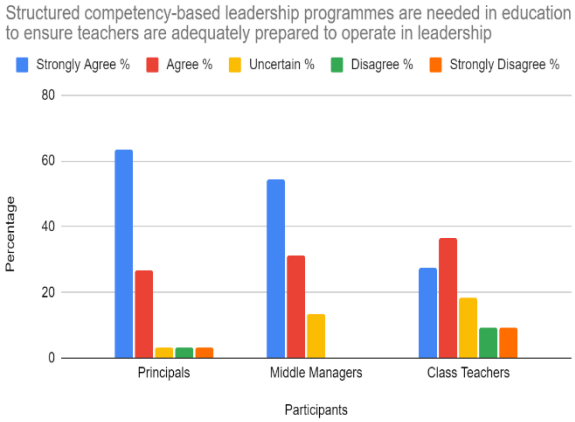

Figure 1. Need for Structured Training Programmes

Question # 2

"Middle Managers should be chosen for leadership positions based on their levels of self-efficacy" The data garnered shows that all categories of the participants agree with this statement. The data reveal that 90.3% of principals gave their perspectives as strongly agree and agree (54.8% and 35.5% respectively). 86.4% of middle managers gave their perspectives as strongly agree and agree (45.5% and 40.9% respectively). 72.8% of classroom teachers gave their perspectives as strongly agree and agree (27.3% and 45.5% respectively). See Table 2 and Figure 2.

Table 2. Provision of Compulsory Programmes

Participant Group	Strongly Agree (%)	Agree (%)	Total (%)
Principals	50.0	33.3	83.30
Middle Managers	33.3	47.6	80.90
Classroom Teachers	22.7	50.0	72.70

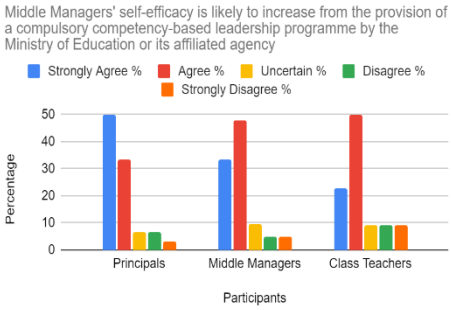

Figure 2. Provision of Compulsory Programmes

Question 2 received the highest mean score of 83.17%, indicating that respondents rated it most positively on average. It had a moderate standard deviation of 7.50%, suggesting that some amount of variability exists in the responses. However, the variability is less than Question 1. The higher mean score for Question 2 indicates that the question resonated more positively with respondents. The respondents collectively responded that middle leaders should be selected for leadership based on their self-efficacy levels. Further exploration of the factors contributing to this positive perception could inform future initiatives or strategies.

Question # 3

"Middle Managers' self-efficacy is likely to increase from the provision of a compulsory competency-based leadership programme by the Ministry of Education or its affiliated agency/ies" The data gathered revealed that 83.3% of principals gave their perspectives as strongly agree and agree (50% and 33.3% respectively). 80.9% of middle managers gave their perspectives as strongly agree and agree (33.3% and 47.6% respectively). 72.7% of classroom teachers gave their perspectives as strongly agree and agree (22.7% and 50% respectively). See Table 3 and Figure 3.

Table 3. Leadership Based on Self-Efficacy Levels

Participant Group	Strongly Agree (%)	Agree (%)	Total (%)
Principals	54.80	35.50	90.30
Middle Managers	45.50	40.90	86.40
Classroom Teachers	27.30	45.50	72.80

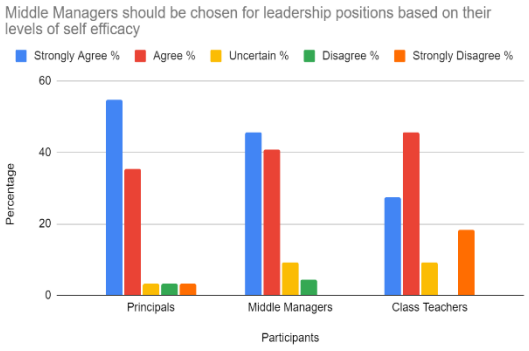

Figure 3. Leadership Based on Self-Efficacy Levels

Question 3 fell between the other questions in terms of mean score, the mean score is 79.30%. It had the lowest standard deviation of 4.55%, indicating the least variability in responses among the three questions. Question 3, despite having a lower mean score, had the least variability in responses, indicating more consistent perceptions among the three respondents.

Discussion

The results are in keeping with research done in the areas of self-efficacy, leadership and competency-based training with other categories of workers and leaders in organizations and in particular, the educational workspace.

It was found that principals had the highest response rate in the strongly agree and agree categories of supporting the need for structured competency-based training programmes, middle managers being chosen for leadership based on their self-efficacy levels and self-efficacy is likely to increase from the provision of leadership competency-based training programmes. This was followed by middle leaders and then classroom teachers.

This research highlights the value that is placed on the concepts by the different demographic groups. The data revealed that principals' and middle managers' response rates were higher than classroom teachers

The results when compared to the objectives of the research show that there is a need for compulsory competency-based training initiatives for middle managers in Jamaican schools and competency-based training initiatives can make an impact in enhancing middle managers' leadership skills and self-efficacy levels in Jamaica's educational settings.

The result obtained from the research is consistent with other research done within education. Researchers have shared similar thoughts about enhancing leadership and self-efficacy through the provision of competency-based training initiatives.

Further research may be needed to explore classroom teachers' perspectives in detail to understand more. It is important to ascertain a competency-based training programme model for prospective and in-service middle managers. This can be achieved by analyzing existing models and making the necessary adjustments where necessary. In so doing, a reliable programme will not only be developed but also implemented to realize meaningful change.

Equations

Question 1

$$Mean = \frac{Sum\ of\ all\ the\ values}{Number\ of\ values}$$

$$Mean = (90.0\% + 85.80\% + 63.70\%) / 3$$

$$Mean = 239.5\% / 3$$

$$Mean \approx 79.83\%$$

Standard Deviation

$$s = n - 1\sum i = 1n(xi - x^{-})2$$

$$Where: s = 11.53\%$$

Question 2

$$Mean = \frac{Sum\ of\ all\ the\ values}{Number\ of\ values}$$

$$Mean = (90.30\% + 86.40\% + 72.80\%) / 3$$

$$Mean = 249.5\% / 3$$

$$Mean \approx 83.17\%$$

Standard Deviation

$$s = n - 1\sum i = 1n(xi - x^{-})2$$

$$Where: s = 7.50\%$$

Question 3

$$Mean = \frac{Sum\ of\ all\ the\ values}{Number\ of\ values}$$

$$Mean = (83.30\% + 80.90\% + 72.70\%) / 3$$

$$Mean = 237.90\% / 3$$

$$Mean \approx 79.30\%$$

Standard Deviation

$$s = n - 1\sum i = 1n(xi - x^{-})2$$

$$Where: s = 4.55\%$$

Conclusion

It is important to take into account the practitioners within education perspectives, as it relates to issues that affect them and how they believe those stated issues can be addressed.

This research has proven that there is a real need for leadership development in education in Jamaica public schools as expressed by principals, middle managers and class teachers. It expressed that competency-based leadership training opportunities can assist in addressing the issue.

Diversity in the responses was seen in the dataset, more so at the classroom teacher level. High levels of agreement exist among principals and middle managers, indicating strong support for structured competency-based leadership programmes. However, there was a slightly lower agreement at the class teacher level. These insights can inform decision-making processes, program evaluation, and future research efforts.

The recommendation is for teachers to understand more about the concept of self-efficacy and its value in developing leadership through competency-based training initiatives. More research is needed to get a better understanding of the concepts. Further exploration of the underlying factors driving these variations is useful for tailoring effective interventions and strategies.

As further research is done in the stated area it is hoped that the issues identified and explored can be lessened. This calls for collaboration so that the desired results of increased self-efficacy and leadership garnered through increased provision of competency-based training can be achieved.

Acknowledgements

I count it joy for all the favour and assistance I have received in completing this research. I thank all who have supported me in one way or another to allow me to complete this research.

Conflict of Interest

I, declare that there is no conflict of interest regarding the publication of this paper. I, the corresponding author on behalf of all contributing authors, hereby declare that the information given in this disclosure is true and complete to the best of my knowledge and belief.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art013

Knowledge and Attitude of Final Year Undergraduate Nursing Students about Research at the University of Technology Jamaica

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Abstract

The importance of research is well acknowledged, nevertheless, students often feel anxious when it comes to research, mostly because of the extensive and conceptual nature of the subject. Research has investigated students' attitudes toward research. Studies have demonstrated that students' perspectives on research can have a substantial influence on their involvement in research endeavors. Some academic fields, such as medical education and pharmacy, have examined the extent of knowledge, attitudes, and practices about research among students. There is a paucity of scholarly studies that specifically examine the attitude of undergraduate nursing students towards research. Therefore, this study examines the knowledge and attitude of final year undergraduate Nursing students about research at the university of Technology Jamaica. The study employed a quantitative, descriptive, cross-sectional research design. The target population was 116 final year nursing students enrolled in the Bachelor of Science in Nursing program at the university. Most students, at 85.4%, encountered challenges in locating research articles; (67.4%) participants considered the interpretation of the literature challenging yet 61.8% maintained a favorable attitude towards research. Chapter two of the research project posed the greatest challenge for the respondents throughout the first half of their research, whereas chapter one was the least challenging. According to the survey, 78% of the students reported encountering greater difficulties than they had anticipated when conducting research.

Keywords: *Attitude, Knowledge, Nursing, Research.*

Introduction

Many studies [1-3] have highlighted the importance of undergraduate research training. Gaining insight into the cognition and disposition of undergraduate students regarding research is crucial for cultivating a research-oriented environment, enhancing scholarly achievements, and equipping them with the necessary skills for future research endeavors. Educational institutions can successfully support and empower undergraduate students in their research pursuits by identifying and addressing the elements that influence students' attitudes and understandings about research. Globally, researchers have conducted studies to assess students' attitudes and knowledge about research. For example, a cross-sectional study was carried out in Saudi Arabia, Bahrain, and Kuwait, which found that undergraduate health sciences students had positive attitudes towards scientific research, but their knowledge scores were relatively lower. The study identified barriers, such as time constraints and inadequate guidance, that hindered students' participation in research activities [4]. Despite its significance, many undergraduate students often perceive research as difficult, intricate, and anxiety-provoking, as reported in [5]. While many students recognize the significance of research, only a minority would opt to participate if it were not mandatory. Despite the

Received: 03.06.2024 ***Accepted: 24.06.2024*** ***Published on: 30.07.2024***
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widespread recognition of research's importance, students frequently experience anxiety due to its extensive and conceptual nature [6]. There is a paucity of scholarly studies that specifically examine the research attitudes of undergraduate nursing students. The studies mostly concentrated on pharmacy, medicine, dentistry, and graduate students. These studies were conducted by [7–10]. One university in Jamaica conducted the only known study on this subject, focusing on postgraduate nursing students [11]. Therefore, the aim of the current study is to assess the knowledge and attitude toward research among senior nursing students at the University of Technology, Jamaica.

Materials and Methods

Research Design

The design for this study was a descriptive quantitative cross-sectional design. This is a method of collection of numerical research data from the participants at a single point in time. The survey was conducted to describe the nature of challenges experienced by final year Bachelor of Science Nursing Students.

Area of the Study

The University of Technology Jamaica is Jamaica's national university. The main campus is located at Papine, Kingston. There are other campuses in Kingston, as well as the Western campus in Montego Bay. The Caribbean school of nursing is one of the schools under the College of health sciences. The school offers both undergraduate and graduate programs. The undergraduate programs offered by the school includes Bachelor of Science in Nursing, Bachelor of Science in Midwifery, and Bachelor of Science in critical care nursing. The postgraduate programs offered are master of science in anaesthesia and Master of Science in trauma studies. The university emphasizes student-centered research driven working environment where core values are lived by all. The mission of the university of technology Jamaica is to positively impact not only Jamaica but the entire Caribbean through high-quality learning opportunities, research and value-added solutions to government, and communities. This underscores the importance of research at all levels.

Study Population

The target population of this research are the final year nursing students in the Bachelor of Science in nursing program from both the main campus and the western campus. There was a total of one hundred and sixteen students (116) in the final year.

Sampling Method

Convenience sampling method was used to collect data for the study. We used this method to maximize participation. All the final year nursing students from both campuses were invited to participate.

Data Collection Procedure

Ethical clearance for the study was obtained from the research ethics committee of the university of technology Jamaica after which the survey instrument was administered to the participants. The research instrument, which is a questionnaire was placed on google form. This was sent to the final year student via their group email addresses. While setting up the survey, the option to collect email addresses of the respondents was disabled to ensure anonymity.

Data Analysis

The responses obtained via google form were analyzed using google spreadsheet to address the objectives of the study, namely, to assess the knowledge and attitude of final year nursing students about research. We presented the results in tables and charts.

Results

Table 1. Socio-Demographic Data of the Respondents

Variable	Frequency	Percentage
Gender (N=89)		
Male	1	1%
Female	88	98.9%
Gender total: 89 respondents (100%)		
Age Group of Participants (N=89)		
18 and below	0	0%
19-25	30	33.7%
26-30	30	33.7%
31-35	26	29.2%
40 and over	3	3.4%
Age group total: 89 respondents (100%)		
Campus (N=89)		
Western campus	31	34.8%
Papine campus	58	65.2%
Campus total: 89 respondents (100%)		

Most of the respondents, 98.9%, were female, while only 1% were male. The participants in the study were between the ages of 19 and 25, with a total of 30 responders, or 33.7% of the total sample. 30 students, which is equivalent to 33.7% of the total, are between the 26-30 age group. Among the respondents, those aged 31-35 constituted 26 (29.2%) of the total, whilst only 3 (3.4%) students were 40 years old or older. One student failed to provide the demographic information.

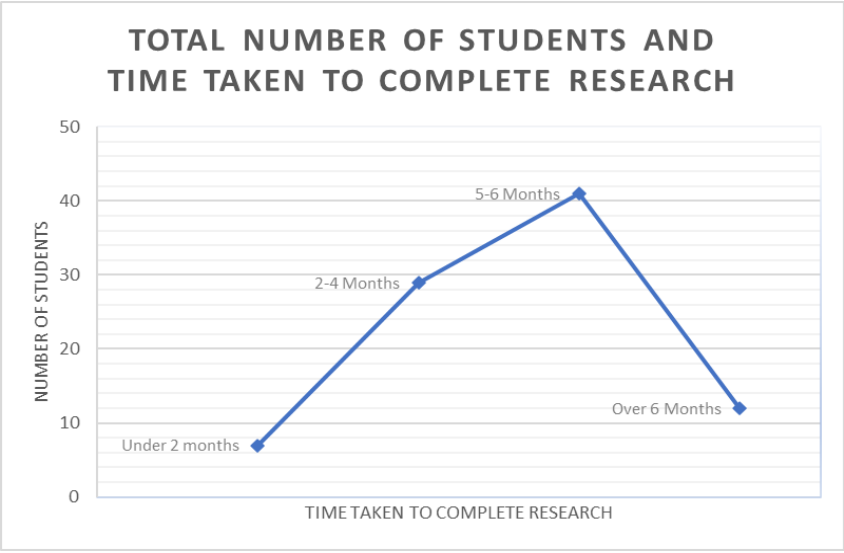

Figure 1. Time Taken by Students to Complete their Research Project

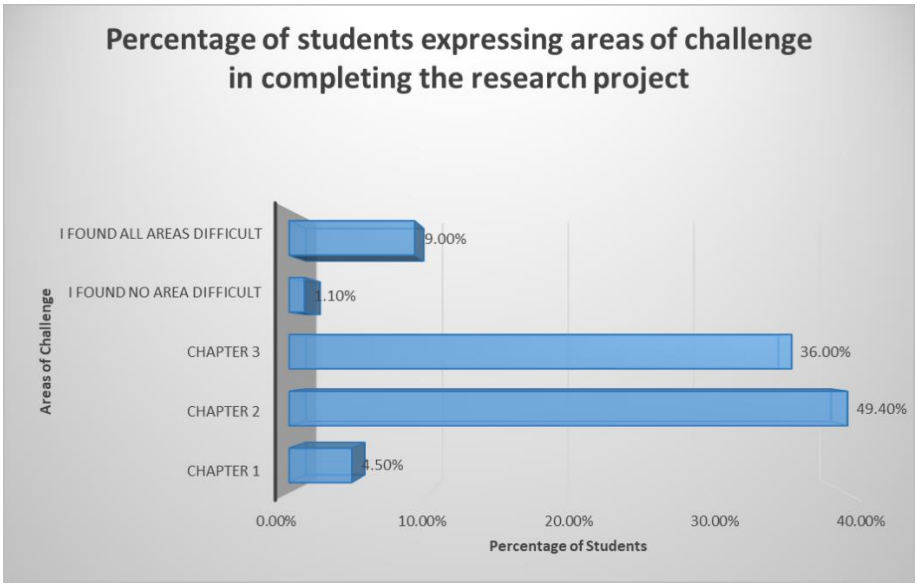

Figure 2. Areas of Challenges Experienced by Students while Conducting Research

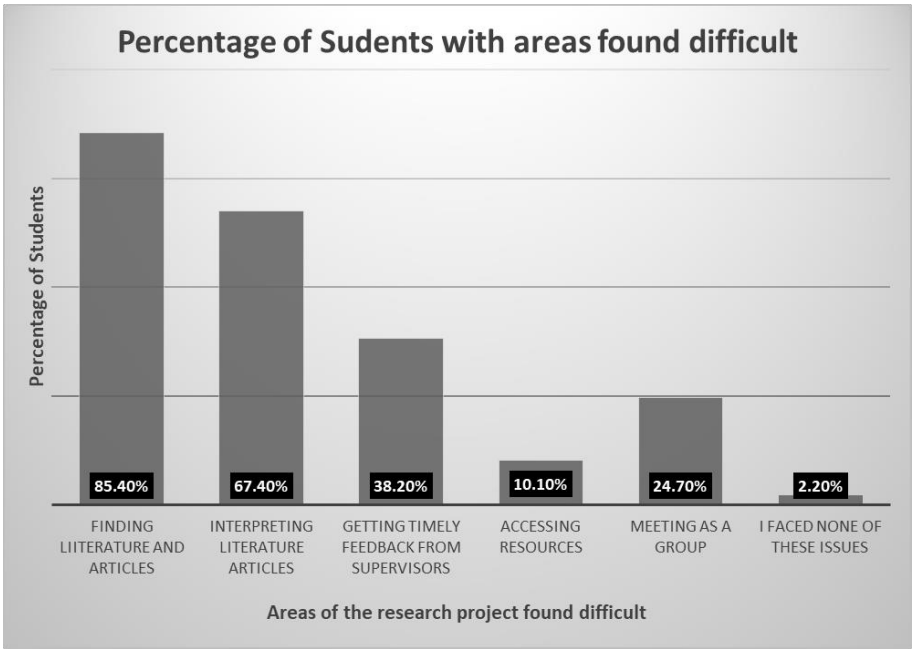

Figure 3. Areas of Difficulties Experienced by Students while Conducting Research

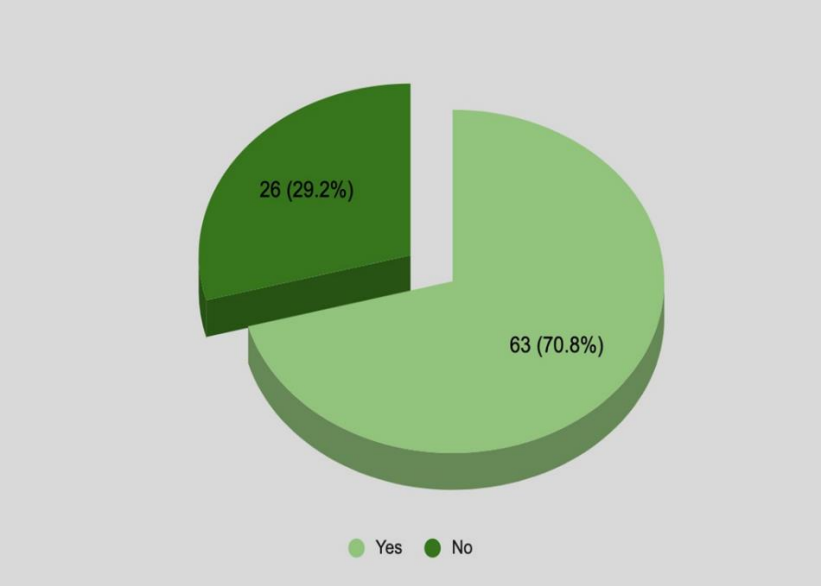

Figure 4. Respondents who Reportedly Failed Exams Due to Focusing on their Research Project.

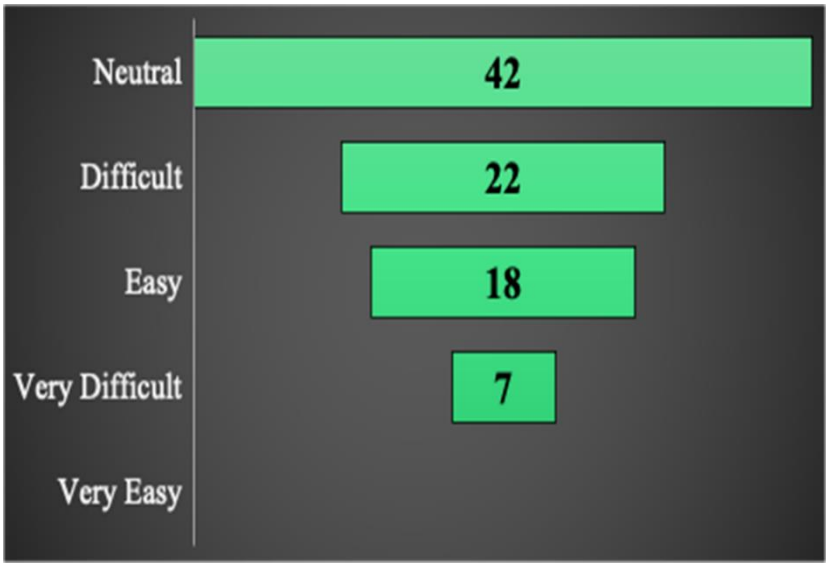

Figure 5. Navigating the University Library to Search for Research Articles

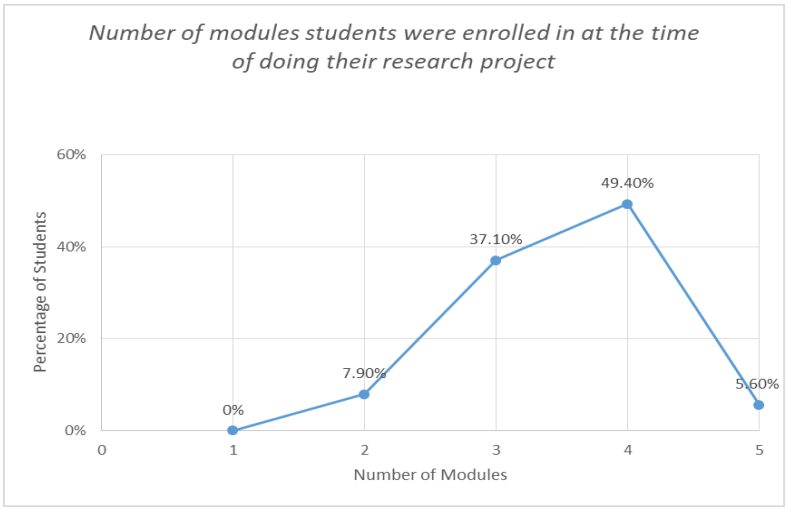

Figure 6. Number of Modules Students were Doing Concurrently while Doing Research Project

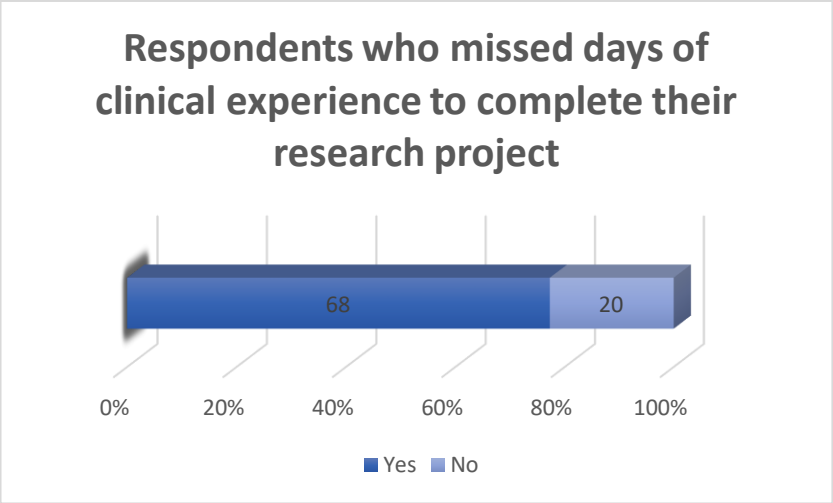

Figure 7. Students who Missed Some Days of Clinical Experience while Making Effort to Complete their Research Project.

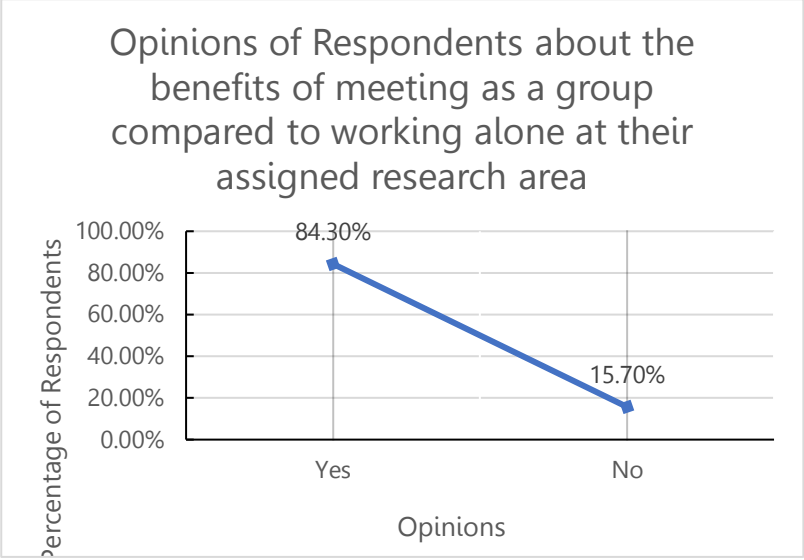

Figure 8. Students' Opinion on Whether they thought Meeting as a Group is more Beneficial Compared to Working on Assigned Area of Research Alone.

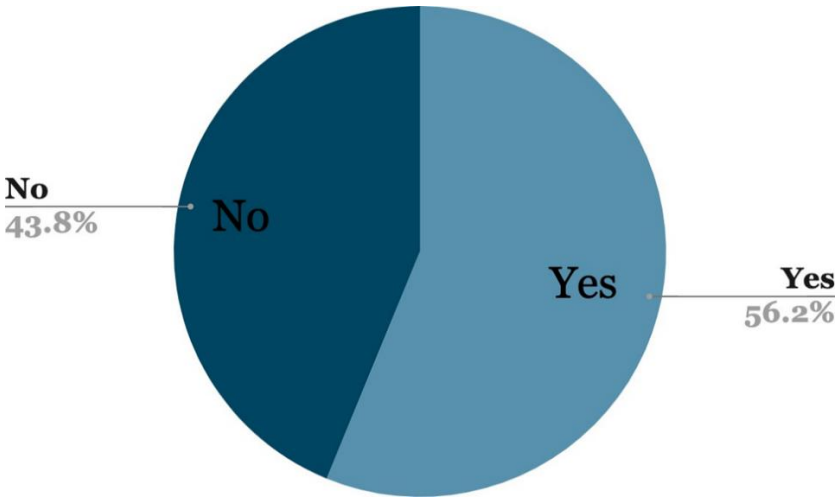

Figure 9. Respondents who Sought Help from Past Students

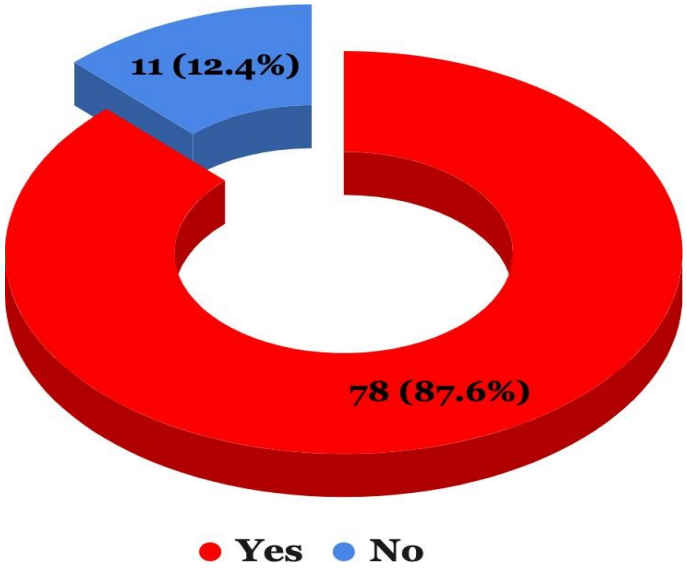

Figure 10. The Proportion of Students who thought that they were Encountering More Difficulties than Anticipated

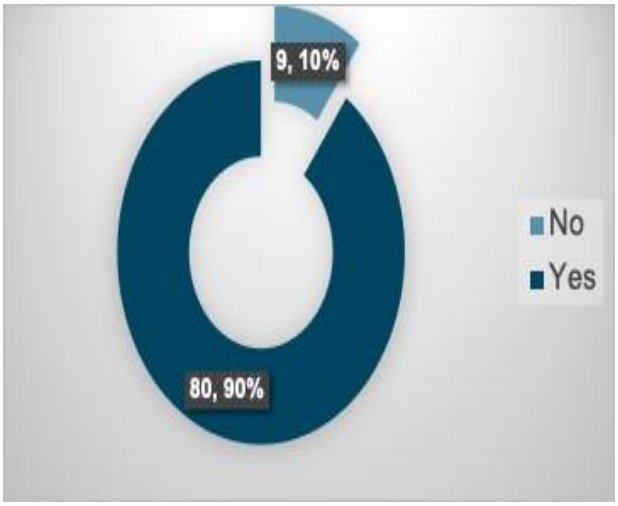

Figure 11: The Respondents' Perspectives on the Advantages of Meeting with the Research Supervisor. Most of the Respondents Opined that Meeting with the Research Supervisor is Beneficial.

Discussion

Demographic Characteristics of the Respondents

Most of the respondents were female, representing 98.9%, with just 1 male responding, which accounts for 1% (Table 1). This may be because males are in the minority and underrepresented in the nursing profession. The nursing profession is predominantly female [12]. Additionally, Jamaican women are more likely than Jamaican men to pursue university or higher-level education. While Jamaican men do aim to further their studies, women are more likely to complete their higher education courses [13].

Knowledge of Research among Students

Typically, students at the University of Technology Jamaica enroll in and complete the "Research Methodologies" module during their third year, prior to enrolling in the final year research project known as the "Major Project". Among the respondents of this study, most students (98.9%) completed the research methods module, with only one student explicitly stating that he or she did not do the module. Even though nearly all participants in this study completed and successfully passed the research methodology module prior to doing the major project, a portion of the respondents, specifically 42 respondents (47.2%), admitted to lacking knowledge on how to conduct research. The Research Methodology module is mandatory for all nursing students because it serves as a prerequisite for their research project. Conducting a research project in undergraduate nursing necessitates meticulous attention to several crucial prerequisites to ensure its success. It is of utmost importance to provide essential support to undergraduate nursing students in the process of finding and critically assessing research papers [14]. A study conducted by [15] found that undergraduate nursing students have challenges when submitting research proposals for the first time, despite being introduced to research through several courses. This underscores the importance of students have a strong basis in formulating research ideas prior to commencing their research endeavors. Prior to conducting research, undergraduate students in various disciplines, including nursing, must complete a curriculum on research methodology. Upon completion of this module, students are expected possess the essential knowledge and skills in research methodologies, which serves as the foundation for progress in their respective fields. [16]. Acquiring knowledge of research methodologies is crucial as it equips students with the necessary abilities to conduct ethical and effective research. Furthermore, students with a solid grasp of research methodology are better equipped to understand the practical aspects of the research process [3]. Providing students with exposure to research equips them with crucial knowledge on delivering evidence-based nursing care to patients [17]. Nursing students can employ rigorous research procedures in their studies to ensure the validity and reliability of their findings by possessing a strong comprehension of research methodology.

Time Taken for the Participants to Complete their Research Project

The respondents took anywhere from under two months to over six months to complete their research projects. 7 (7.9%) students finished in less than two months, 29 (32.6%) respondents took 2–4 months, 41 (46.1%) took 5–6 months, and 12 (13.5%) went beyond 6 months. Completing the research project entails preparing a research proposal and applying for ethical clearance from the university's research ethics committee. Depending on the nature of the study, some students must obtain ethical clearance from two research ethics committees. For instance, when conducting data collection at hospitals, students need to secure ethical

clearance from both the Ministry of Health and the university's research ethics committee. This may account for the wide variation in time to complete their research projects. A qualitative study by [17] focused on undergraduate nursing students conducting clinical research projects as part of their bachelor theses. This study included students who had chosen to participate in ongoing clinical research projects and write academic papers as part of their bachelor's theses. Such projects typically involve an in-depth exploration of a research topic, data collection, analysis, and academic writing, which could extend over a considerable period.

Literature Search and Interpretation of Literature

Most of the participants of this study opined that the second chapter of their research project posed the greatest challenge (Figure 2 & Figure 3). The chapter focuses on examining the relevant literature for their study. When writing a literature review, students must carefully identify any gaps in the related studies. The task involves thoroughly examining, describing, and assessing research articles [18]. Many students find literature reviews to be a source of anxiety, often considering them the most intimidating part of research [19]. Students often perceive literature reviews as challenging resulting in increased procrastination or avoidance. Students often encounter numerous challenges when it comes to literature reviews, which can lead to a negative mindset and ultimately hinder their ability to publish on a wide range of topics. Interestingly, the literature review emerged as the most challenging aspect of their research, leading to a negative attitude towards the overall research process [20].

When questioned about the challenges they faced during the literature review, most respondents (85.4%) indicated that locating the relevant articles was the most arduous task. Supporting this discovery, [21] found in their research that Libyan students encountered significant obstacles when trying to access literature. [21] also observed that undergraduate students in Zimbabwe encountered a similar challenge. Traditional perceptions of libraries as ideal spaces for research have recently undergone a noticeable shift. Libraries nowadays offer students outdated information that may not be applicable to their research [22]. Most individuals who accessed literature had to pay for it, which may not be feasible for many people [23]. Undergraduate nursing students may vary in their confidence regarding their ability to assess literature and analyze evidence [24].

Challenges Navigating the University's Library

The survey results revealed that 42 students (47.2%) reported a neutral experience when it came to navigating the university library. Out of the total respondents, 18 (20.2%) reported that they found it easy, while 22 (24.7%) expressed difficulty, and 7 (7.9%) students found it to be very difficult to navigate the library (figure 5). Understanding the intricacies of a university library and conducting research can pose a significant challenge for undergraduate students. Navigating through a vast library complex to locate and access the most pertinent resources can be quite daunting. [25,26] conducted research that illuminated the difficulties faced by first-year students and library users in navigating library resources. While it is understandable of this finding among first year students, why final year students will have difficulties accessing information from the library need to be investigated. Challenges navigating the library can cause students to feel confused, disoriented, and anxious, as highlighted in studies conducted by [27,28].

Participants' Reported Challenges Conducting Research

A significant number of the respondents reported encountering more challenges than

anticipated. Specifically, 78 (87.6%), indicated they were encountering greater challenges than they had anticipated (figure 10). This finding is consistent to the finding of a study was conducted at a university in Singapore, where students discovered that the initial phase of their research posed greater difficulties than anticipated. The students faced numerous challenges and utilized different methods to successfully finish their research project [29]. A study at the College of Science and Arts, Al-Namas, University of Bisha, Saudi Arabia, corroborated our research findings. It highlighted the difficulties associated with writing research project proposals in their initial phases [30]. There was a significant correlation between taking more research courses and experiencing a decrease in research anxiety. Ref. [31] emphasized the link between students' enhanced self-efficacy and their favorable attitudes towards research. During research projects, students often come across various challenges. Given these challenges, students discovered the importance of employing a variety of strategies to facilitate the completion of their research project. Most of the respondents found that meeting with a supervisor and reviewing examples of research like their topic were the most helpful (Figure 11). One of the strategies for coping with the challenges experienced by the students was to seek help from previous students (Figure 9). Additionally, because of how challenges faced by the students while conducting research, most of them had to miss clinical experience sessions to prioritize completion of research (Figure 7). One of the reasons the respondents find working on research projects challenging is because they were doing other modules while at the same time trying to complete their research projects (Figure 6). Due to the excess workload associated with research some students reportedly failed their examination (Figure 4).

Meeting with Research Supervisor

Out of the total number of students who responded, nine students (10%) expressed dissatisfaction with the value of meeting with their supervisor. In contrast, the majority of 80 students (90%) found these meetings to be beneficial (Figure 11). This correlates with the fact that most of the students prefer to meet as a group rather than working alone on an assigned area of their research projects (Figure 8). Supervisors' feedback is crucial for undergraduate students involved in research projects to enhance their learning and research abilities. Offering prompt and appropriate feedback can greatly impact the advancement and growth of students. Ref. [32] conducted research that emphasizes the importance of efficient in-person feedback for professional growth. Refs. [33,34] emphasize the need for supervisors to provide students with regular, timely, and constructive feedback to assist their progress and learning. Nevertheless, there are obstacles to delivering timely feedback, as shown by Bastola (2020), where supervisors have difficulties offering rapid feedback to students, thereby affecting their perception of support. According to [35], effective feedback plays a vital role in the teaching and learning processes. Ref. [36] carried out a study that examined students' perceptions of supervision, highlighting the crucial role of feedback in ensuring effective supervision. By implementing feedback systems, as outlined by [37], universities can establish opportunities for undergraduate research and promote the exchange of research methodologies among faculty members. Moreover, feedback processes are subject to the influence of other elements, such as online settings and cultural diversities, as emphasized by [38].

Conclusion

Based on the results, it seems that many participants found the first three chapters of their research to be more challenging than anticipated. While many of the respondents had

prior experience with research methodology, others had taken a course on the subject and were now more knowledgeable. Finding articles for review was another challenge, and chapter two (2) was the most difficult part of the research. The respondent found that meeting with their supervisor was a particularly helpful technique for completing their research, while reaching out to former students for assistance was least beneficial.

Conflict of Interest

No funding was received from any organization for this study therefore there is no conflict of interest.

Acknowledgement

The authors acknowledge the technical support of Mr. Ewan Brooks during the preparation of the manuscript of this study.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art014

State of Green Management Practices in Public Sector Institutions in the Bono Region of Ghana

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Abstract

This study was conducted to assess the state of green management practices among public sector institutions in Ghana with focus on the Bono region. The descriptive study employed a mixed-method approach to recruit employees of seven public sector institutions in the region for data collection using stratified random sampling method. A five-point Likert scale and a semi-structured interview guide were used to gather quantitative and qualitative data respectively. In all, quantitative data of 228 participants together with qualitative data from 15 respondents were used for the study. The quantitative data was analyzed using SPSS version 23 software while thematic content technique was used to analyze the qualitative data. The results of the quantitative data showed that majority of the study participants took a neutral stance on all the items used to measure the three main constructs: environmental orientation, environmental strategy and environment development in public sector institutions. On the other hand, the qualitative results indicated description of green management, forms of green management practices and measurement of green management practice as sub-themes of state of green management practice in public sector institutions. In conclusion, the mixed findings of the study have shown low level of awareness on green management practice in public institutions and hence serves as basis for attention to create awareness on the practice in the Bono region and Ghana as a whole.

Keywords*: Environmental Development, Environmental Orientation, Environmental Strategy, Green Management, Public Sector Institution.*

Introduction

Background of the Study

Green management practices encompass a range of strategies and actions undertaken to minimize environmental impact while maximizing resource efficiency [1]. In the context of public institutions, green management practices include the implementation of sustainable policies, the adoption of eco-friendly technologies, and the promotion of environmentally conscious behaviour among employees and stakeholders [2].

A significant step towards promoting green management practices in public institutions is the development and implementation of sustainable policies and legislation [3]. Ghana has made notable progress in this regard through the development of the Ghana Environmental Policy Framework which outlines guidelines for environmental planning and sustainable management practices [4]. Additionally, the Public Procurement Authority

Received: 13.05.2024 ***Accepted: 13.07.2024*** ***Published on: 30.07.2024***
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introduced the Green Procurement Policy, which emphasizes the purchase of eco-friendly products and services by public institutions [5].

Empirically, few studies have assessed the state of green management practices in different sectors in Ghana. A study by Ampratwum et al. [6] to propose an implementation framework for green certification of buildings in Ghana found that despite the existence of knowledge on green management practices in Ghana, promotion for implementation of the practice by relevant bodies is lacking in the country. In another study by Li et al. [7], it was found that the environmental policy framework in the mining sector in Ghana is regulated by the state agencies including the Environmental Protection Agency and hence needs a paradigm shift that would contribute to effective implementation. In the hotel industry, Mensah and Blankson [8] conducted a study to assess the attitude of hotel managers towards green management practices in the capital city of Accra and found that there was poor attitude of smaller hotels toward green management practices as compare to larger hotels which were committed with regard to having environmental officers, written environmental policy documents, environmental action plans, history of implementation as well as having environmental certification. Others have also assessed practices relating to waste management and have revealed poor state of sustainability practices in health institutions [9].

Given the account of available studies on green management practices in Ghana, the attention to the state of the practice in public sector institutions is very limited. This gap in literature hinders policymakers and regulatory bodies from evaluating the implementation of green management practices among public institutions for improvement. The conduct of this study provides an opportunity to assess the state of green management practices in the Bono region to serve as foundation for policy direction on environmental sustainability practice in the public sector.

Problem Statement

Despite the role of public sector institutions in the adoption and implementation of government policies in Ghana, the state of green management practices in these institutions are not well documented. This problem makes it unclear about the commitment of public sector institutions in Ghana toward the promotion of environmentally friendly practices as the country is seeking to meet its Sustainable Development Goals (SDGs). This study sought to solve this problem by assessing the state of green management practices among public sector institutions in the Bono region.

Purpose

The main purpose of the study was to assess the state of green management practice in public sector institutions in the Bono region of Ghana. The study specifically assessed environmental orientation, strategy and development in the public sector institutions.

Limitations

A descriptive design was adopted for the study hence the study could not establish relationship between variables. The limited time and resources available for the study affected its scope which has potential to affect the level of representation of the results. Also, the results cannot be generalized as the study focused only on the Bono region.

Schematic Diagram

The study process is as shown in figure 1 below.

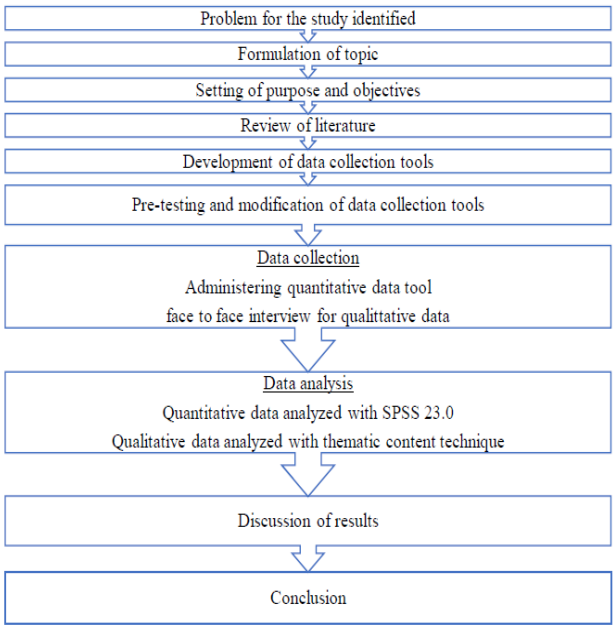

Figure 1. Schematic Diagram Showing the Study Process

Material and Methods

Study Design and Site

The study adopted a descriptive cross-sectional design with a mixed-method approach to assess the state of green management practices among public sector institutions in the Bono region of the republic of Ghana. The region is one of the sixteen administrative regions of Ghana and is located in the middle portion of the country. With Sunyani as the regional capital, the Bono region is made up of 12 Municipal and District Assemblies (MDAs).

According to the 2020 Population and Housing Census conducted by the Ghana Statistical Service (GSS), the population of the region is 1,208,649 consisting of 596,676 males and 611,973 females with 708,481 being urban dwellers and 500,168 as rural population [10].The region covers an area of approximately 9,826 square kilometres (3,790 square miles) and is bordered by six other regions. The region's topography encompasses vast grasslands, forests, rivers, and hilly landscapes, contributing to its ecological diversity [11]. The dominant climate is tropical, characterized by two primary seasons: a wet season (April to October) and a dry season (November to March).

Bono region is endowed with abundant natural resources, including fertile arable land suitable for agriculture, mineral deposits, and rich biodiversity. The region boasts a variety of crops such as cocoa, yam, maize, and oil palm, contributing significantly to Ghana's agricultural output. Additionally, its dense forests support timber and other non-timber forest products, emphasizing the importance of sustainable forest management practices. Public institutions in the Bono Region have the responsibility to lead in the implementation of green management practices to promote sustainability and preserve the region's natural heritage thus making it suitable for the study.

Study Population, Sampling and Sample Size

The population of the study involved 2,147 employees of selected public sector institutions in the Bono region. With stratified random sampling proportionate to size, respondents were proportionally selected from each institution. Employees who were below 18 years old and those on contract or temporary appointments as well as employees who could

not understand Twi or English language were excluded in the study. In all, 337 respondents were estimated using the Yamane formula for collection of quantitative data. Also, 15 respondents were sampled based on data saturation for the collection of qualitative data.

Data Collection Tool and Procedure

Collection of quantitative and qualitative data was done using a 5 point-Likert scale and semi-structured interview guide respectively. While the Likert scale was adopted, the interview guide was developed by the author. The quantitative data tool was pretested with seven respondents where reliability test was conducted to ensure that items with Cronbach alpha values less than 0.7 were dropped before main data collection. Face and content validity of the interview guide was ensured by subjecting it to peer and expert reviews before data collection.

Prior to collection of data, approval was sought from the authorities of the selected institutions. This was followed by a meeting with employees to brief them about the study. After addressing questions and concerns from employees, those who consented to partake in the study were given the questionnaire to complete. In terms of qualitative data collection, face-to-face interviews were held with selected respondents at separate places and times. All interviews were recorded with audiotape recorder while a journal was kept for field notes during the interview session.

Data Analysis

The quantitative data was analysed using SPSS version 23 software. Data from filled questionnaires was entered into the software one after the other. Entered data was screened for errors and omissions after which descriptive analysis was performed. The outcomes of the analysis were presented in tables.

The qualitative data on the other hand was analysed manually using thematic content technique. With this technique, the recorded interviews were transcribed verbatim, and the transcripts were read severally to observed similar patterns. These patterns were organized into themes and sub-themes which were described with support of quotes from the respondents.

Results

Socio-Demographic Characteristics of Participants

The majority of the participants in the study, 221 (57.4%) were male with 107 (32.6%) being females. In terms of age, 33 (10.1%) were 20 to 29 years, 208 (63.4%) were 30 to 39 years, 84 (25.6%) were 40 to 49 years while 3 (0.9%) were 50 years or more. Also, 176 (53.7%) of the participants were married while 152 (46.3%) were single. In addition, majority, 316 (96.3%) were Christians with 12 (3.7%) being Muslims. With regard to educational background, 31 (6.4%) had PhD, 93 (28.4%) had Master's degree, 157 (47.9%) had first degree, 36 (11.0%) had HND and 11 (3.4%) had basic education. Again, 21 (6.4%) of the participants worked with NPRA, 54 (16.5%) worked with GHS, 72 (22,0%) worked at RCC, 54 (16.5%) worked at UNER, 60 (18.3%) worked at GES, 30 (9.1%) worked at the Regional Hospital while 37 (11.3%) worked at GCB bank. The results further showed that 25 (7.6%) of the participants worked at the institution for at most 2 years, 155 (47.3%) had worked for 3 to 5 years at the institution, 77 (23.5%) worked for 6 to 8 years, 14 (4.3%) worked at the institution for 9 to 11 years while 57 (17.4%) worked for 12 years and above at the institution.

Descriptive Statistics

The results from the quantitative data showed that majority of the participants took a neutral stance on the state of green management practice which was measured with three main constructs; environmental orientation, environment strategy and environment development as indicated by the descriptive statistics in Table 1.

Table 1. Descriptive Statistics

Constructs	**Mean**	**Mode**	**Standard deviation**	**Interpretation of results**
Environmental orientation (EO)				
EO1: our institution has a clear policy statement urging environmental awareness in every area	2.95	2	1.30	Neutral
EO2: Environmental preservation is a high priority in our institution	2.96	2	1.31	Neutral
EO3*:* Preserving the environment is a central corporate value in our institution	2.96	2	1.32	Neutral
EO4*:* Environmental preservation is vital to our institution's survival	3.11	2	1.36	Neutral
EO5*:* A concerted effort is made to let every employee understand the importance of environmental preservation	2.92	2	1.26	Neutral
Environmental strategy (ES)				
Our institution has integrated environmental issues into our strategic	2.82	2	1.24	Neutral
ES2: In our institution, 'quality' includes reducing our environmental impact	2.78	2	1.21	Neutral
ES3: Our institution links environmental objectives with other corporate goals	2.92	2	1.27	Neutral
ES4: Environmental issues are always considered when we make operational decisions	2.94	2	1.27	Neutral
ES5: We emphasize the environmental aspect of our services in creating publicity	2.86	2	1.27	Neutral
Environmental development (ED)				
ED1: Our institution reduces energy consumption	3.03	4	1.22	Neutral
ED2: Our institution reduces the impact on animals' species and natural habitats	2.91	2	1.17	Neutral
ED3: Our institution reduces purchases of non-renewable materials and chemicals	2.94	2	1.14	Neutral
ED4: Our institution reduces the use of traditional fuels by substituting less polluting energy sources	2.93	2	1.23	Neutral
ED5: Our institution undertakes voluntary actions for environmental restoration	2.88	2	1.25	Neutral
ED6**:** Our institution undertakes actions for environmental audits and training employees on environmental practices	2.80	2	1.20	Neutral
1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree				

Qualitative Results

State of Green Management Practices

Three themes that emerged after analysis of the qualitative data were description of green management practices, forms of green management practices and measurement of green management practices.

Description of Green Management Practices

In order to obtain participants' understanding of green management practices, the study asked them to describe it in their own words. While some participants described green management practices as adoption of work activities that serve the interest of the environment others understood it as a way of ensuring that the environment is safe.

G3: *"I will say that green management practices are concerned with how we carry out activities that protect the environment and ensure that we the workers are saf".*

G5: *"…if I really understand you, I will describe green management practices as the adoption of non-chemical products or a way of life that promotes the use of things that are of the best interest of the environment. You know that these days, climate change has become a major concern of the world and due to that we are encouraged to protect the environment at all cost. Those things that we need to do to protect the environment as an institution can be described as the green management practice".*

G11*: "Green management practices can be described as ways and means to work without causing harm to the environment by utilizing resources and methods that support the effective functioning of the environment".*

Forms of Green Management Practices

Participants in the study were asked to identify various green management practices that have been adopted and implemented in their institutions of work. Efficient energy practices, waste management and sustainable procurement practices were some of the green management practices indicated by participants. The forms of green management practices were expressed in some of their statements quoted below.

G6: *"In this institution, we don't buy used electrical appliances but only new ones that are energy efficient. Our bulbs are all energy bulbs, and we purchase fridges that are labelled by the Ghana Energy Commission with at least three stars which is believed to consume less energy. In fact, it is our policy to stick to the purchase of more efficient electrical gadgets. That is not all, we discourage the use of plastics and that is why we used water dispenser in the office. In this case, we are able to control the disposable cups compare to a situation where customers and staff come in with sachets and bottles of water which we cannot control how they dispose them".*

G10*: "I am very sure that environmental sustainability is very key in our institution. We actually try our best to purchase products that are eco-friendly so that they will not be harmful to the environment. Again, we are mindful of conserving water at all times. Our maintenance practices include prompt rectification of water leaks. We also comply with the Energy Commission requirements for use of efficient electrical apparatus. For example, this institution does not purchase old fridges; we procure new ones which are certified by the Energy Commission".*

G14: *"One thing I know is that as for this institution, we make sure a product is quality before we buy it for use. When I say quality, I mean it can help both the human being and the environment. We have a practice where we don't allow the use of weedicide on our environment. We have constantly engaged our laborers to avoid the use of any chemical on the environment. We are also strictly using energy bulbs and new fridges in our offices as required by the Energy Commission of Ghana".*

Measurement of Green Management Practices

When participants were asked how they measure the effectiveness and impact of green management practices in their institutions, it was found that they had no standard criteria for assessing the impact of the practice, but they believed green management practices have positive impact on their operations.

G1: "*In fact, we don't really have any laid down formula or standard for measuring the impact of our green practices but we believe that it is a good thing and have several positive impacts. For instance, the use of energy bulbs is contributing to reduce the amount of electricity bills our institution pay. But the truth is that we have not done any research to assess its impact*".

G10: "*I will say that is something we have to think about because as we speak now, there is no method to measure or assess the impact of these green practices on our activities. We only know that if you purchase like new fridge with Energy Commission's label it will consume less energy and consequently our electricity bills will come down. I think going forward, we will have look at how we will scientifically assess the impact of these practices"*.

G14: "*.to the best of my knowledge, I am not aware of how we are really assessing the impact of green practices in this institution. Nonetheless, we know that it has positive benefits on our activities so far as it is the best practice around the world*".

Discussion

The main purpose of the study was to assess the state of green management practice in public sector institutions in the Bono region. The quantitative data was collected using a 5-point Likert scale where the state of green management practice was examined with three main constructs: environmental orientation, environmental strategy and environmental development. The finding of the quantitative data showed that there was not significant state of green management practice in the public sector institutions in the region. The finding was inconsistent with the results of Mensah and Blankson (2014) which found significant commitment to green management practice among hotels in Accra. However, the qualitative data of the study showed that majority of the institutions had efficient energy practices, waste management and green procurement practices. Unlike the finding of Asante, Yanful and Yaokumah (2014) where healthcare facilities were not implementing waste management policies which resulted in poor state of sustainability practices, public sector institutions in the Bono region were found to restrict plastic waste on their environment. In all, the finding of the study implies that there is lack of clear guidelines and awareness on green management practice among public sector institutions. This resulted in the difference between the results of the quantitative and qualitative data. The result is therefore significant as it has brought to light the need to create awareness for public sector institutions to develop clear policy documents on environmental sustainability practices to guide the adoption and implementation of green management practices.

The study also found that public sector institutions did not have criteria for monitoring and evaluating the impact of green management practices. This finding is an indication that there is lack of understanding of the importance of the practice among the institutions. As a result, they don't see green management practice as part of management function that should be measured for improvement. This revelation is a call on management of public sector institution to consider green management as a sustainability practice that should be prioritized with a strategic objective. This result of the study can be described as novel as no study has considered how institution measure the impact of their green management practices. In view of this, further investigation on the best way to measure the impact of green

management practices in organizations would contribute to provide a standard metric for evaluation.

Equations

Sample size estimation using the Yamane formula given by

Sample size (n) $\frac{N}{[1+N(e)\hat{}2}$ (1)

Where, N = Population, e = margin of error at 95% confidence level.

Substituting N = 2147 and e = 5% = 0.05 into equation (1), it implies.

Sample size (n) = $\frac{2147}{[1+2147(0.05)\hat{}2}$ (2)

Sample size = 337

Conclusion

In conclusion, results of the study imply low level of awareness on green management practices among public sector institutions in the Bono region. As a result, the study has contributed to lay the foundation for creating awareness for the adoption and implementation of green management practice in public sector institutions in the region.

Acknowledgement

I would like to sincerely thank all heads of public sector institutions and all respondents who contributed to make this research successful.

Conflict of Interest

There is no conflict of interest as far as the conduct of the study is concerned.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art015

Understanding the Socio-Economic and Demographic Factors Affecting Uptake of Second Dose Measles Vaccination (MCV2) among Children Under 5 in Ebonyi State, South-Eastern Nigeria

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Abstract

Measles is a highly contagious viral disease that poses a significant threat to children worldwide. Vaccination programs have been successful in reducing the burden of measles, but the complete protection against the disease requires two doses of the measles-containing vaccine (MCV 2). The study sought to identify the socio-economic and demographic factors that affect uptake of second dose of measles vaccine (MCV2) and explore the opportunities available to mitigate the challenges in Ebonyi state. Community-based cross-sectional study was conducted in the selected areas. One focal health facility was selected in each LGA, and the target population was the birth cohort of children born between 22nd March 2021 and 22nd February 2022. The adjusted sample size for this study is 409. Results/Factors identified are child got sick after first dose, no chance to go to facility, frequent cancellation of immunization sessions, caregivers not aware of the second dose, forgetfulness, assumption of first dose being adequate for the child, relocation, no vaccine at facility and 69% of mothers and caregivers are worried that vaccines can cause a child to be sick. Among socio-demographic characteristics; there are no significant association between MCV 2 and age of the mother, maternal educational status, family monthly income, family size, and number of children alive. However, the study showed significant association between maternal occupation and vaccine out of stock at the health facility with low uptake of MCV2. Therefore, health education on the importance of MCV2 should be intensified at all levels.

Keywords: *Demographic, Measles Vaccine Second Dose, Socio-Economic, Uptake.*

Introduction

Measles is a highly contagious viral disease that poses a significant threat to children worldwide [1, 2]. Vaccination programs have been successful in reducing the burden of measles, but the complete protection against the disease requires two doses of the measles-containing vaccine (MCV2) [3, 4]. However, the uptake of the second dose among children under 5 in Ebonyi State, Southeast Nigeria, remains low [5]. Identifying and analyzing the various factors that influence the low uptake of MCV 2, understanding these factors is crucial for developing effective strategies to improve vaccination rates and enhance the overall health outcomes of children in the region. Socio-economic and demographic factors proved to be crucial in improving uptake of MCV2 [6]. A total of 96 cases of Measles have been recorded in Ebonyi State within the first

Received: 01.06.2024 ***Accepted: 13.07.2024*** ***Published on: 30.07.2024***
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quarter of 2023, with 4 associated deaths and a case fatality rate of 4.1% by the Emergency Operations Centre (EOC) situation report on measles outbreak in the state. EOC Situation report, march, 2023). In Ethiopia, it was mentioned that in order to increase the utilization of the second dose of the measles vaccine, improved health education and service expansion to difficult-to-reach areas are required [2, 7, 8]. Other research effort further explained that low uptake of second dose of measles vaccine was associated with maternal age and birth order, [9, 10]. other socio-economic and demographic factors inhibiting adequate uptake of second dose measles vaccine was poverty level, and multiple twins [11-14].

The objective of the study is to identify the socio-economic and demographic factors that affect uptake of second dose of measles vaccine (MCV2) in Ebonyi state and to explore the opportunities available to mitigate the challenges faced by parents or caregivers in accessing the MCV2 in Ebonyi state.

Limitations

The study is limited by time and finance to including all eligible individuals in the target population. Possible recall bias, social desirability bias, and the generalizability of the findings to other populations, also constitute part of the limitations of the study.

Conceptual Framework

The Health Belief Framework suggests that the health-related behavior of people is associated with vulnerability of the health condition, perceived benefits of acting and barriers to the available actions. See figure below.

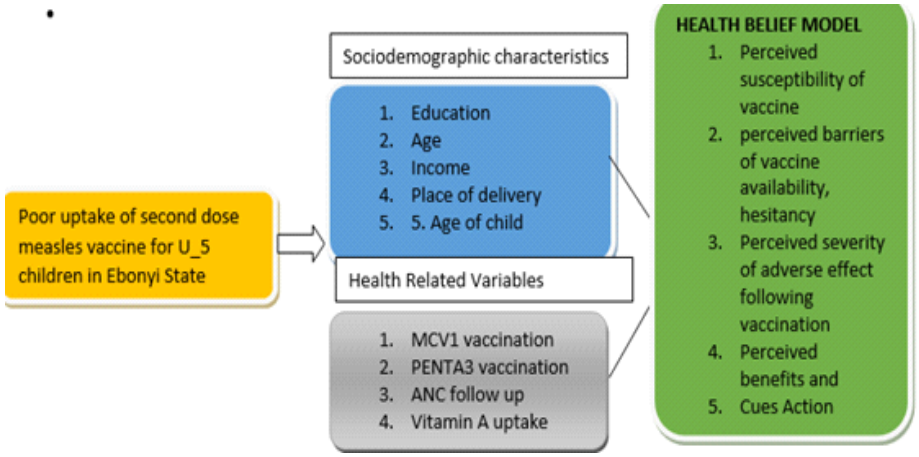

Figure 1. Health Belief Model for Poor uptake of Measles Vaccines

Novelty of the work: The study found limited empirical articles on the topic, especially for Nigeria context. Most of the reviewed papers were on the overall vaccination hesitancy and incompletion, while this study focused on the second dose of measles vaccination.

Literature Review

Studies evaluated different levels in the case finding and uptake of measles vaccine and revealed that the administration of first dose of measles vaccine increases immunity rates, with respect to the age of the children in that population, whereas second dose has a higher impact on increased immunity, leading to reduction in potential outbreaks. According to World Health Organization immunization has been adjudged a success story for global health and development, saving millions of children every year, and preventing tens of millions of deaths associated with Measles. 86% of all infants (over 116 Million) have reportedly been vaccinated annually [15]. The prevalence of MCV2 utilization among children aged 24–35 months and as well,

inconsistency in optimizing the opportunity of vaccination, as well as geographical location (residence) was assessed and seen to have played important roles in determining second dose of MCV2 coverage [10]. The authors identified socio-demographic characteristics of families as well as the communities, knowledge, perceptions, and attitudes towards vaccination, as significant variables associated with low uptake of MCV2. Health service availability and quality of care, inconsistency in optimizing the opportunity of vaccination, as well as geographical location (residence) played important roles in determining second dose of MCV2.

Furthermore, a work was carried out in India on the influence of socio-demographic factors on coverage of full vaccination among children aged 12–23 months between (2015-2016). Their result showed that educational attainment of the mother, the family's economic status, the size of the child at birth, and maternal healthcare services, significantly influence full vaccination coverage. Other socioeconomic factors, like, maternal age, sex of the household head, exposure to mass media, childbirth order, social status, religion, place of residence, and region also contributed to the coverage of full vaccination [16]. In the manner, it was discovered that maternal knowledge about child immunization is significantly associated with child immunization completion, meaning that poor knowledge about childhood immunization among mothers led to incomplete childhood immunization [17].

Millions of measles cases and deaths are reported on yearly basis in Africa [18, 19].

WHO introduced for inclusion, the second dose of measles vaccine (MCV2) into the routine immunization schedule in 2018 for children at 15 months. [20] Ebonyi State complied with that policy in 2018 with coverage at 38.1%. Subsequent annual assessments showed a significant decline in 2019 and 2021 (20.8% and 18.9%) respectively; increased a bit to 36% in 2022 [21]. The coverage improved to 55% in 2023, following collaborative efforts, yet still below the 80% target. Continuing, a research team estimated the coverage of measles vaccination and identified factors associated with low uptake in a cross-sectional study of 536 children 24-59 months in Kenya. The authors showed that MCV2 utilization improved through public health intervention by targeting rural residents, children of uneducated mothers, economically poor women, and other factors [22].

Another study analyzed the trends in the monthly number of children vaccinated with specific antigens and compared the changes in the first three months of the COVID-19 pandemic for 15 African countries between January 2018 to June 2020, Results showed that 87% of the countries that participated in the study had a significant decline in the average number of vaccine doses [23]. Nigeria among other African countries experienced a drop in the number of children that received DPT3 and Measles Containing Vaccine 1(MCV1) [23].

Factors associated with low coverage of the second dose of MCV2 were examined in Kenya and the researchers established a relationship between the settlement types and the percentage coverage, a higher percentage (58%) of the children vaccinated coming from urban population. [24,25] Differently, a researcher, evaluated the association between access to a health facility and uptake of each vaccine, dropout, and impact of distance to the health facility on respondent’s vaccination behaviours. [26] The need for improved health education and service expansion to hard-to-reach areas, was suggested for increased uptake of MCV2. Low awareness of mothers on the importance of second dose of MCV, vaccines not being readily available in health institutions, poor accessibility of children for a second dose of measles vaccine, attitude of mothers towards vaccination were further

revealed as some of the factors contributing to low uptake of second dose vaccine [27].

In the same vein, the spatial variations were explored and the individual and contextual factors of uptake of measles-containing second dose vaccine among children aged 24 to 35 months in Ethiopia. The result showed that uptake of second dose of measles in Ethiopia was low, attributable to maternal age, and birth order, hence, special concern should be given to regions with lower second dose of measles vaccine uptake [28]. In another study, a scoping review to synthesize recent literature on risk factors and interventions for zero- and missed-dose children in Nigeria was conducted. However, this study is focused on the second dose of measles vaccine, hence, a gap in scope of the study [24]. In a different study, showed that more than half of the Under-5 children in MDC, Tanzania were not vaccinated with second dose of measles. This was associated with issues like, lack of caretaker knowledge about appropriate vaccination age, unavailability of vaccine, insufficient numbers of children waiting, to warrant multi-dose vial use, and long clinic waiting times [29]. The findings were obtained following their study that determined factors associated with non-uptake second dose of measles vaccine among children in Tanzania, using cluster sampling from January to April 2017. While their study was in Tanzania, our research will focus on Under-5 children in Nigeria.

Another study in Kenya for children aged 19-59 months, revealed that among other factors, education of the population of its catchment area on the measles-rubella second dose vaccination schedule and that all immunizing health facilities are always open, will enhance uptake of second dose of measles vaccine. Also, outreach services for hard-to-reach communities, is of good benefit [30]. A study in Ebonyi State, within the purview of discuss, investigated the factors associated with incomplete immunization among Under-5 children in Ebonyi State, Nigeria using ANOVA statistical analysis. The authors found that the location from home to health facility and inadequate health education were major factors for low uptake and incomplete vaccination [5]. In the same age category, another team assessed the factors associated and level of second dose measles vaccine uptake in Central Ethiopia among under five children. The authors indicated that the level of measles vaccine among Under-5 children is low. More so, waiting time, inadequate vaccination awareness and its recommended doses are factors inhibiting increase in the uptake of second dose of measles vaccine [27].

Evidence from another study showed that second dose measles vaccine was very low due to unawareness of second dose by caregivers, waiting time, and distance to health facility. The authors went ahead and recommended focus on demand creation, outreaches services to the hard to reach areas to increase uptake and reduce missed opportunities [24]. Another team assessed the acceptability of second dose measles vaccination services among caregivers/mothers with children less than 2 years of age in Zambia. Their result indicated that knowledge about uptake and acceptability of second dose of measles vaccine is associated with gender, marital status, employment, income level, socio-cultural beliefs, and educational level. Therefore, the authors suggested that health workers should continue to increase awareness in relation to the low acceptability of the second dose of measles vaccine [31].

Reasons for incomplete immunization and factors responsible for missed opportunities for immunization in children less than one year of age in rural areas in Nigeria were revealed [32]. The study used immunization cards, sampled mothers with children of target age and findings showed that parents' objection, disagreement or concern about immunization safety, long distance walking and long waiting time at the health facility are

the most common reasons for incomplete immunization. Following the discourse on second dose of measles vaccination among children [33]. Another study assessed the prevalence of second dose of measles vaccination among children aged 24–35 months and analyzed factors associated with it by using recent nationally representative surveys of Sub-Saharan Africa countries, using secondary data from Demographic and Health Surveys (DHS). The authors indicated that high community poverty, multiple twins negate uptake of second dose of measles vaccine, while health facility delivery, postnatal visit, ANC visit positively encouraged uptake of second dose of measles vaccine [10].

Gap in Literature

This study found limited published empirical articles on the topic of discourse. However, from the reviewed empirical works, gaps were found in terms of geographical areas, while the study focuses on Nigeria; most of the reviewed papers were works from African country and the shores. The study concentrated on the second dose of measles, but most of the reviewed empirical studies focused on overall vaccination hesitancy, incompletion, not specific to second dose measles vaccine.

Materials and Methods

In this section, describe the methods followed and responds to the question how the problem was studied. The order is as follows:

Description of the Site: The study was conducted in 13 local government areas (LGAs) of Ebonyi State, South Eastern Nigeria. Four (4) LGAs each in the North and Central senatorial zones with five (5) in the South zones.

Description of the Experiments done: Community-based cross-sectional purposeful study was conducted in the selected areas. One focal health facility was selected in each LGA, and the target population was the birth cohort of children born between 22nd March 2021 and 22nd February 2022. The adjusted sample size for this study is 409 following the sample size determination for cross-sectional studies. Socio-economic and demographic variables used are maternal education status, age, income, place of delivery, MCV1 vaccination, health facility, age of the child at vaccination. Children under the age of 5 residing in Ebonyi State and received first dose of measles vaccine were included in the study, whereas does not residing in the state were excluded. Parents or caregivers of children who signed or approved consent were included, while those who are unwilling to participate were excluded.

Description of statistical methods used.: Structured questionnaire was designed to collect data from parents or caregivers of children under 5 years and health facility workers using English and administered in Ebonyi local language for easy understanding and proper responses. Data collectors were recruited and trained. Data collected went through cleaning and quality checks prior to conducting a descriptive analysis to summarize the socio-economic and demographic characteristics of the participants.

Results

The results obtained from data analysis with their interpretations were presented in this chapter. Out of the four hundred and nine (409) copies of the questionnaire administered, four hundred and seven (407) of them were returned and were properly filled and fitted for analysis giving a response rate of 99.5%. The questionnaire that was not properly filled was a result of many fields in the questionnaire not being filled. The mean age and standard deviation of the students are 23.39±4.84years.

Table 1. Socio-Demographics Characteristics of the Mothers Involved in the Study of Mcv2 Vaccination and Associated Factors (N = 407)

Characteristics	Frequency	Percentage
Age of the mother in years		
20 - 25	91	22.4
26 - 30	149	36.6
31 - 35	112	27.5
> 36	55	13.5
Maternal educational status		
Unable to read and write	67	16.5
Primary	109	26.8
Secondary	145	35.6
College and above	86	21.1
Maternal Occupation		
Farmer/Housewife	124	30.5
Private business	202	49.6
Governmental profession	64	15.7
Casual labourer	17	4.2
Family monthly income		
<5000	134	32.9
>5000	273	67.1
Family size		
1-3	172	42.3
4-5	179	44.0
>-6	56	13.8
Number of children alive		
One	45	11.1
Two	134	32.9
Three and above	228	56.0

The result in table 1 shows the sociodemographic characteristics of the mothers. The majority of the mothers 149 (36.6%) and 112 (27.5%) aged between 26 – 30 years and 31 – 35 years, respectively. On their educational status, the majority of them 109 (26.8%) attained Primary educational level and 145 (35.6%) attained Secondary level. Almost half of the mothers 202 (49.6%) were doing private business as their occupation and 124 (30.5%) were farmers/housewives. Greater proportion of the mothers 273 (67.1%) earn more than 5,000 Naira. Almost equal proportion 172 (42.3%) and 179 (44.0%) have family size between 1 to 3, and 4 to 5 respectively. More than half of the mothers 228 (56.0%) have three and above children alive.

Table 2. Demographic Characteristics of Children Involved in the Study (N = 407)

Childs Demographic Characteristics	Frequency	Percentage
Child lives with both parents?		
Yes	367	90.2
No	40	9.8

Order of birth		
First	51	12.5
Second	117	28.7
Third	122	30.0
Fourth	72	17.7
Fifth	41	10.1
More than five	4	1.0
Age of child		
15-20months	244	60.0
21-24months	102	25.1
25-36months	37	9.1
37months and above	24	5.9

As shown in table 2 was the demographic characteristics of children involved in the study. Almost all the children 367 (90.2%) lives with both parents. The majority of the children 122 (30.0%) were the 3rd child according to birth order, 117 (28.7%) were the 2nd child. More so, the majority 244 (60.0%) and 102 (25.1%) aged between 15-20 months, and 21 – 24 months, respectively.

Table 3. Description of Access and Service-Related Factors (N = 407)

Description	**Frequency**	**Percentage**
Distance of the nearest facility		
5mins	17	4.2
6-10mins	91	22.4
11-15mins	72	17.7
16-20mins	94	23.1
21mins and above	133	32.7
How long do you wait before accessing services?		
10-20mins	173	42.5
21-25mins	50	12.3
26-30mins	71	17.4
31-40mins	48	11.8
41mins and above	65	16.0
Have you ever returned without receiving immunization services?		
Yes	55	13.5
No	352	86.5
If yes, why?		
Due to vaccine stock out at the health facility	44	80.0
It was not the immunization day	2	3.6
Number of children to give MCV were too small for the day	7	12.7
The child fever above 37 degrees	1	1.8
Vaccine is always available	1	1.8

On the participants' access and service-related factors as shown in table 3. The majority of the participants 133 (32.7%) spent 21 minutes and above. Result shows that the majority 173 (42.5%) spends minimum waiting time to access services between 10 –

20 minutes, and 71 (17.4%) spends between 26 – 30 minutes. More than three-quarters of the participants 352 (86.5%) have never returned without receiving immunization services. Out of the 55 participants that have ever returned from a facility without receiving immunization services, the majority 44 (80.0%) were due to vaccine out of stock at the health facility.

Table 4. Association between Socio-Demographic Factors, with the Low Uptake of MCV 2 Vaccination Among Children under 5 in Ebonyi State (N = 407)

	Uptake of MCV 2 Vaccine					
Characteristics	**Poor Uptake n (%)**	**Good Uptake n (%)**	**Total n (%)**	**□2 ,P**	**aOR**	**95% C.I.**
Age of the mother in years						
20<-25	53 (21.9)	38 (23.0)	91 (22.4)	3.032,	1.199	0.67 - 2.13
26-30	80 (33.1)	69 (41.8)	149 (36.6)	0.082	0.759	0.40 - 1.45
31-35	73 (30.2)	39 (23.6)	112 (27.5)		0.793	0.35 - 1.81
>-36	36 (14.9)	19 (11.5)	55 (13.5)			
Maternal educational status						
Unable to read and write	47 (19.4)	20 (12.1)	67 (16.5)	4.291	0.232	0.72 - 3.08
Primary	62 (25.6)	47 (28.5)	109 (26.8)	0.232		0.75 - 3.12
Secondary	81 (33.5)	64 (38.8)	145 (35.6)			0.66 - 3.45
College and above	52 (21.5)	34 (20.6)	86 (21.1)			
Maternal Occupation						
Farmer/Housewife	84 (34.7)	40 (24.2)	124 (30.5)	10.503	0.015	1.01 - 2.97
Private business	105 (43.4)	97 (58.8)	202 (49.6)	0.015		0.54 - 2.49
Governmental profession	40 (16.5)	24 (14.5)	64 (15.7)			0.18 - 2.07
Casual laborer	13 (5.4)	4 (2.4)	17 (4.2)			
Family monthly income						
<5000	86 (35.5)	48 (29.1)	134 (32.4)	1.846	0.174	0.63 - 1.71
>-5000	156 (64.5)	117 (70.9)	273 (67.1)	0.174		
Family size						
1-3	110 (45.5)	62 (37.6)	172 (42.3)	4.505	0.105	1.45 - 4.10
4-5	96 (39.7)	83 (50.3)	179 (44.0)	0.105		0.89 - 3.90
>-6	36 (14.9)	20 (12.1)	56 (133.8)			
Number of children alive						
One	26 (10.7)	19 (11.5)	45 (11.1)	3.171	0.205	0.33 - 1.49
Two	72 (29.8)	62 (37.6)	134 (32.9)	0.205		0.20 - 0.98
Three and above	144 (59.5)	84 (50.9)	228 (56.0)			

As shown in Table 4, was results of the association between sociodemographic characteristics and uptake of MCV 2 vaccine. The sociodemographic characteristics that significantly has no association with MCV 2 vaccine uptake include age of the mother, (Chi-Square = 3.032; P = 0.082 > 0.05), maternal educational status (Chi-Square = 4.291; P = 0.232 > 0.05), family monthly income (Chi-Square = 1.846; P = 0.174 > 0.05), family size (Chi-Square = 4.505; P = 0.082 > 0.05), and number of children alive

(Chi-Square = 3.171; P = 0.205 > 0.05).

However, there is a significant association between maternal occupation and uptake of MCV 2 vaccine (Chi-Square = 10.503; P = 0.015 > 0.05). This implies that greater proportion of those that have good uptake 58.8% were private business women while the majority of the housewife/farmers 34.7% have poor uptake of MCV 2 vaccine.

Table 5. Logistics Regression on Association between Socio-demographic Factors, with the Low Uptake of MCV 2 Vaccination among Children under 5 in Ebonyi State (N = 407)

Socio-Demographic Characteristics	**B**	**S.E.**	**Wald**	**df**	**P-Value**	**Odd Ratio**	**95% C. I. for EXP(B)**
Age of mother in years							
20 – 25	*Ref*						
26 – 30	0.181	0.293	0.381	1	0.537	1.199	0.67 - 2.13
31 – 35	-0.276	0.329	0.700	1	0.403	0.759	0.40 - 1.45
>36	-0.232	0.422	0.303	1	0.582	0.793	0.35 - 1.81
Maternal educational status							
Unable to read and write	*Ref*						
Primary	0.397	0.371	1.145	1	0.285	1.487	0.72 - 3.08
Secondary	0.425	0.364	1.359	1	0.244	1.529	0.75 - 3.12
College and above	0.406	0.423	0.919	1	0.338	1.500	0.66 - 3.45
Maternal Occupation							
Farmer/Housewife	*Ref*						
Private business	0.547	0.276	3.947	1	0.047	1.729	1.01 - 2.97
Governmental profession	0.145	0.392	0.136	1	0.712	1.156	0.54 - 2.49
Casual laborer	-0.505	0.630	0.642	1	0.423	0.604	0.18 - 2.07
Family monthly income							
<5000	*Ref*						
>5000	0.036	0.254	0.021	1	0.886	1.037	0.63 - 1.71
Family size	Ref						
1-3							
4-5	0.892	0.264	11.380	1	0.001	2.440	1.45 - 4.10
>-6	0.621	0.378	2.710	1	0.100	1.862	0.89 - 3.90
Number of children alive							
One	*Ref*						
Two	-0.357	0.385	0.862	1	0.353	0.700	0.33 - 1.49
Three and above	-0.817	0.406	4.054	1	0.044	0.442	0.20 - 0.98

Furthermore, findings subjected to Logistics Regression as shown in table 5, revealed that there was a significant association between maternal occupation (Private business) of the mothers and uptake of the vaccine among children under 5 in Ebonyi State (OR = 1.729, CI = 1.01 – 2.97, P = 0.047 < 0.05). This implies that the mothers who do private business were 2 times more like to have good uptake of MCV 2 vaccine compared to the farmers/housewives.

Discussion

The objective of this research is to identify the socio-demographic factors affecting the uptake of second dose of measles vaccine (MCV2) in Ebonyi state as well as explore the available opportunities of mitigating the challenges faced by parents or caregivers in accessing the MCV2 in Ebonyi state. The results show that majority of the caregivers that participated in the study fell within 26 and 35 years of age.

Chi square and Logistics Regression analysis as shown in table 5 confirmed that majority of the socioeconomic and demographic factors do not have significant association with uptake of the vaccine among children under 5 in Ebonyi State, however result presented in table 5 has revealed a significant association between maternal occupation (Private business) of the mothers and uptake of the vaccine among children under 5 in Ebonyi State (OR = 1.729, CI = 1.01 – 2.97, P = 0.047 < 0.05). This implies that the mothers who do private business were 2 times more like to have good uptake of MCV 2 vaccine compared to the farmers/housewives. This result is consistent with a study in Ghana that examined the Socioeconomic and demographic characteristics influencing the hesitancy and refusal of COVID-19 vaccine, [39] the team discovered that there was higher odds of vaccine hesitancy and refusal among people the unemployed. Among other factors.

Ignorance of the second dose is the most significant barrier affecting the uptake of second dose of measles vaccine in addition to forgetfulness, unavailability of the vaccine in the facility, assumption that the first dose is adequate for the child, relocation, frequent cancellation of immunization sessions, being indisposed to go the facility and children getting sick after the first dose.

Owing to the fact that ignorance has been observed to be the most dominant factor, a vice that can only be overcome with knowledge, efforts should be channeled into putting out relevant information about the availability and necessity of the vaccine (MCV2) through direct communication. The ability to present relevant and available information to people, ensuring that the right information reaches the end user will help in militating ignorance of the second dose of the measles vaccine. In a review, certain aspects of community engagement itself, such as conducting stakeholder consultations, holding community dialogues or involving community leaders were associated with better immunization outcomes [34]. The team proved that community engagement interventions hold promise for improving child immunization coverage in LMICs. Involving communities in decision-making processes, fostering trust in vaccines, and addressing local barriers to immunization, are interventions that can contribute to achieving equitable immunization coverage and reducing vaccine-preventable diseases in vulnerable populations. In conclusion, they stated that community engagement interventions are successful in improving outcomes related to routine child immunization [34].

This analysis also shows forgetfulness, children getting sick after the first dose and assumption that the first dose is enough for the child as factors that affect the uptake of (MCV2). Many parents and caregivers tend to forget immunization schedules and assume that the first dose is sufficient for the child due

to busy work schedules while some tend to develop apathy because the child got sick after the first dose. Health care workers have been recognized as the primary source of vaccine information [17]. Parents need reassurance and information about the addition of any new vaccines to the schedule, the likelihood of developing post – immunization fever and post-immunization management [17]. Emerging evidences suggest that provider-parent communication is important to achieving childhood vaccine coverage. A child's provider is consistently cited as a key factor in parental vaccine decision-making and is a trusted source of vaccine information [35]. The team also discovered that many health care providers did not give a rational for the vaccine(s) recommended neither did they discuss the potential side effects of the recommended vaccines and how to manage it. Therefore, the need to train healthcare providers on how to effectively communicate with patients about the vaccine (relevance and schedules), addressing concerns and providing evidence-based information to help individuals make informed decisions about vaccination.

Unavailability of the vaccine at health care facilities is interestingly, a barrier that affects the uptake of (MCV2). This is due to poor stock management, delay in stock delivery and poor communication between the depot and the facilities. Suggestion about certain interventions such as ensuring regular and timely delivery of vaccine stocks at facilities; notifying facilities timely in case of delays in deliveries or when there are expected; providing clear guidelines to facilities and officials responsible for stock management; visits by the district or sub-district managers to the health facilities; effective supportive supervision and refresher training for health workers in the facilities and their managers on vaccine stock management [36].

Relocation has been identified as a socio-demographic factor that significantly disrupts the continuity and timely administration of vaccines such as the measles vaccine especially the MCV2. Addressing relocation as a barrier to vaccine uptake encourage the use of national or regional Immunization Information System (IIS) registries that can track and retrieve vaccination records regardless of where patients move [37]. In a thesis done by Bryant "Electronic Health Records and Immunization Information Systems Interoperability: Measuring Impact on Immunization Outcomes" also corroborates the fact that Electronic Health Records (EHRs) improves vaccine coverage and timelines [38]. Stating succinctly that interoperability between EHRs and IIS leads to higher vaccination rates, better adherence to vaccination schedules and patients also receive timely reminders and follow-ups, to ensure they complete their vaccine series. It will also aid in transferring health records when patients move to another place and in ensuring that patients receive the appropriate vaccinations at the right time, reducing the risk of missed doses and improving overall vaccination rates.

Conclusion

The sociodemographic characteristics that significantly has no association with MCV 2 vaccine uptake include age of the mother. maternal educational status, family monthly income, family size, and number of children alive. The study produced results that showed significant association between maternal occupation and vaccine out of stock at the health facility with low uptake of MCV2. It is pertinent that health education on the importance of MCV2 be intensified.

Conflict of Interest

None of the authors declared any conflict of interest.

Acknowledgements

I wish to appreciate all that offered various levels of support to make this study a success. My profound gratitude goes to all the co-authors, (Dr Charity Anoke, Dr Paul Olaiya,

Dr Miracle Ogbu, and Dr. Onyinyechi Grace Okoro) for making a wonderful and proactive team. Many thanks to Ebonyi State Emergency Routine Immunization Coordination Centre (SERICC) team, the Routine Immunization Officers (RIOs) and the Primary Health Care Facility OICs, for their huge support during data collection. My thanks go to the caregivers that participated in the study, for their willingness to give their time and freely volunteer information. A big thank you Mr James Orioha, Favour Njoku and Victor Odeffa for making themselves available to review this work. What would I have done without the support of my family; I appreciate your love and care. You have managed the home so well that I experienced minimal distraction. A bunch of thanks to Onyi, Udonna, Toochukwu, Idinmachi, and Peace. Finally, I give my special thanks to my darling husband, who has been a pillar of support to me throughout the period of this study, thank you darling for making do with whatever the children cooked and for preparing many of the family meals, I will soon be back to fully taking charge of my kitchen. To God Almighty, I give every glory and praise.

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https://doi.org/10.1177/25151355221149336

Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art016

Effectiveness of the Interventions of TB and HIV Control in Zambia: A Systematic Review

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Abstract

The purpose of the research paper was to investigate the effectiveness of the interventions of TB and HIV control in Zambia. The research had the objectives to 1) identify the current TB and HIV control mechanisms in Zambia, 2) to find out the prevention and curative activities on the incidence and fatality of TB and HIV in Zambia and 3) to analyse the contents of the government policy provisions that address TB and HIV in Zambia. A mixed design was used for the research, in this regard two data sources were of significance to the research i.e. the primary and secondary data. The primary data was collected from the sample of 314 health personnel from the Copperbelt Regional offices and the National Aids Council who were randomly selected. Semi-structured questionnaires were used to collect primary data. In addition, primary data was collected for systematic review. The quantitative primary data was analysed using SPSS version 25 and thematic analysis was used for qualitative data. This systematic review followed the guidelines described in the Cochrane Handbook and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The findings indicate that the effectiveness of the interventions of TB and HIV control in Zambia is positively significantly correlated with TB and HIV control mechanisms (r = 0.507), prevention and curative activities (r = 0.279) and government policy provisions (r = 0.465)

Keywords: *Control, Effectiveness, HIV, Interventions, TB.*

Introduction

The research paper investigated the effectiveness of the interventions of TB and HIV control in Zambia. Zambia's intervention programs aim at eradicating TB and HIV by the year 2030. The initiative concentrates on leveraging supplementary resources from countries, international private-sector partners, and other local organizations for the purposes of meeting the targets. The interventions have been carried out in the country across all the districts, aiming at communities that are highly burdened with TB, people living with HIV, children, and personages living in congregate settings for instance, prisons. From time and again, the Ministry of Health has partnered with various organizations international and local and this calls for the need to find out how effective these interventions have been so that improvements can be done where they need to [1].

The study objectives are to:

1. To identify the current TB and HIV control mechanisms in Zambia.
2. To find out the prevention and curative activities on the incidence and fatality of TB and HIV in Zambia.
3. To analyse the contents of the government policy provisions that address TB and HIV in Zambia.

With regards to the study significance, the findings of the study will inform policy formulation, evaluation, and implementation in the area of intervention in health services in general and TB/HIV services specifically with respect to the transferable findings that can be

Received: 24.04.2024 ***Accepted: 30.05.2024*** ***Published on: 30.07.2024***
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applied in similar settings. In addition, the study will add to the body of knowledge.

Literature Review

Literature

Eligibility Criteria

The records were reviewed by the researchers to determine whether the search results met the following criteria: (1) published in peer-reviewed journals in English prior to November 2011; (2) focused on qualitative or quantitative studies of TB and HIV intervention programs with focus on Zambia; and (3) investigated the government policy provisions addressing TB and HIV.

Data Extraction

Data was extracted and coded using structured tables containing ten defined fields. The define field incorporated the participants' characteristics, location and setting, research design, and the effects of the programs. The participants' characteristics included the gender and age of the sample. The research design included such fields as sample size, study design, and type of TB and HIV intervention. The researcher and the research assistant worked independently to extract data from each article and then reconciled their responses for the purposes of checking for consistency.

Search Results

Initially, the search generated 18,000 studies related to HIV interventions and 15,900 studies related to TB interventions. Upon exclusion of duplicates, 11,000 remained for HIV and 12,000 remained for TB. In defining the search with regards to year of publication 486 studies were returned for HIV and 329 for TB. The researcher and the assistant carried out a three-step screening of the citations and the year of publication. As such at the title of publication review stage 405 studies were found not to be directly associated to HIV interventions in Zambia and 218 studies were found not to be directly associated to TB interventions in Zambia. This left 81 studies for HIV interventions and 111 studies for TB interventions. At the time of screening abstracts, 22 studies were found to be directly relevant to HIV interventions in Zambia and 22 for TB interventions. A manual search was carried out in the references of the remaining articles, resulting in the discovery of 3 articles on HIV interventions and 3 articles on TB interventions that met the inclusion criteria. In total, 28 articles on HIV interventions and 25 on TB interventions were deemed eligible for inclusion.

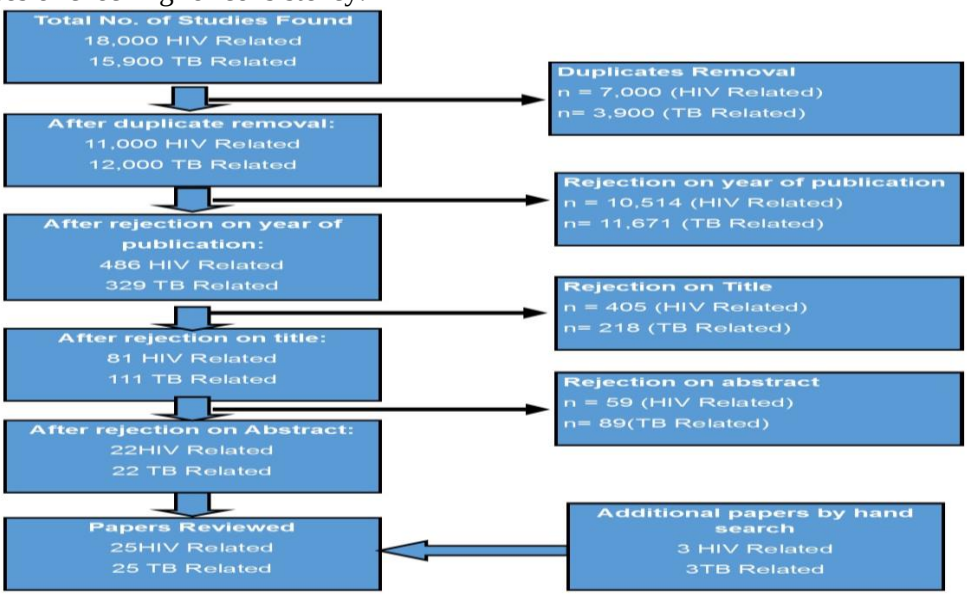

Figure 1. Review Protocol

Reviewed Studies

HIV/AIDS

Table 1 outlines some of the reviewed studies of the 25. The reviewed studies reviewed various HIV interventions, for instance, Behavioral risk reduction intervention, Couple voluntary HIV counseling and testing (CVCT) and condom use (among others). The studies targeted various populations and used a number of study designs

Table 1. Research Setting of the HIV Studies

#	Author and publication year	Geographic location	Year data collected	Target population	Sample size	Study design/method	HIV Intervention
1.	Vamos et al[2].	Lusaka	2015	Community health centers staff	82	Survey	Behavioral risk reduction intervention
2.	Kelley et al.[3]	Lusaka (Zambia) and Kigali (Rwanda)	2004	Men. 15-60 Women. 15-49	Rwanda: n = 600 Zambia: n = 603	Quantitative study: Questionnaire survey. Cross-sectional study.	Couple voluntary HIV counseling and testing (CVCT).
3.	Chitalu et al[4]	Lusaka	March 2009 to March 2012;	Couples in urban communities	240	Experimental (baseline assessment)	Behavioral interventions (condom use)
4.	Qiao et al.,[5]	Zambia	literature published prior to November 2016	1,819 articles	32 Articles	Systematic Review	HIV testing
5.	Shanaubea et al.[6]	Zambia	October 2016 to December 2017	12 communities in Zambia	2100 adolescents	cluster-randomized trial	PopART
6.	Bond et al.[7]	Zambia and South Africa	2012 to 2018	1547 participants	1127 observations.	Cluster-randomised trial (CRT	ART
7.	Leiby et al.,[8]	Lusaka	May to October 2014	uncircumcised males	2312 uncircumcised males aged 15–30	Randomized controlled trial	VMMC uptake
8.	Herce et al.[9]	Lusaka	study outcomes before (June 1, 2010—January 31, 2011) and after (August 1, 2011—March 31, 2012)	473 patients with HIV-associated TB	pre- (n = 248) and post-intervention (n = 225) cohorts.	quasi-experimental design	integrated HIV treatment and care

9.	Pry et al.[10]	Lusaka	1 January—30 June 2020	59 HIV care facilities	101 371 individuals	Experimental	HIV treatment and care
10.	Brooke et al[11]	Rural Macha	2010 and 2011	85,000 simulations	539 simulations	Mathematical modeling	Prep
11.	Limbada et al.[12]	Lusaka	May 5 and Dec 19, 2017	Two urban communities in Lusaka,	2489 participants were enrolled into the trial: 781 in the SoC group, 852 in the HBD group, and 856 in the AC group.	three-arm, cluster-randomised, non-inferiority trial	viral suppression (ART)
12.	Moyo et al.,[13]	Copperbelt Province	2010 to 2019	monthly data of HIV/AIDS cases from the Ministry of Health	120 observations	time series modeling	Mandatory HIV Testing (government policy provisions)
13.	Jones et al.[14]	Lusaka	2013	446 couples living with HIV attending community health clinics (CHCs).	223 heterosexual couples	Descriptive survey	ART adherence
14.	Chatora et al.[15]	Lusaka	2017	Lusaka based companies	128 randomly selected member companies of Zambia Federation of Employers	A mixed method assessment	Workplace policy
15.	Tiwari, et al.[16]	Zambia	July 2010 and December 2019.	29,980 studies	76 studies	systematic review and meta-analysis	Sexual behaviour change
16.	Pinchoff et al.[17]	Lusaka, Chilanga, Chongwe and Kafue	November 2015 to January 2016	g sexually active young adults ages 18–24	2,388 individuals	household cross-sectional survey	Condom use

17.	Gumede-Moyo et al.[18]	Zambia	2010 to 2015	all pregnant women who attended antenatal care in the 889 health facilities	104 155 pregnant women	Retrospective cohort study	PMTC

TB Interventions

Table 2 outlines some of the reviewed studies of the 25 that studied various TB interventions.

Table 2. Research Setting of the TB Studies

#	Author and publication year	Geographic location	Year data collected	Target population	Sample size	Study design/method	TB Intervention
1	Melgar et al.[19]	Copperbelt and Lusaka provinces	October 2018	Adults and children living with HIV	482 records of individuals diagnosed with HIV (including 128 children). Excluding two individuals diagnosed with tuberculosis before enrolling in HIV care	Cross-sectional survey	case-finding and prevention
2	Hatwiinda et al.[20]	Lusaka, Livingstone and Kabwe	2010-2011	Six large Zambian prisons:Lusaka Central Prison, Livingstone Central Prison andthe four prisons in the Kabwe Complex incorporating:Kabwe Maximum, Kabwe Medium, Kabwe Female and the Kabwe Open Air Prison	6282 inmates	Descriptive survey	TB diagnosis and treatment in Zambian Prisons
3	Cremers et al.[21]	Lusaka (Kanyama clinic)	2015	TB patients	300 TB patients	Mixed methods	DOTS
4	Podewils [22]	Copperbelt and North-Western provinces	2014-2018	Ex-mineworkers and healthcare workers (HCWs) in Zambia.	2,792 mineworkers and 94 HCW	mixed-methods	TB care and policies

5	Nanzaluka et al.[23]	Lusaka	1st January to 31st December, 2015	all TB cases on treatment	1,724 registered TB patients,	Descriptive	Tuberculosis treatment
6	Kerkhoff et al[24]	Lusaka	2021	consecutive adults with newly microbiologically-confirmed TB	401 patients	Experiment	Home Based Care
7	Toyama[25]	Lusaka	September 2014 and February 2015	community volunteers	74 community volunteer	cross-sectional study	community volunteer involvement
8	Herce et al [26]	Lusaka	June 1, 2010-January 31, 2011 And August 1, 2011-March 31, 2012	All new or relapse HIV-positive TB patients	473 patients with HIV-associated TB	quasi-experiment	Integrating HIV care and treatment into tuberculosis clinics
9	Kagujje et al.[27]	Lusaka	n July 2017 and December 2018	Walk in George health Facility clients	18,194 individuals	Descriptive survey	TB case finding
10	Chongwe et al.[28]	Lusaka, Central and Copperbelt provinces,	2012	all private health facilities in the country	157 health facilities	Cross-sectional survey	Private sector DOTS
11	Lungu et al [29]	Zambia	2018 to 2020	TB notifications in the patients ages 45 and above	All TB notifications	Retrospective study	Case detection
12	Mutanga et al.[30]	Southern province	2018	All TB patients	25,533 TB patients	Retrospective cohort study	TB treatment
13	Mweemba et al. [31]	Lusaka	2014	Pulmonary PTB patients	104 pulmonaryPTB patients	Descriptive study	TB treatment compliance
14	Lungu et al [32]	Zambia	2018	All individuals with active TB disease in Zambia	72 495 TB patients	Retrospective cohort study	Gap identification

Tb Control Mechanisms

Hachiboola [33] outlines that the Ministry of Health in Zambia aims to control TB by reducing morbidity, mortality and transmission of the disease, while preventing the development of drug resistance strains of M. tuberculosis. The essential strategies to control TB include: i) preventing the infection, ii) stopping the progression from latent to active TB, and iii) treating the active disease [34].

Prior to the development of anti-TB drugs, TB control focused mainly on prevention [35]. The discovery of anti-TB drugs in the 1940s revolutionalised TB control and from the 1950s, truly effective public health measures became possible with treatment to cure being the goal of TB control globally. Initially, treatment consisted of a standard 18 month regimen with a combination of anti-TB drugs. This was subsequently reduced to 6 months duration following the development of improved anti-TB drugs in the 1970s [35]. As a result of improved living conditions and availability of anti-TB drugs, TB control became effective in most industrialised countries. Subsequently, TB slipped from the international agenda and effective control became the responsibility of each country.

HIV Prevention and Control in Zambia

Various combinations of HIV prevention strategies have been implemented in Zambia, as outlined in the country's National AIDS Strategic Framework [36]. These strategies include:

1. Social and Behavior Change Communications (SBCC), aimed at altering behaviors of individuals and the community at large.
2. Comprehensive Condom Programming, aimed at promoting condom use among the general population.
3. Voluntary Medical Male Circumcision (VMMC), aimed at increasing male uptake of MC. The Ministry of Health (MoH) covers the costs by providing it free of charge in health centers.
4. HIV Testing Services (HTS) encouraged and provided free of charge by the Ministry of Health and its partners.
5. Pre-Exposure Prophylaxis (PrEP) which is administered to the HIV vulnerable population as a preventive mearsure, for instance the discordant couples.

Government Policy Provisions that Address TB and HIV (2016 -2021)

The Zambia government over the years has partnered with a number of organizations in coming up with a number of policies that have been documented in policy documents. For instance, some of the notable policies include immediate starting of ART for any individual who tests positive to HIV and ever firm to have a TB and HIV prevention program [36].

Hypotheses

The research hypothesizes that the independent variables (TB and HIV control mechanisms, government policy provisions and preventive and curative activities) are associated to the dependent variable (intervention effectiveness). These assumptions are presented as:

1. H1: There is a positive relation between TB and HIV control mechanisms and intervention effectiveness.
2. H2: There is a positive relationship between government policy provisions and intervention effectiveness.
3. H3: There is a positive relationship between preventive and curative activities and intervention effectiveness.

Methodology

Logic of Inquiry

Mixed methods were used as the research strategy incorporating concurrent triangulation; this meant collecting both quantitative and qualitative data simultaneously. The strategy was intended for model testing and in-depth understanding of phenomena [37]. The basis for this choice was three-fold. Firstly, because there was existing literature from which a conceptual model and hypotheses could be developed, a quantitative study was deemed appropriate for model testing. The quantitative research ensured that highly structured and objective methods were employed in order to test hypotheses, facilitate research replication and generalise findings.

The research study employed two research designs: descriptive and correlational. The descriptive design was chosen to accurately depict the current state of affairs. The correlational design enabled the researcher to evaluate the relationships between two or more variables [37]. A descriptive survey design, incorporating mixed methods, was utilized in the research. Both quantitative and qualitative data were collected through the use of a semi-structured questionnaire.

Research Setting and Participants

The study targeted health personnel from the Copperbelt regional offices (i.e. Ndola, Kitwe and Chingola) and National Aids Council. The targeted respondents were those involved in the TB and HIV intervention programmes which was estimated at 2500. Simple random sampling was used in selecting 377 respondents and the sample size was determined used Raosoft online calculator.

Methods And Procedure of Data Collection

At the beginning of data collection, identified respondents were served with consent form that explained the nature and purpose of the research. After signing the consent form, they were given either a printed copy of the questionnaire or were given a link to the softcopy questionnaire. The questionnaire was semi-structured that contained provisions for collecting data on the profile of the respondents, TB and HIV interventions and government policy provisions.

Methods and Procedure of Data Analysis

The data collected from the respondents was sorted and edited for analysis. The questionnaires were organized and classified according to the patterns given by the respondents. Inferential and descriptive and statistics were used in the analysis of the data. Quantitative data was recorded and analyzed by the use of Statistical Package for Social Sciences (SPSS) version 25. For qualitative data, thematic analysis was used.

Ethical Issues

The researcher observed the following.

1. Protection from harm: There are a number of ways in which participants can be harmed: physical harm, psychological harm, emotional harm, embarrassment (i.e., social harm). The research made sure that no harm occurred to the voluntary participants and that each and every participant had made the decision to assist her with full information as to what was required. Those who choose not to participate were also given the same information on which they made their decision not to be involved.
2. Voluntary Participation: Participation in the research was voluntary, and there was no coercion or deception.
3. Informed Consent: The researcher guaranteed that potential participants comprehensively understood the tasks they were asked to perform and were informed of any potential negative consequences of participation. The informed consent document provided detailed information about the research, and all participants were required to sign it before taking part in the study.
4. Confidentiality and Anonymity: no participant was known on a personal basis and in as much as electronic questionnaires were used, they were designed in such a way as not to leave a trace record of the respondent be it email or phone number. The responses were used for academic purposes only.
5. Plagiarism: Citations were included for every source of information used in the research. For the systematic review, it adhered to the protocols outlined in the Cochrane Handbook (Higgins & Green, 2008) and followed the Preferred Reporting Items for Systematic Reviews

and Meta-Analyses (PRISMA) guidelines [38].

Results and Discussion

This section presents the results obtained from the analysis of the primary data collected. Researchers predicted that the independent variables (TB and HIV control mechanisms, government policy provisions and preventive and curative activities) are positively associated to the dependent variable (intervention effectiveness). The results depict that relatively low correlations between the variables are shown. The study included hierarchical regression tests that were aimed at determining the applicability of the conceptual model.

This research was aimed at examining the effectiveness of the interventions of TB and HIV control in Zambia. The effectiveness has been determined by the primary and secondary data collected.

Correlation analyses

Pearson correlation analysis was conducted to assess the strength and direction of the relationships between variables. Table 3 displays the correlations, means, and standard deviations of the dependent variables (TB and HIV control mechanisms, prevention and curative activities and government policy provisions) and independent variable (interventions effectiveness).

Table 3. Correlations Amongst Variables

Variable		**N**	**Mean**	**Std. Dev**	**1**	**2**	**3**	**4**
1.Interventions Effectiveness	Pearson Correlation	314	3.678	1.055				
2.TB and HIV control mechanisms	Pearson Correlation	314	4.035	0.617	0.507**			
3.Prevention and Curative Activities	Pearson Correlation	314	3.061	0.758	0.279**	0.396**		
4.Government policy provisions	Pearson Correlation	314	3.407	0.670	0.465**	0.612**	0.280**	
**. Correlation is significant at the 0.01 level (2-tailed).								

The results in Table 3 depict correlations that are relatively low with regards to the variables i.e. each and every one of them is below 0.8. This gives an indication that multicollinearity is not a problem (Tabachnik et al., 2017). The table also depicts that interventions effectiveness is positively significantly correlated withT B and HIV control mechanisms (r = 0.507), prevention and curative activities (r = 0.279) and government policy provisions (r = 0.465).

Hierarchical Regression Analyses

Table 3 is a presentation of the hierarchical regression results. It depicts the control variables and the independent variables that have been added to model containing the independent variable.

Table 4. Hierarchical Regression

Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**VIF**
	Beta, t	**Beta, t**	**Beta, t**	**Beta, t**	
Control Variables					
Education	0.017*, 0.278	0.100, 1.833	0.219*, 0.166	0.205*. 0.947	1.125

Years of Service	0.277*, 3.831	0.221, 3.496	0.305, 4.854	0.307, 0.037	1.524
Independent Variables					
TB and HIV control mechanisms		0.505***, 9.363	0.435*, 8.131	0.378*, 6.583	1.107
Prevention and Curative Activities			0.289**, 5.046	0.264*, 4.599	1.357
Government policy provisions				0.262***, 2.549	1.701
R	0.250	0.541	0.595	0.608	
R Square	0.062	0.293	0.354	0.370	
Adjusted R Square	0.049	0.280	0.340	0.353	

***sig < 0.001 (0.1 percent); **sig < 0.01 (1 percent); *sig < 0.05 (5 percent); VIF = Variance Inflation factor.

For the purposes of evaluating the ability of the multiple regression model (where TB and HIV control mechanisms, prevention and curative activities and government policy provisions) are the explanatory variables to predict (interventions effectiveness) after controlling for education level and years of service, hierarchical regression analysis was carried out. Table 4 gives a depiction of the results with interventions effectiveness as a dependent variable. The preliminary checks from Table 4 give an indication that multicollinearity is not a problem for the reason that the variance inflation factor (VIF) values were lower than 5 for the independent and control variables [39]. Further, each and every regression coefficients are in the anticipated positive direction.

Model 1 shows the base model with two control variables only i.e. education level and years of service. The control variables make a combined significant contribution of adjusted multiple coefficients of determination (R-Square) of 4.9 percent and multiple correlation coefficient of (R) 0.250, representing a combined small effect size.

In the 2nd model i.e. model 2, TB and HIV control mechanisms is added to the control variables and a significant combined effect happens (adjusted R2 = 28.0 percent from 4.90 percent), with R = 0.541 representing a combined medium effect size. For TB and HIV control mechanisms, this entails that the more control mechanisms are carried out in a manner that conforms to the health regulations, the more they will add to the effectiveness of the interventions. As such, hypothesis 1 which postulates that there is a positive relation between TB and HIV control mechanisms and intervention effectiveness has been supported.

In the 3rd model, i.e. model 2, prevention and curative activities firm is added to the control variables and TB and HIV control mechanisms, a significant combined effect happens (adjusted R2 of 34.0 percent from 28.0 percent), with R = 0.595 representing a combined medium effect size. As such hypothesis 2 which postulates that there is a positive relationship between government policy provisions and intervention effectiveness has been supported.

In the 4th model, i.e. model 4, in addition to control variables, TB and HIV control mechanisms and, prevention and curative activities, another variable i.e. government policy provisions is added and a significant combined effect occurs (adjusted R2 = 35.3 percent from 34.0 percent), with R = 0.608 representing a combined medium effect size. As such hypothesis 3 which postulates that there is a positive relationship between preventive and curative activities and intervention effectiveness has been supported.

The findings have revealed that the prominent control mechanisms for TB include case detection, routine screening and frequent checkups. Though there are few health personnel which posses a challenge in the

control of TB and HIV. The HIV control mechanisms include Social and Behaviour Change Communications, Comprehensive Condom Programming, Voluntary Medical Male Circumcision and HIV Testing Services. Also, Pre-Exposure Prophylaxis and Post-Exposure Prophylaxis.

The prominent TB curative activities are advocating for TB treatment adherence while being on a healthy diet. The same applies for HIV where ART adherence is ideal. The government has for some time partnered with various organizations in the drawing up of policy documents. For instance, the government has partnered with USAID, PEPFAR, UKAID, WHO (among others).

The effectiveness of the interventions of TB and HIV control in Zambia is positively significantly correlated with TB and HIV control mechanisms (r = 0.507), prevention and curative activities (r = 0.279) and government policy provisions (r = 0.465). This implies that for the interventions to be more effective, TB and HIV control mechanisms, prevention and curative activities and government policy provisions should not be developed in isolation but the three should be developed together. As their improvements will lead to interventions to be more effective and the reverse is also true [40].

Table 5depicts the main results on the reviewed studies that studies various HIV and TB interventions ranging from VMMC uptake, Behavioral change, ART, Prep (among others) for HIV and, TB screening and treatment for TB.

Table 5. Main Results of the Studies

#	STUDY	INTERVENTION	FINDINGS
1	Leiby et al.**Error! Reference source not found.**	VMMC uptake	The self-reported VMMC uptake at six months was 11.6%, 12.6%, and 10.4% in the Conventional, Tailored, and control arms, respectively; verified uptake was 1.8%, 1.1%, and 1.5%. Using multivariate logistic regression, the adjusted odds ratio of self-reported VMMC uptake was 1.17 (95% CI: 0.80 to 1.72) in the Conventional campaign arm compared with the control arm and 1.24 (95% CI: 0.84 to 1.81) in the Tailored campaign arm. The adjusted odds ratios of verified VMMC uptake in the Conventional and Tailored campaign arms were 1.34 (95% CI: 0.45 to 4.02) and 0.67 (95% CI: 0.20 to 2.23), respectively.
2	Chitalu et al.**Error! Reference source not found.**	Behavioral change	Changes in acceptability had the most significant overall impact on condom use, with social support, relationship consensus, and willingness to use condoms following closely behind. However, changes in self-efficacy, IPV, negotiation, and information showed no effect. These findings underscore the value of multidimensional approaches in behavioral interventions and emphasize the need to identify crucial elements of interventions to maximize risk reduction outcomes. A significant positive relationship between changes in sexual behaviour acceptability and weekly condom use was found. A 1-point increase in the acceptability of male condoms was associated with a 5% increase in condom use (standardized β = 0.228). Social support positively impacted weekly condom use, such that a 1-unit increase in social support was associated with a 2% increase in condom use (β = 0.211).

			Willingness to use male condoms also impacted condom use, such that a 1 point increase in willingness was associated with an 7% increase in use ($\beta = 0.146$). No interactions were significant, and self-efficacy did not impact condom use in multivariable analysis.
3	Melgar et al.**Error! Reference source not found.**	TB Screening	About 482 records of individuals living with HIV were examined, including 128 children. Excluding two individuals diagnosed with tuberculosis before enrolling in HIV care, 93.4% underwent tuberculosis symptom screening. Of those screened, 4.7% were diagnosed with tuberculosis disease, and 95.3% were eligible for Tuberculosis Preventive Therapy (TPT), of whom 24.7% initiated TPT. TPT initiation was lower among eligible children (7.7%) compared to adults (25.2%, $p = 0.03$), and among Copperbelt residents (3.1%) compared to Lusaka residents (35.8%, $p < 0.01$). The TPT completion rate was 38.4% among people living with HIV who initiated the 6-month course. Among interviewed healthcare workers, 58.3% (unweighted) incorrectly stated the number of symptoms required for a positive tuberculosis symptom screen, 83.3% (unweighted) reported insufficient isoniazid stockpile for completion at the time of TPT initiation, and only 27.3% (unweighted) reported receiving TPT-specific training
4	Nanzaluka et al**Error! Reference source not found.**	TB treatment	A total of 1,724 registered TB patients were included in the study, with 694 (40%) from an urban clinic, 654 (38%) from a 1st Level Hospital, and 276 (22%) from a peri-urban clinic. Of all patients, 43% experienced unfavorable outcomes. These outcomes included treatment failure (0.3%), loss to follow-up (5%), death (9%), and not evaluated (29%). The odds of unfavorable outcomes were higher among patients over 59 years old (AOR=2.9, 95% CI: 1.44-5.79), relapse cases (AOR=1.65, 95% CI: 1.15-2.38), patients treated at the urban clinic (AOR=1.76, 95% CI: 1.27-2.42), and TB/HIV co-infected patients (AOR=1.56, 95% CI: 1.11-2.19).

Conclusion

To conclude, the current TB and HIV control mechanisms in Zambia include case-finding, case detection, diagnosis, community volunteer involvement, gap identification, stigma reduction and Health care provision (for TB). For HIV, the prominent control mechanisms include behavioural change, Couple voluntary HIV counseling and testing (CVCT), condom use, Differentiated service delivery (DSD), VMC, Stigma reduction and Self-testing.

For the prevention and curative activities on the incidence and fatality of TB and HIV in Zambia they include DOTs, Integrating HIV care and treatment into tuberculosis clinics and TB treatment compliance (for TB). While ART and Prep are the prevention and curative activities for HIV.

With regards to the government policy provisions that address TB and HIV in Zambia, the government has made it mandatory for HIV testing in all the government health centers. In addition, it is a requirement by the government

that every individual who tests positive to HIV and TB to start ART and TB treatment respectively. In addition, it has become a mandate that every organization is to have a policy that is aimed at reducing the spread of HIV and TB.

Further, the research aimed at examining the effectiveness of the interventions of TB and HIV control in Zambia. As such it has been depicted that TB and HIV control mechanisms, government policy provisions and preventive and curative activities are positively associated to intervention effectiveness. Improvements in the interventions will lead to the interventions being more effective. As such the national statistics, the primary and secondary data findings depict that the interventions of TB and HIV control in Zambia have been effective.

Contribution to Knowledge

This research makes theoretical contributions along three directions the current TB and HIV control mechanisms, the curative activities on the incidence and fatality of TB and HIV, and the contents of the government policy provisions that address TB and HIV in Zambia. Also, how these three are associated to the effectiveness of the interventions. In the first instance, this study finds that the effectiveness of the interventions of TB and HIV should be examined in conjunction with factors at individual and institutional levels.

Suggestions for Future Research

The study has demonstrated the effectiveness of the interventions of TB and HIV can be associated to TB and HIV control mechanisms, the curative activities on the incidence and fatality of TB and HIV and the contents of the government policy provisions. For future research is required to:

1. Explore other elements of the health system (financing, information technology, pharmaceutical management and supply of medical technologies) involved in the interventions process not fully covered in this study.
2. Ascertain TB and HIV patients' perspectives on the challenges in accessing HIV services after testing for HIV.
3. Access the extent of partner notification after testing for HIV as a preventive method.
4. Determine how to adopt a system-wide approach in the interventions process and in service delivery by involving other key actors including those outside the health sector.
5. Uncover innovative ways to improve and sustain the existing trust between all the key actors involved in the interventions process and in service delivery.
6. Use actual health data on HIV and TB from the communities.

Conflict of Interest

The author declares that there are no conflicts of interest.

Acknowledgments

Special thanks go to Texila American Unversity for awarding me the opportunity to study PhD in Public health.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art017

Investigation into Succession Plan in the Chieftaincy Institution of the Savannah Region of Ghana: A Case Study of Kingship (Overlord) of the Gonja Kingdom

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Abstract

Kingship, a social phenomenon across the globe has been recognized and established in many countries. Kingship is believed to be the genesis of evolution of social leadership in the community, family, clan, and or tribe. In many jurisdictions, it is a preserve for the royal family who hailing from patrifiliation or matrifiliation. In the case of the Gonja Kingdom, the King (Yagbonwura) as he is called succeed the Kingship through patrilineal lines. Unlike the Ashantis in Ghana, succeed the Kingship through the matrilineal lines. In the United Kingdom (UK), Charles III is the King of Great Britain. In Africa, we have Mswati III the Ngwenyama King of Eswatini formally known as Swaziland. This paper focus to ascertain whether or not the Kingship succession of Gonja is conflict free or otherwise. The methodology of the research, applied both qualitative and quantitative research methods. Observation, interviews, focus group discussions were employed in data collection. The research reveals that, Kingship in the Gonja Kingdom is conflict free in Ghana. It is highly revered, upheld and considered one of the sacred institutions. Every King automatically has followers and subjects who serve the Kingship within a defined jurisdiction.

Keywords: *Customs and Traditions, Chieftaincy Succession, Gonja Kingdom, Kingship and Chieftaincy.*

Introduction

Gonja, according to Goody comprise of three estates- the royals or people of royal descent (Ngbanya), the Moslem estate and the commoners (Nyamase) [1].

Though these internal distinctions exist and count for somethings, they are not very apparent to the outsider. Centuries of intermarriage mediate the distinctions together with a cognatic mode of reckoning descent, which permits the individual wide latitude in the tracing of his ties through patrifiliation and or matrifiliation to royals, Moslems and commoners. This go hand in hand with a system of kinship fosterage. History has it that Sumaila Ndewura Jakpa (SNJ) is the founder of the Gonja Kingdom.

Gonjas are believed to come from the land of Mande a community in the Mali empire. SNJ entered the area through western Gonja in a community called Sakpa in the Bole district.

According to [2] suggested that the Mande intervention may not have begun with Jakpa, although the latter brought it to its climax. Dickson in his scholarly work named Nabaga as the first leader or King of the Gonjas and that he is the initiator of the conquers expedition.

This ethnic group called Gonja belong to the KWA or GUAN group and they form majority of the Guan extraction in modern day Ghana according to [20].

Received: 16.07.2024 ***Accepted: 23.07.2024*** ***Published on: 30.07.2024***
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In today's country Ghana, Gonjas at the end of the conquers founded a Kingdom called the Gonja Kingdom. The Kingdom formed the Savannah region of Ghana today. The Gonja Kingdom has the largest land under its jurisdiction. The land covers about 15% of Ghana's landmass.

The Gonja Dynasty or monarch operates a centralized system of traditional political governance where the Yagbonwura (King) the allodial title holder of all Gonja lands is the head and under his auspices are traditional policies on culture, customs, traditions, values, norms and matters affecting chieftaincy are discussed for an enhanced future.

Research Hypothesis

1. Kingship succession of the Gonjas per tradition breeds conflict in Ghana (Ho)
2. Kingship succession of the Gonjas per tradition don not breed conflict in Ghana (Hi)

Research Objectives

1. To understand the general perspective of Kingship in the Savannah region of Ghana.
2. To examine the level of conflicts that arise during the selection of a King in Gonja Kingdom of the Savannah region of Ghana.
3. To investigate whether the Kingship succession plan has been documented.
4. To ascertain the number of Kings that ascended to the Kingship so far

Problem Statement

Chieftaincy forms part of the social life of the World's community in general. In Europe, Asia, America, (North America, South America and Antarctica), Africa and Oceania/Australia have glimpse of chieftaincy. In Africa, chieftaincy predates colonialism and seen as part and parcel of the folks of the continent and a rousing proponent of social life development.

In Ghana, the institution of chieftaincy is revered and dignified and a core factor of the peace component of the country's development. As a result of the strategic nature and position of chieftaincy, the 1992 Republican constitution of Ghana article 270 guarantee's chieftaincy and its traditional councils. Again, enhancing the chieftaincy institution, saw the inception of the Chieftaincy Act, 2008 Act, 759 as a working document for matters affecting chieftaincy in Ghana. This recognition emanates from the role chieftaincy played during three phases of Ghana's political history thus pre-colonial, colonial and post-colonial eras [3].

In the context of Ghana, article 277 of the 1992 Republican constitution defines a chief to mean a person, who, hailing from the appropriate family and lineage, who has been validly nominated, elected or selected and enstooled, enskinned or installed as a chief or queen mother in accordance with the relevant customary law and usage" [4].

Whereas the chieftaincy institution has successfully been handled in some states, it has been subjected to some punitive and upsetting conditions in other states [5].

In the United Kingdom (UK), for example, the monarch still plays a significant role in national affairs, though his role is symbolic and ceremonial in character. In Africa, the constitution of Uganda abolished kingship and kingdoms in 1966 [5].

Of late in Ghana, and according to [19] the National Security Minister, Hon. Albert Kan-Dapaah published on modern Ghana news portal on 5th May, 2024 said "chieftaincy disputes in particular remain a thorny internal security threat that must be permanently dealt with, adding that it is interesting to note that chieftaincy disputes are a significant portion of the daily situational reports received at the Ministry of National Security"

In the light of these and many more has been the government of Ghana's worry as well as the folks of Ghana, the commoners, royals and even the chieftaincy institution itself. This is so because, in the arena of chieftaincy succession conflicts and or encounters, many lives are lost, huge financial investment of government to

forestall the peace and security of the area, collapse of businesses, human resettlement issues, thwart the progress of education, exposure of the vulnerable (women and children) to environmental dangers etc.

It is therefore against this background that this investigation is bent to focus on the Kingship succession plan of the Gonja people in the Savannah region to unearth it strengths, weaknesses and potentials to provide the best succession plan for the entire Kingdom to avoid chieftaincy conflicts in the Kingdom.

Methodology

Methodology is the study of research methods. It can also refer to the methods themselves or to the philosophical discussion of associated background assumptions. Methodology concerns a detailed description and analysis of the processes. It includes evaluative aspects by comparing different methods. For example, how to conceptualise the studied phenomena and what constitutes evidence for or against them.

Methodology offers the theoretical underpinning for understanding which method, set of methods, or best practices can be applied to a specific case, for example, to calculate a specific result Irny & Rose, [6].

Qualitative and Quantitative technics of data collection were employed in gathering data on the topic under study.

As viewed by [7] quantitative research approach that it emphasizes objective measurements and the statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys, or by manipulating, pre-existing statistical data using computational techniques.

Data Collection

Data collection is the process of gathering and measuring data on target variables of interest in an established system, which then enables one to answer relevant questions and evaluate outcomes. This research focused on data collection tools such as Snowball, Focus Group Discussion (FGD), Key Informant Interviews (KII) and Participant Observation to gather data for analysis.

Below are some data collection tools used:

Snowball: According to [8], Snowball or chain sampling or chain referral sampling is a nonprobability sampling technique where existing study subjects recruit future subjects from among their acquaintances for interview. Thus the sample group is said to grow like a rolling snowball. As the sample builds up, enough data are gathered to be useful for the research. To avoid wide biases in applying Snowball, respondent–driven sampling technique has been merged with Snowball to allow the research to make asymptotically unbiased estimates under certain conditions and to enhance estimates of social network.

Focus Group Discussion (FGD): A focus group discussion involves gathering people from similar backgrounds or experiences together to discuss a specific topic of interest. It is a form of qualitative research where questions are asked about their perceptions, attitude, believes, opinions, or ideas. In FGD, participants are free to talk with other group members. Unlike other research methods, it encourages discussions with other participants. It generally involves group interviewing in which a small group of usually 8-12 people. FGD is led by a moderator (interviewer) in a loosely structured discussion of various topics of interest. According to [9] the technique was developed after World War II to evaluate audience responses to radio programs.

Key Informant Interviews (KII): It is a qualitative in-depth interviews between the range of 15-35 people selected for their first-hand knowledge of a specific perspective of a particular topic of interest. The interview is structured regarding the list of issues or questions to be discussed. It is a form of conversation among acquaintances allowing free flow of ideas and information on a particular matter of interest.

According to [10] KII are framed questions to spontaneously probe for information and notes taking which are elaborated on later.

Participant Observation: is a research method where the researcher immerses him/herself in a particular social setting or group, observing the behaviours, interactions, and practices of the participants. This can be a valuable method for any research project that seeks to understand the experiences of individuals or groups in a particular social context. In a participant observation, the researcher is called a participant-observer, meaning that he/she participate in the group's activities while also observing the group's behaviour and interactions for quality information gathering.

Study Area

The Savannah region is located in the northern belt of Ghana. Its capital is Damongo. The region has a land size of 35,862 square kilometers making it the largest region in Ghana with total population of 653,266 people according to [18]. The region has seven (7) districts which include; Bole, West Gonja Municipal, Central Gonja, North Gonja, Sawla-Tuna-Kalba, North East Gonja and East Gonja Municipal. With respect to the chieftaincy institution, the Savannah region currently has 22 paramountcies across the length and breadth of the region. The region has the black and white Volta rivers transcending across with arable lands quality in cereal, tuber, vegetable agriculture. The young region is a repository of natural endowments such as gold, clinker, salt, hydro-carbons etc. The core delicacy of the people of the region is Tuo-Zafi (T.Z) usually prepared with maize and cassava floor mixed. Damba is the major festival of the people of the region which is celebrated annually by the chiefs and people of the infant region. The Savannah region shares boundary with the Northern and the Upper West regions to the north. To the South is Bono and Bono East regions and to the east is Oti region of Ghana.



Figure 1. A Map Showing the Districts of the Savannah Region of Ghana

Source: Ghana districts.com

Sample Size and Sampling Technique

Sample size is the measure of the number of individual samples or observations used in a statistical setting. It can also be called sample statistics. Sample size is a critical determiner of a project, as it affects the accuracy and reliability of the results of the research. In short, the sample size is the number of people to be surveyed.

Using sample size calculator in determining the sample size with a population size of 80 people, at confidence level of 95% with a margin of error of 5% with population proportion of 50%.

The sample size (n) therefore is 67 people.

Sampling Technique

Online survey or Google form survey and stratified sampling techniques were used to

gather data from respondents in conducting the survey.

The sampling technique is the method employed while choosing a sample from a population. For example, you could select every 3rd person, everyone in a particular age group, and so on. The study was carefully considered and put to perspective before choosing the appropriate sampling technique. The sampling technique has a significant effect on the results. For example, some sampling techniques might be intentionally biased. So, selecting a suitable sampling technique is essential to draw accurate conclusions from the data.

Chieftaincy Institution in Ghana

The chieftaincy institution in Ghana is a system that structures and regulates the activities of local chiefdoms in the Ghanaian society and state. It is an institution that has being recognized by the 1992 Republican constitution of Ghana. Article 270 (1) of the 1992 constitution of Ghana states that the institution of chieftaincy together with its traditional councils as established by customary law and usage, is hereby guaranteed" [4].

To strengthen chieftaincy in Ghana, the noble institution is further regulated by the chieftaincy Act, 2008 Act 759. The act regulates how matters affecting chieftaincy are resolved and defines the roadmap for the National, regional and traditional councils are ran.

In the view of [11], most chiefs in various communities have become agents of development and thus, they are essential to contemporary local governance. It is perhaps in this vein, that the institution has been significantly recognized legally in Ghana, making it a formidable foundation for her proper functioning in the society.

As a result of the effective structure of chieftaincy in the 1950s press home for four ministerial posts from the colonial masters. To solve the matter, at that time the Governor-Arden-Clarke agreed to give two ministerial posts to the chiefs.

Who is a Chief in Ghana?

According to [17] section 57 sub-section (1) defines a chief as a person who, hailing from the appropriate family and lineage, has been validly nominated, elected or selected and enstooled, enskinned or installed as a chief or queen mother in accordance with the relevant customary law and usage.

In the postulation of [12] defines a chief to mean the leader of a tribe or clan in a town or village (sometimes towns or villages) and who is in charge of and answerable to the people in the town or village.

In the Gonja Kingdom, a chief is a royal hailing from the lineage of the royal family of Gonja (Kagbanye) ancestry stalk who has been nominated and enskinned according to customs and traditions of Gonja. In Gonja, we have skins for paternal and maternal lineages. In the Bole division, chief of Seripe (Seripewura) is the head of the maternal lineage of chieftaincy inheritance. In the case of Damongo, Zonzuwura represent same and this development transcends across Gonja. Those who inherit paternally rise through the ranks and files of the chieftaincy structure to the paramountcy status and in the case of the Yagbon skin, paramount chiefs of the seven divisions of Gonja are eligible to the Yagbon skin. Though two of the divisions (Kung/Kong & Kandia) are in abeyance for now.

A chief is a person of a royal ancestry of the same family stalk who is validly selected or nominated to rule over a defined jurisdiction per the relevant customs and traditions.

Categories of Chiefs in Ghana

According to [17] section 58 states that the following are the categories of chiefs:

1. The Asantehene and paramount chiefs
2. Divisional chiefs
3. Sub-divisional chiefs
4. Adikrofo and

5. Other chiefs recognize by the National House

Brief History of Gonjas in the Savannah Region

History has it that, Sumaila Ndewura Jakpa son of Lata Dii Ngoro Jakpa originally has been the founder of the Gonja Kingdom. Ndewura Jakpa foundered the Gonja Kingdom through conquerors. His tactics and antics were more of a diplomatic approach except extreme resistance of the native force then Ndewura Jakpa will fight an open battle with such native group. It is believed that the Gonjas are an embodiment of the Kwa group or Guan group.

According to [2] suggested that the Mande intervention may not have begun with Jakpa, although the latter brought it to its climax. In his work, he named Nabaga as the grandfather of Sumaila Ndewura Jakpa (SNJ) and the initiator of the process. Nabaga was believed to be the first leader or King of the Gonjas on the conquers expedition according to Kitab Ghunja compiled in about 1751. Nabaga came by that office as a result of a punitive expedition he undertook for the chief of Mande-Kabba.

SNJ entered present day Gonja Kingdom from western Gonja Bole through Sakpa with his fighting army. It is common knowledge that during SNJ's conquerors, he planted in every division that he conquered one of his seven sons as chief of the area or division. According to oral history and practice of the Gonjas, the seven sons include; the Wasipewura, Kpembewura, Bolewura, Kongwura, Kandiawura, Tuluwewura and the Kusawguwura in a hierarchical order.

According to history, Gonjas in general hailed from Mande in the Mali empire and are therefore part of the Madingo or Madinka group. The founder of the Gonja Kingdom Ndewura Jakpa ruled from 1675 to 1697. Ndewura Jakpa used the spear throughout his conquerors expedition. The spear has remained the emblem or symbol of authority of the Gonjas and their symbol of identity.

Per custom and tradition of Gonja, every Yagbonwura (King) is revered and called father or grandfather by the sons of Jakpa. It is so because, Yagbonwura inherited the founder of the Gonja Kingdom and therefore strategically positioned as Sumaila Ndewura Jakpa. During Jakpa's conquerors expedition, he fought into the Wala nation where he took parts of the lands for Kong and Kandia by defeating them, the Dagomba nation where he claimed the Wasipe and Kusawgu lands.

The 5th son of Ndewura Jakpa and his elder brother Tuluwewura Abbas fought the Dagombas in the area and claimed the Kusawgu lands for the Kusawguwura. Per custom and tradition of Gonja, Kusawguwura is the 7th son and last born of the founder of the Gonja Kingdom.

In modern governance system, the Gonja Kingdom form the Savannah region of Ghana with vast lands. Indeed, the Savannah region in the history of Ghana geographically holds about 15% of Ghana's total land mass and therefore the biggest region in Ghana.

Kingship

Chambers 21st dictionary 1996 edition Pg748 defines a King as;

1. a male ruler of a nation especially, a hereditary monarch
2. a ruler or a chief

According to [14] viewed a King as; a male sovereign prince who is the official ruler of an independent state; a monarch. In the New Penguin English dictionary, 2000 edition, at Pg 770, a King is defined as: a male monarch of a state, country etc., especially one who inherits his position and rules for life.

According to [12] in his book titled "The Law of Chieftaincy in Ghana" there is no reference to a King, Kingdom or Empire in the 1992 constitution, Act 370, Act 759, or any other statute published after the 1992 constitution. Conscious efforts have therefore been made in this book to leave out reference to any King, Kingdom or Empire. Justice Brobbey

further elaborated that in the history of Ghana, there were Kingdoms with rulers who were Kings who owed no allegiance to anyone. These Kings have paramount chiefs who swore the oath of allegiance to them and had the authority to establish paramount chiefs in their traditional areas as well. In the present day Ghana some chiefs continue to wiled these powers. In contemporary Ghana, those who readily come to mind when Kings are mentioned are the Overlord of Gonjas (Yagbonwura), the Overlord of Dagombas (Ya-Naa), of the Mamprusis (Nayiri), of the Ashantis the (Asantehene) and the Nanumbas (Bimbila Naa).

The Yagbon Skin (Kingship)

The Yagbon skin is the ultimate chieftaincy title among the people of Gonja in the Savannah region. The occupant of the Yagbon skin is the Yagbonwura representing the monarch (Ngbanya) dynasty of the Gonja Kingdom. It is believed that the Yagbonwura is the representative of the founder of the Gonja Kingdom Sumaila Ndewura Jakpa who embarked on his conquerors through Sakpa in the Bole district of western Gonja.

Originally, the chieftaincy succession to the Yagbon skin has seven heir apparents – the Wasipewura, Kpembewura, Bolewura, Kongwura, Kandiawura, Tuluwewura and the Kusawguwura. These seven heir apparents ascend to the Yagbon throne in rotational turns.

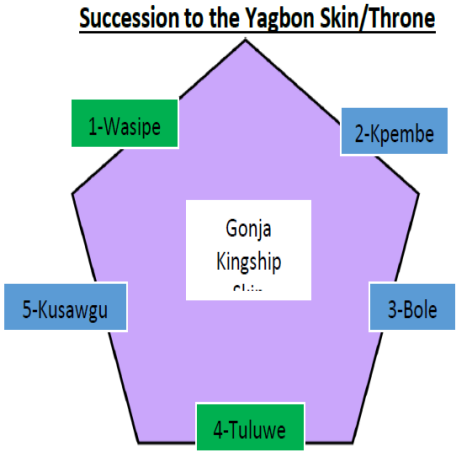

Figure 2. Showing Succession of the Yagbon Skin

Source: Field survey, 2024

Currently, Kong and Kandia who are legitimate heir apparents to the Yagbon skin, are in abeyance [13]. For the meantime, the remaining five heir apparents ascend to the Yagbon skin in rotation and according to seniority of skin. Among the five are Wasipewura, Kpembewura, Bolewura, Tuluwewura and Kusawguwura. Since 1975, the Bolewura ascension to the Yagbon Skin pre-dates the Kpembewura. However, in the succession, Kpembewura is second on the list of chiefs eligible to the Yagbon skin (Wul-Puti)

Nyange in the Sawla Tuna Kalba district is the traditional capital of the Yagbon skin until 1942 when Yagbonwura Awushi of Wasipe moved the capital from Nyange to Damongo the administrative capital of the Savannah region. Nyange is still upheld in the customs and traditions of Gonja during the enskinment and demise of a Yagbonwura.

The Yagbonwura is the King and Overlord of the People of Gonja Kingdom. He serves as a major link between the dead and the living and the epitome of the customs and traditions of

the people of the Gonja Kingdom. The Yagbonwura is revered.

As mentioned earlier, the succession to the Yagbon skin originally were seven gates or divisions. In further concurrence of the issue under discussion, [16] answers that the Gonja chieftaincy declaration succession to the Yagbon skin is rotational among the five gates or divisions. Today, and in practice, the divisions eligible to the Yagbon skins (Wul-Puti) are five divisions or gates. These gates include; Wasipe, Kpembe, Bole Tuluwe and Kusawgu. Reasons for the expel of Kandia and Kong are still researchable.

Kingmakers of the Yagbon Skin

According to the 1930 constitution of Gonja, the Kingmakers of the Yagbon skin are seven (7) namely, the Sonyorwura, Damongowura, Debrewura, Chorowura, Mankpanwura, Kulaw-wura and the chief linguist (Nsuawura) of Yagbon. Upon a vacancy, the Kingmakers led by Sonyorwura per custom and tradition convene a meeting after the 7th day funeral rites of the demised Yagbonwura and nominate a candidate for the Yagbon skin in accordance with the laid down structure of the Gonja state.

In 1698 – 1709 the Yagbon skin experienced a rebellion in the Kingdom. Between 1891-1896 there was an interregnum to the Yagbon skin thus the era of the Samori war. In 1909 – 1912 observed another interregnum of the monarch skin of Gonja.

According to [15] states that since 1912 to date, the chieftaincy succession to the Kingship (Yagbon skin) has since existed without any oppression and resistance from within or external.

In simple terms, Kingmakers of the Yagbon skin is a body of paramount chiefs who according to customs and traditions of Gonja are eligible to nominate or select the succeeding King in accordance to the laid down customs and traditions of Gonja.

List of Kings in the Gonja Kingdom

Table 1. Showing List of Yagbonwuras and Leaders of Gonja Kingdom Since the 16th Century

S/N	NAME OF KING/LEADER	DIVISION	REIGN (PERIOD)	LEADER	YAGBONWURA	REMARKS
1	Naba/Nabaga/Lamba		1546-1576	Leader		Died
2	Wam		1576-1595	Leader		Died
3	Charimanwura		1595-1615	Leader		Died
5	Amoah Alhaji Imoro Seidu		1615-1634	Leader		Died
6	Lanta Dii Ngoro Jakpa		1634-1675	Leader		Died as Emeritus King (Bure in 1681)
7	Sumaila Ndewura Jakpa		1675-1697	Leader		Died as founder
5	Limu		1697-1697	Leader		Died
	Bur Lanyo	Sonyor	1697-1697		Yagbonwura	Died
8	Sulemana Jakpa		1697-1709	Leader		Died
9	Abbass	Tuluwe	25th May 1709		Yagbonwura	100 days Interregnum
10	Mahama Labayiru	Kpembe			Yagbonwura	1709-1712

11	Kankanga	Kandia			Yagbonwura	1712…..?
12	Sarfu	Bole			Yagbonwura	…..?.....?
13	Kali	Tuluwe			Yagbonwura	……? 1858
14	Nyantachi	Kong/Kung			Yagbonwura	1858-1873
15	Jau	Tuluwe	-		Yagbonwura	-
16	Pirku (Mahama)	Kusawgu	-		Yagbonwura	-
17	Wari	Kong/Kung			Yagbonwura	-
18	Adama	Kong/Kung	-		Yagbonwura	-
19	Kurban Seidu Dushi	Bole	….? 1890/1		Yagbonwura	Died
						Samori invasion (1891-1896)
20	Pontonprong Abudu	Bole	1896-1907		Yagbonwura	Died
21	Lanyor	Bole	1907-1909		Yagbonwura	Maternally from Bole & Paternally from Kong.
						Interregnum (1909-1912)
22	Dagbonga Mahama	Bole	1912-1937		Yagbonwura	Founder of modern Gonja
23	Iddi Banbanga	Tuluwe	1937-1942		Yagbonwura	Died
24	Soale Lanyo	Kusawgu	1942-1942		Yagbonwura	Died
25	Ewurbunyanso Ewuntoma Mahama	Wasipe	1942-1975		Yagbonwura	capital from Nyange to Damongo
26	Kurabaso Abutu Mahama	Bole	1975-1982		Yagbonwura	Son of Dagbonga
27	Joseph Adam Braimah Timu	Kpembe	1983- 26th Jan. 1987		Yagbonwura	Wrote Gonja history
28	Kanyiti	Tuluwe	1987-1990		Yagbonwura	Died
29	Bi-Awurbi	Kusawgu	1990-1992		Yagbonwura	Died
30	Ale-Adengi Tikpiri	Wasipe	1992-1993		Yagbonwura	Died
31	Sarfo Amantana Borenyinche	Bole	7th Dec. 1993-1999		Yagbonwura	Died
32	Bawa Abudu Doshie	Kpembe	2000-2010		Yagbonwura	Died
33	Prof.Tuntumba Bore Essa I	Kusawgu	March,2010-5th Feb. 2023		Yagbonwura	Petitioned for Savannah region.

34	Bii-Kunuto Jewu Soale I	Tuluwe	20th March, 2023 to date		Yagbonwura	Reigning

Source: African occasional papers No.6 and field survey 2024

Table 2. The Number of Yagbonwuras from the Seven Divisions of Gonja Since 18th Century

Serial Numbers	Division from	No. of Kings (Yagbonwuras)	Percentage (%)
1	Wasipe	2	8
2	Kpembe	3	11
3	Bole	7	27
4	Kong (Kung)	3	11
5	Kandia	1	4
6	Tuluwe	6	23
7	Kusawgu	4	15
TOTAL		26	99

Source: Field Survey, 2024

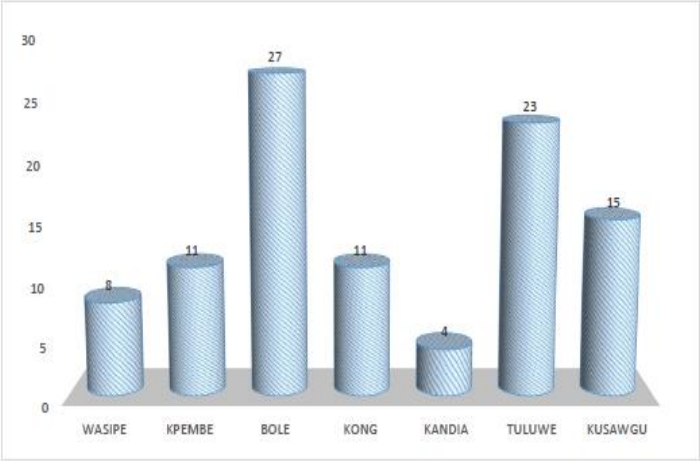

Figure 3. Bar Graph Showing Number of Yagbonwuras from Each of the Seven Divisions of Gonja

Source: Field Survey, 2024

Table 3. 2022 Chieftaincy Cases Before the Houses of Chiefs in Ghana

S/N	Region/House	Total Cases	Percentage (%)
1	National House	**139**	**28**
2	Ahafo	**2**	**0.4**
3	Ashanti	**32**	**6**
4	Bono	**33**	**7**
5	Bono East	**32**	**6**
6	Central	**51**	**10**
7	Eastern	**16**	**3**
8	Northern	**2**	**0.4**
9	Greater Accra	**38**	**7**
10	North East	**2**	**0.4**
11	Oti	**13**	**3**

12	Upper East	**9**	**2**
13	Volta	**33**	**7**
14	Upper West	**14**	**3**
15	Western	**52**	**11**
16	Western North	**23**	**5**
17	Savannah	**2**	**0.4**
Total		**493**	**99.6**

Source: Field survey, 2024

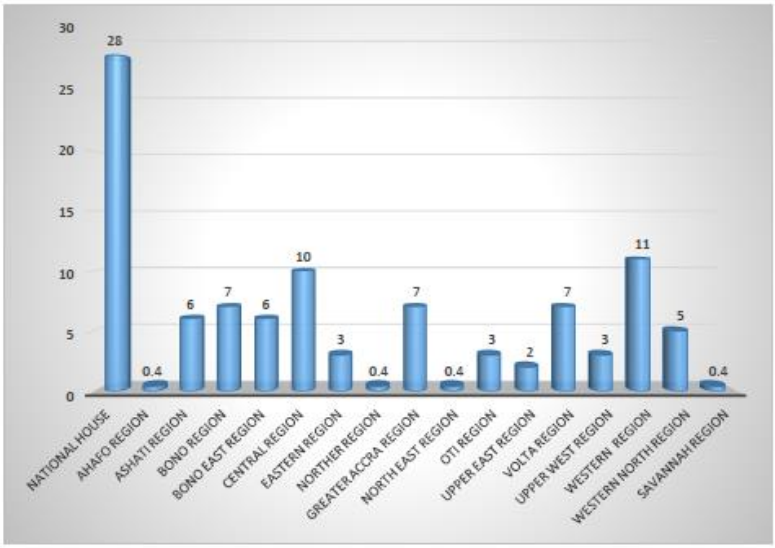

Figure 4. Bar Graph Showing Cases of the Houses of Chiefs in 2022

Source: Field Survey, 2024

Data Analysis and Results

Data Analysis

Data analysis is the act of using statistical tools to organize, represent, describe, evaluate, and interpret data. In this research, excel was used to analyse data for interpretation.

Results

Respondents viewed a king as a male ruler of the Gonja family ancestry stalk who inherits the skins of the kingship from the paternal lineage of royal inheritance. It also reveals that since the 18th century, twenty-six (26) Kings (Yagbonwuras) so far ascended to the Kingship in the Gonja Kingdom. Objective four (4) was resolved by knowing the number of kings so far.

In the course of selecting a King for the Kingdom, two interregnums were recorded since the 15th century of which one was as a result of the kingship. This addresses objective two (2) of the research. In summary, the Gonja Kingship undergo a peaceful succession process since the establishment of the

Kingdom. The results confirm the alternative hypothesis as true postulation

Clearly, the Gonja Kingship succession plan was documented in the 1930 constitution of Gonja titled "Areas of Research into Gonja Traditional Area (Ngbanye Kingdom)''. The findings answer objective three (3).

From time immemorial, Gonja Kings are chosen from the five divisions of Gonja though the divisions eligible to the skin (Wul-Puti) are seven. In practice, the Kingship is the highest throne in the Gonja chieftaincy hierarchy. The Gonja people practice centralized system of Kingship where the reporting system is bottom-up approach of chieftaincy leadership. The Kingship has kingmakers headed by the

Sonyorwura (paramount chief of Sonyor) who chose among the sons of the Yagbonwura in the succession to the Kingship. To be a King in the Gonja Kingdom, one must inherit patrilineally as a Gonja royal from either of the recognized divisions eligible to the Kingship. The King (Yagbonwura) has paramount chiefs serving under the King's authority. The Gonjas are believed to be coming from the Mali empire of the Madingo or Madinka group. In general, objective one (1) was addressed to a far extend.

Discussion

A meeting of stakeholders was organised for presentation of results to key stakeholders in the region to validate the research findings.

During the discussion, it was recommended that if the succession plan of Gonja kingship could be replicated and used at the paramountcy and divisional levels, will go a long way to solve chieftaincy succession conflicts in the region.

Participants argued that there is the need to define clearly the traditional roles in the chieftaincy structure of Gonja to enhance working effectiveness and to avoid unnecessary role competitions.

Conclusion

The research employed the finest techniques and methods in collecting data for quality results. The validity of the work was improved as a result of proof reading of work. The efforts of respondents to the research work was inspiring that nudged stakeholders to provide the best of information to enhance the work. It was observed that the monarch dynasty of the Gonjas (Yagbonwura) was revered, respected and dignified by the followers as their God on earth apart from the omnipotent. In Gonja Kingdom, kingship is not by elections rather by inheritance and lineage. It considered one of the best chieftaincy succession process that follow tradition and customs in a peaceful manner.

Conflict of Interest

Conducting the research, the research has no any conflict of interest in the course of the study about any occurrences. Professionally, there is no any conflict of interest during the study

Acknowledgement

In carrying out this research, I truly recognize my colleague staff for their sincere assistance to this research. I would like to express my sincere gratitude to respondents for their time and share of knowledge and wisdom. Appreciation to my local guide and external guide for their mammoth direction and supervision made the research an exceptional academic work.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art018

Ayurveda After Age of Covid-19 Exploring the Impact and Empowering Informed Decisions Through Health Literacy

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Abstract

This paper explores the role of Ayurveda in the post- COVID era, focusing on its potential impact on healthcare systems and the empowerment of informed decision-making through health literacy. Ayurveda, an ancient holistic healing system originating in India over 5,000 years ago, offers a unique approach to health promotion and disease management based on personalized treatments, herbal medicines, lifestyle modifications, and preventive care. The COVID-19 pandemic has underscored the importance of exploring complementary treatments, such as Ayurveda, which provides immune-boosting techniques, post-COVID symptom management, mental health support, and integrative healthcare options. By integrating Ayurveda into mainstream healthcare systems, policymakers and healthcare authorities can address contemporary health challenges more effectively while promoting greater health literacy among individuals. This paper discusses the historical background, principles, and therapeutic modalities of Ayurveda, along with its potential role in boosting immunity and managing post- COVID symptoms. It also examines the challenges and opportunities of integrating Ayurveda into post-pandemic healthcare, including policy recommendations, education reforms, and industrial initiatives. Overall, the integration of Ayurveda into modern healthcare systems holds promise for improving healthcare delivery, enhancing patient outcomes, and fostering greater health literacy in the post- COVID era.

Keywords: *Ayurveda, Ayurvedic Herbs, Holistic Health, Immune-Boosting Herbs, Immunomodulation, Immune Health Interventions, Immune System.*

Introduction

Background and Significance of Ayurveda in Healthcare

Ayurveda, often referred to as the "Science of Life," stands as one of the oldest holistic healing systems globally, originating in India over 5,000 years ago. Its roots delve deep into ancient Vedic texts, including Rigveda and Atharvaveda, where references to medicinal plants and healing practices can be found. Over the millennia, Ayurveda evolved into a sophisticated medical system, encompassing diverse disciplines such as internal medicine, surgery, pediatrics, psychiatry, and geriatrics. At the core of Ayurveda lies the concept of balance and harmony between the body, mind, and spirit. According to Ayurvedic philosophy, health is attained through a dynamic equilibrium of the three doshas (bioenergetic forces) – Vata (air and space), Pitta (fire and water), and Kapha (earth and water) – within the individual. Imbalances in doshas are believed to lead to illness, prompting Ayurvedic interventions aimed at restoring balance through personalized treatments tailored to each individual's unique constitution (Prakriti). Ayurveda takes a holistic approach to health, addressing the underlying causes of illness and promoting overall well-being, unlike conventional medicine that often focuses on treating symptoms or specific diseases.

Received: 25.06.2024 ***Accepted: 23.07.2024*** ***Published on: 30.07.2024***
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Ayurvedic practitioners assess various aspects of an individual's life, including diet, lifestyle, mental and emotional states, and environmental influences, to develop personalized treatment plans aimed at restoring balance and preventing diseases. Ayurveda has diverse therapeutic modalities ranging from herbal medicines and dietary recommendations to lifestyle modifications, detoxification therapies (Panchakarma), yoga, meditation, and massage (Abhyanga). These therapies are often combined to address the root causes of diseases and to enhance the body's natural healing mechanisms. In recent years, Ayurveda has gained popularity beyond its traditional homeland, with an increasing number of people seeking a holistic approach to health and wellbeing. Ayurvedic clinics, wellness centers, and educational institutions have proliferated globally, offering Ayurvedic treatments, training programs, and research opportunities. The integration of Ayurveda into mainstream health care systems in some countries reflects the growing recognition of its potential contribution to preventive and integrative medicine. Despite its long history and widespread use, Ayurveda faces various challenges, including standardization of practices, quality control of herbal medicines, regulatory issues, and skepticism from conventional medical establishments. However, there are also opportunities for Ayurveda to address contemporary health challenges, such as chronic diseases, mental health disorders, and lifestyle-related conditions, through a holistic and personalized approach to health promotion and disease management. Ayurveda represents a rich and ancient medical tradition, with profound insights into the nature of health and disease. Its holistic philosophy, personalized approach, and diverse therapeutic modalities continue to inspire individuals and healthcare practitioners worldwide, offering new perspectives on health and healing in the modern age [1].

Introduction to Covid-19 and Its Impact on Healthcare Systems

The global effects of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)-caused coronavirus disease (COVID-19) pandemic have been significant. It has caused millions of illnesses and almost five million deaths globally by late October 2021. Although the COVID-19 epidemic has had a direct or indirect impact on every industry, many nations' already overcrowded health systems have worsened as a result of the crisis. Relentless transmission of the virus across various environments significantly affects the provision of healthcare services, especially during the initial phases. This poses challenges for managing medical supplies, optimizing facility usage, and overseeing the allocation of healthcare personnel. Data indicate that the COVID-19 pandemic has profoundly disturbed the delivery of healthcare services, particularly in countries with limited resources [2]. In addition to the direct consequences of the COVID-19 pandemic, additional factors that contributed to the disruption included indirect strain on health systems and the overstretching of others. The COVID-19 pandemic has highlighted the weaknesses of existing healthcare systems [3]. The COVID-19 pandemic has impacted services for treating and preventing infectious and non-communicable diseases. Medical facilities have delayed the development of many necessary facilities [4]. Patients' fear and worry throughout the pandemic prevented them from attending acute care appointments and follow-up visits. Owing to the interruption of crucial healthcare services caused by the COVID-19 pandemic, there is a substantial risk of indirect illness and death from other diseases that could have been avoided and treated, in addition to the immediate health impact of the pandemic itself. The most frequent reasons given for critical gaps or service reductions during COVID-19 were as follows: moving medical staff to support COVID-19 services, postponing

planned treatments, decreasing public transportation, losing money to pay for services, restricting utilization, and high rates of morbidity and mortality among medical staff. Many nations have stated that the primary causes of service interruptions are a shortage of medications, diagnostic tools, and other technologies [5].

Similarly, Ethiopia's health system faced significant challenges after the first COVID-19 case was announced in March 2020.The increasing number of COVID-19 cases necessitated the reorganization of healthcare personnel and adaptation of facilities. Conversely, individuals with various ailments hesitate to visit the medical facilities. A comparison between service utilization during the COVID-19 period and the pre-COVID-19 era revealed significant disparities in healthcare delivery methods. Notably, there has been a marked decline in the number of patients seeking routine medical care. The global experience with the COVID-19 crisis underscores the critical need to establish robust and sustainable healthcare systems. This necessitates substantial investments in the development and training of healthcare personnel, as well as ensuring adequate provision of equipment, particularly personal protective gear, and measures for occupational safety. Creating a conducive work environment is therefore essential. Fostering social dialogue is imperative for an effective crisis response and for shaping a health-ready future. The sixth issue of the Ethiopian Journal of Health Sciences, which is currently available, includes two case reports, twenty-five original papers, and an editorial covering a range of subjects. This issue's seven original pieces discuss the effects of the Corona virus disease of 2019 on families, the community, and medical professionals.

Rationale for Exploring Ayurveda in the Post-Covid Era

The global COVID-19 pandemic has highlighted the importance of researching complementary and alternative treatment methods, including Ayurveda, to address current health concerns. The following reasons support the investigation of Ayurveda's relevance in the post-COVID era:

1. Immune modulation: Ayurveda provides a comprehensive method for boosting immunity, which is an important defense mechanism against viral disorders, such as COVID-19. Ayurvedic concepts focus on maintaining the body, mind, and spirit in balance to boost immunity through dietary adjustments, lifestyle changes, herbal remedies, and exercises such as yoga and meditation.
2. Management of post-COVID symptoms: Many people getting well from COVID-19 still have symptoms that return to normal, such as exhaustion, breathing problems, memory problems, and mental health issues. Ayurveda offers a comprehensive framework for treating the underlying causes of imbalance and fostering overall well-being through individualized therapies aimed at regulating these post-COVID symptoms [6].
3. Mental health support The COVID-19 pandemic has had a significant psychological impact, resulting in stress, anxiety, sadness, and trauma. Herbal medicine, mindfulness exercises, stress-reduction methods, and lifestyle adjustments are just a few of Ayurveda’s holistic approaches to mental health care. Therefore, they can be used in conjunction with traditional mental health therapies.
4. Preventive healthcare: Ayurveda places a strong emphasis on preventative healthcare practices that try to keep people healthy and stop illness before it starts. To lessen the effects of pandemics and other health emergencies, preventive medicine and

holistic wellness practices have become increasingly important in the post-COVID era.

5. Integrative healthcare: The effectiveness and accessibility of healthcare services can be improved by incorporating Ayurveda into conventional healthcare systems, especially for the treatment of complicated chronic illnesses that may emerge in the wake of the COVID-19 pandemic. Patients may benefit from a more thorough and individualized treatment approach when mainstream medical professionals and Ayurvedic practitioners work together.
6. Ayurveda has been used for hundreds of years and is a vital component of India's cultural legacy. Investigating Ayurveda in the post-COVID era offers a chance to uphold and advance this antiquated medical practice while modifying it to meet modern medical requirements and scientific guidelines [7].

Knowledge of Ayurveda's potential roles in immunological regulation, COVID-19 symptom management, psychological counselling, integrative medicine, preventative care, and cultural heritage preservation spurs research into practice in the wake of the pandemic. The COVID-19 pandemic and its aftermath have presented healthcare systems with numerous health concerns that can be better addressed using Ayurvedic ideas and practices.

Ayurveda: An Overview

Historical Background and Principles of Ayurveda

Ayurveda's history dates back thousands of years, as does the quest for health, which predates humankind's struggles to survive and adapt to the natural environment. It has developed alongside human civilization and has become a complete healthcare system. According to Indian philosophy, physical well-being is necessary for materialistic, spiritual, and social advancement. Through meditation, Brahma—the Hindu legendary God of Creation, who is thought to have created the universe—evolved the science of Ayurveda and passed it on to Prajapati Daksha. The earliest Indian literature, dating back to 5000–1000 BCE, is the Vedas, which includes allusions to plants and natural resources for a variety of medicinal purposes. These include the Rig Veda, the Sam Veda, the Yajur Veda, and the Atharva Veda. Two ancient texts, Ramayana and Mahabharata, describe several medical miracles that employ botanical and surgical techniques. However, during the "Samhita" period, circa 1000 BCE, Ayurveda emerged as a complete medicinal system 1. Sushruta Samhita and Charaka were composed during each era. The two Samhitas founding fathers, Sage Bharadwaja and Sage Devadas Dhanwantari, have established two distinct schools of thought. Punarvasu Atreya, the founder of the Atreya School, or the School of Physicians learned Ayurveda from Sage Bharadwaja [8]. The establishment of the Dhanwantari School, also known as the School of Surgeons, is attributed to the revered monarch Devadas Dhanwantari, which is believed to embody the physician-God Dhanwantari. Among the notable figures associated with this school were Agnivesh, Bhela, Jatukarna, Parasara, Harita, and Ksharpani—six disciples of the sage Atreya—who emerged as prominent proponents of the school of physicians. Each penned extensive work on Ayurvedic medical practice, which is now known by his name. The most well-known pupil of Punarvasu Atreya, Agnivesha, penned Agnivesha-Samhita prior to the sixth century BCE. Charaka, king Kanishka's trusty physician, is reported to have acquired this text in the first century CE. However, he was unable to finish it, so he abandoned it halfway through "Chikitsasthana" 's chapter. A scholar from Kashmir, Dridhabala, completed Charaka's treatise, the "Charaka Samhita," later in the eighth century CE. These 17 chapters, titled "Siddhisthana" and "Kalpasthana," are

currently regarded as ancient and authoritative Ayurveda texts. Prominent members of the surgical school were Dhanwantari, the Varanasi king's disciple, as well as Susruta, Bhoja, Gopura, Karavirya, Aupadhenava, and Aurabhra [1]. The primary goal of Ayurveda is outlined in Figure 1.

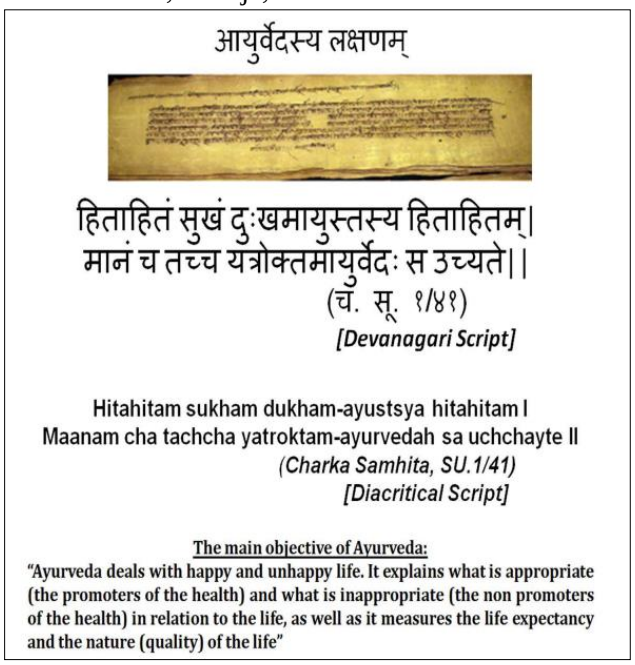

Figure 1. Main Goal of Ayurveda [8]

Rakshita, Vaitaran, and others have all contributed extensive treatises on the practices of midwifery and surgery, some of which continue to be frequently referenced in other studies. This composition is comparable to that of Sushruta Samhita and Charaka Samhita before the sixth-century CE. While Sushruta's work deals mainly with surgical matters and provides precise information about ancient India's surgical instruments, Agnivesha Samhita is essentially a general medical treatise. Later, an unknown writer added the Uttara-tantra [9]. The major Disciples in Ayurveda are shown in Figure 2.

In modern times, Sushruta Samhita is the name given to the entire text, including the supplement. The Astanga Sangraha and Astanga Hridaya, written by Vrdha Vagbhata and Vagbhata during the sixth and seventh centuries CE, encapsulate essential principles from both the Charaka and Sushruta Samhita [10]

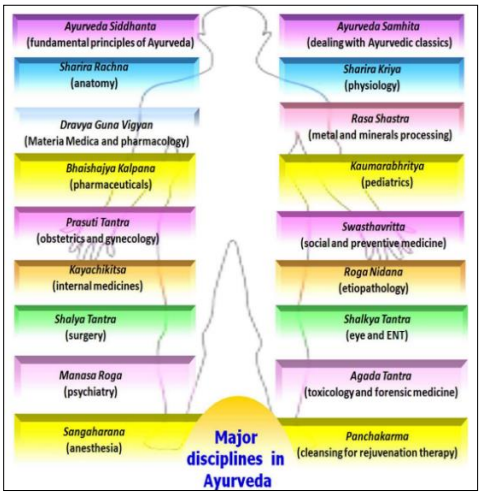

Figure 2. Major Disciplines in Ayurveda [8]

Therefore, the three aforementioned great texts are collectively referred to as the "Brihattrayi," and they served as the basis for other classics known as the "Laghutrayi," Laghutrayi such as Madhava Nidana, Sarangadhara Samhita, and Bhavaprakasha. Madhavakara wrote the Madhava Nidana, which addresses disease diagnosis. Sarangadhara Samhita listed Ayurvedic pharmaceuticals with an emphasis on formulations and dose forms. Bhava Misra's book, Bhavaprakash, focuses on diets and medicinal plants. Takshashila University's Jivaka, a renowned surgeon who once treated Gautam Buddha, studied Ayurveda during the Buddhist era. Medical students from all over the world traveled to the ancient University of Takshashila in the year 200 BCE to study Ayurveda. Students studying medicine at the University of Nalanda came from China and Japan between 200 CE and 700 CE. It is assumed that several medicinal systems, such as traditional Chinese and Tibetan remedies, were nourished by Ayurveda, who arrived at them through Buddhism. The Greeks and Romans interacted with one another through maritime trade. At 800 CE, Nagarjuna introduced the use of metals and minerals for medicinal purposes in a practice known as Rasasashtra. Some of Rasasashtra's major treatises are Rasaratnasamuchaya, Rasarnava, and Rasa Hridaya Tantra, which elaborate on how to produce metallic formulations and detoxify metals using a variety of natural ingredients [11]. Ayurveda's history is shown in Figure 3.

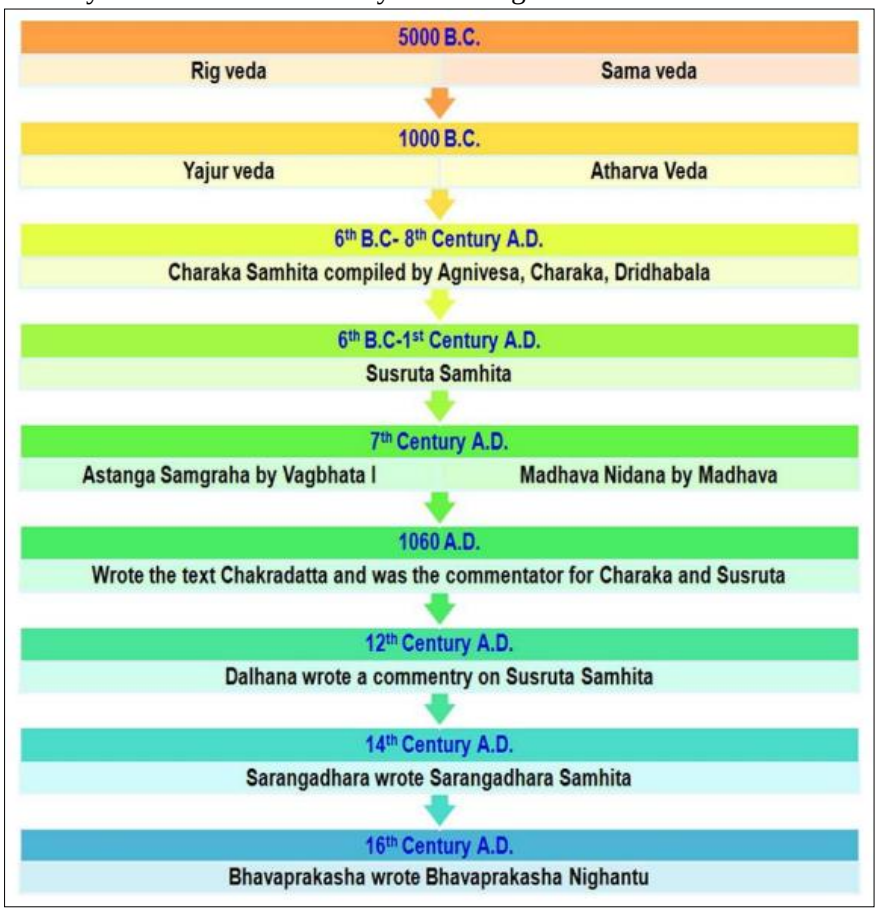

Figure 3. Historical Background of Ayurveda [8]

Integration of Ayurveda in to Modern Healthcare Systems

Simply because something is old does not necessarily mean that it is valuable or of a high quality. For example, even valuable items such as gold require occasional maintenance to maintain their value. India's medical systems, science, and technology are highly advanced.

However, the fact that these ideas and methods are old does not mean they should be dismissed. Rather, their age should not be a reason to discard them. To benefit from the wisdom that underlies the science and technology found in ancient texts, we must objectively analyze them in light of our current understanding of the concepts and procedures of the natural sciences. By doing so, we will be able to answer the questions “What,” “Why,” and “How.” It is worth noting that over the past few decades, numerous studies have been conducted, supported by traditional health care systems, to identify their “active compounds” and use them to generate unique treatments tailored to certain targets. While there have been some remarkable successes, the “reductionist” strategy generally has serious limitations, as evidenced by the “side effects” associated with the majority of so-called “target-specific” medications. In this case, it is better to use the “holistic” and “systems” approach that is central to Ayurveda and carefully examine the different Rasayanas, Bhasmas, and Asavas that are discussed in ancient texts to determine how they work and how well they treat different health problems.

Quality control has emerged as a significant issue with the recent spike in the popularity of Ayurveda, affecting not only the numerous Rasayanas and other Ayurvedic formulations but also other Ayurvedic processes and practices, including Panchakarma and other massages. Except for a few simpler formulations, most Ayurvedic formulations are complicated mixtures of several botanical and/or mineral components, making it impractical to control their quality using physicochemical characteristics [12]. Therefore, it is necessary to identify the appropriate biological quality control parameters using model organisms. However, there is a need to restrain the industry's and practitioners' inclination to label any purportedly “herbal” preparation as “Ayurvedic.” It is necessary to address the reciprocal mistrust that currently exists between traditional and modern health care providers. Practitioners of Ayurveda and other traditional medical systems need to come out of their shells and receive training and exposure to modern biological principles, particularly those related to genetics, genomics, cell and molecular biology, developmental biology, and physiology. Modern science and medicine practitioners must acknowledge the system organization of living organisms and the holistic concept ingrained in Ayurveda. Only by combining these efforts would it be possible to distinguish between the truths and myths that are ingrained in all ancient customs and bodies of knowledge [13] Any society's goals of “health for all” would be greatly advanced by combining modern diagnostic techniques with the holistic tenets of Ayurvedic and other traditional healthcare systems. Finding and comprehending the similarities between many languages and beliefs is crucial. the foundations for ayurgenomics-based precision and integrative medicine are presented in Figure 4.

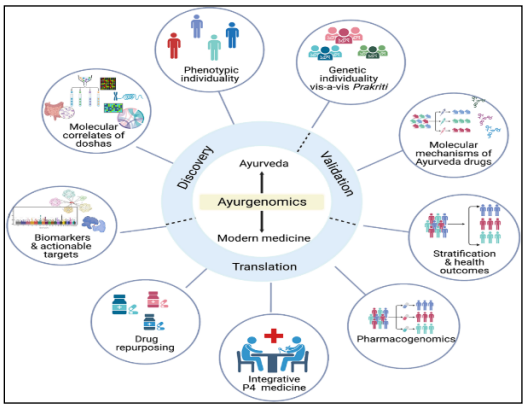

Figure 4. Frameworks for Precision and Integrative Medicine Based on Ayurgenomics [13]

Ayurvedic Practices and Immune Health

Role of Ayurvedic Herbs and Formulations in Boosting Immunity

Various natural ingredients, including medicinal plants and herbs such as garlic (Allium sativum), giloy (Tinospora cordifolia), and tulsi (Ocimum basilicum), as well as spices such as clove, cinnamon, ginger, black pepper, and turmeric, are recognized as immunity boosters, as shown in Figure 5. These substances not only possess antiviral properties but also contribute to strengthening the immune system. Recent studies have emphasized the antiviral attributes of commonly used spices and herbs, such as curcumin, cinnamon, ginger, clove, black pepper, garlic, neem, giloy, and basil, particularly during the COVID-19 pandemic. Furthermore, compounds such as zinc, quercetin, vitamin A, B1, B2, B6, C, and E found in neem leaves have been shown to enhance immune function [14].

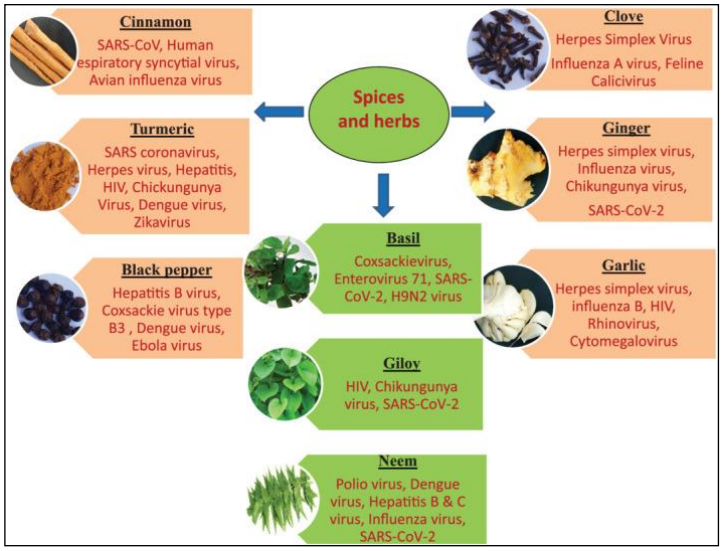

Figure 5. Common Plants and Spices Having Antiviral Characteristics [14]

Curcuma Longa L. (Turmeric)

Turmeric (Curcuma longa L.), a member of the ginger family Zingiberaceae, is native to India and Southeast Asia, is a member of the ginger family (Zingiberaceae). The main bioactive components found in the rhizomes of this plant are polyphenols, steroids, sesquiterpenes, and curcuminoids [15]. Asian nations have traditionally used curcumin, a naturally occurring polyphenol extracted from turmeric (Curcuma longa), as traditional medicine to treat a wide range of illnesses. Numerous studies have demonstrated that curcumin has certain pharmacological characteristics, including anti-inflammatory, anti-angiogenic, and anti-neoplastic effects, without causing harm. According to the Food and Drug Administration (FDA), it is "generally recognized as safe." Clinical trials have demonstrated that a daily dose of curcumin (up to 12 g) is safe for human consumption and does not induce adverse effects. No toxicity was observed when curcumin was administered at dose of 2,500–8,000 mg daily for three months. Curcumin is a potent antiviral agent that inhibits viral multiplication [16].

Several viruses, such as those that cause hepatitis, SARS coronavirus, influenza, HIV, herpes simplex, dengue, chikungunya, and other infections, have been shown to be resistant to the antiviral potential of curcumin. The ability of curcumin to control many molecular targets that help cells do many

things, such as controlling transcription and initiating cellular signaling pathways, is another indication that it can fight viruses. Curcumin has emerged as a leading antiviral medication owing to its ability to target multiple cellular pathways, thereby inhibiting the growth and replication of viruses. Molecular docking techniques have revealed that curcumin binds to and obstructs target receptors that are crucially involved in viral infections. These include PD-ACE2, spike glycoprotein-RBD, and SARS-CoV-2 protease [17].

Zingiber Officinale (Ginger)

Ginger is a medicinal plant that grows naturally in several countries. Zingiber officinale, or ginger, is a member of the Zingiberaceae family of plants and includes the well-known plants turmeric, cardamom, and galangal. This plant is native to Southeast Asia and grows throughout the region, particularly in India. In Ayurveda, ginger (Zingiber officinale) is referred to as Sunthi, and ancient texts, such as Charaka, Sushruta, Vagbhatta, and Chakra-dutta, describe the herb. In the traditional Unani medical system, Zanjabeel, also known as zicgerofficinale, is a well-known herbal remedy [18].

Ginger is a rich source of bioactive substances with therapeutic effects, including steroids, alkaloids, and phenolic compounds. Paradol, zingerone, and shogoals are analogs of zingiberol, the main aromatic component of the rhizome. Ginger contains many sub-chemicals, including 4-gingerol, 6-gingerol, 8-gingerol, 10-gingerols, 6-shogaols, and 14-shogaols, in addition to the primary bioactive compounds. According to previous reports, they possess antipyretic, analgesic, anti-arthritic, antiemetic, and anti-inflammatory properties.

Several studies have underscored the potent antiviral activity of ginger and its bioactive constituents against various viruses, including the chikungunya virus, herpes simplex virus, human respiratory syncytial virus, and SARS-CoV-2 [19]. In one study, lyophilized juice extracted from Zingiber officinale was evaluated for its antiviral efficacy against the hepatitis C virus across different doses ranging from 5 to 200 μg/mL. Analysis of viral RNA segment amplification indicated that 100 μg/mL effectively suppressed viral replication. A molecular docking study was performed to examine the anti-SARS-CoV-2 potential of several bioactive compounds, such as zingerone, shogaol, geraniol, gingerenone A, and zingiberene. These compounds interact with the major protease (Mpro). It was discovered that the bioactive components in ginger inhibit MPro or prevent spike (S) proteins from attaching to the ACE2 receptor [20]. The S protein attaches to the angiotensin-converting enzyme 2 (ACE2) receptor in the host cell, creating an environment that is suitable for viral replication. This explains the entry of SARS-CoV-2 into the host during the infection. The main Protease (MPro) processes the poly-proteins pp1a and pp1ab during viral replication [21].

Cinnamomum Cassia (Cinnamon)

One species of aromatic tree in the Lauraceae family is Cinnamomum cassia. For a long time, traditional Chinese, Indian, Persian, and Unani medicines have extensively used cinnamon. Cinnamon has been a popular spice in many nations for thousands of years. The bark of young branches of this plant contains cinnamon, which is used as a daily condiment worldwide. It has a great economic value and can be used for medicinal purposes. It is used to treat several illnesses, including headache, fever, leukorrhea, amenorrhea, diarrhea, and flatulence. Additionally, it has been noted that the daily use of cinnamon helps prevent throat infections [22].

Cinnamon bark contains 21 chemical components, including eugenol (3.19%) and cinnamaldehyde (60.41%), both of which are known for their antimicrobial properties. Numerous studies have highlighted the diverse

therapeutic properties of cinnamon, including its antibacterial, antiviral, antifungal, antioxidant, antihypertensive, antidiabetic, anticancer, gastroprotective, and immunomodulatory effects. One study revealed that, while a low dose of cinnamon (10 mg/kg) primarily elevated serum immunoglobulin levels, a higher dose (100 mg/kg) significantly increased the phagocytic index, serum immunoglobulin levels, and antibody titer. Consequently, a higher dose enhanced both humoral and cell-mediated immunity, whereas a lower dose predominantly affected humoral immunity. In one study, the effects of cinnamon hydroalcoholic extract on herpes simplex virus-1 (HSV-1) were investigated. These findings demonstrated that the hydroalcoholic extract effectively reduced the viral titer of HSV-1 by impeding viral attachment to cells [23].

Syzygium Aromaticum (Clove)

Clove, a plant belonging to the Myrtaceae family known for its antimicrobial properties against oral bacteria, is widely used as an antiseptic to prevent infectious diseases. In addition to their medicinal uses, cloves are employed in the food industry to increase shelf life because of their antibacterial properties. The FDA has approved clove oil, oleoresins, clove buds, and eugenol for use as dietary supplements [24]. According to the WHO, humans can consume up to 2.5 milligrams of clove per kilogram of body weight per day. Flavonoids, hydroxycinnamic acids, hydroxybenzoic acids, and hydroxyphenylpropens are some of the primary phenolic compounds found in cloves.

Eugenol is the primary bioactive ingredient of cloves. Eugenol has extensive antibacterial properties against fungi, bacteria, and acid-fact-bacteria (grade 1-negative). The well-known antiemetic (relieves nausea and vomiting) and carminative qualities of cloves have been widely recognized. Eugeniin, a compound extracted from the herbal extracts of S. aromaticum and Geum japonicum, exhibited anti-herpes simplex virus properties at a dose of 5 μg/mL. In addition, eugenol inhibits viral replication, thereby reducing the risk of infection. Eugeniin, on the other hand, inhibits the production of viral DNA by blocking HSV-1 DNA polymerase [25].

Piper Nigrum (Black Pepper)

Piper belongs to the Piperaceae family and is renowned for its strong aroma, earning it the title of “king of spices.” Many tropical countries, including Brazil, Indonesia, and India, have grown black peppers. Piper nigrum is used in perfumes, medicine, and preservatives because of its bioactive components that have considerable biological effects. Ayurvedic, Siddha, Unani, and Tibetan medicines all extensively use piperine, a potent black pepper alkaloid. Piperine (1-peperoyl piperidine) is a primary pungent alkaloid. It is well-known to have a variety of pharmacological properties, including antihypertensive, anti-Alzheimer's, antidepressant, antiplatelet, anti-inflammatory, antioxidant, antipyretic, antitumor, analgesic, and antimicrobial [24, 26].

Piper nigrumin chloroform and methanolic extracts were assessed for antiviral efficacy against human parainfluenza virus and the enteric virus vesicular stomatitis virus in human cell lines. They discovered that a higher number of alkaloids in the chloroform extract of Piper nigrum resulted in increased antiviral activity. A molecular docking study found that piperine was better than the commercial antiviral ribavirin in blocking the VP35 interferon inhibitory domain of the Ebola virus and methyltransferase of the dengue virus. In a docking-based investigation, bioactive components of black pepper, namely piperdardiine and piperanine, were found to be very active against COVID-19 and can be employed to treat the virus [25, 27].

Ocimum Basilicum L. (Basil)

Ocimum basilicum L. (OB), commonly known as sweet basil, is a popular medicinal herb belonging to the Labiatae family. Essential oils of this plant have been widely used in food, cosmetics, and oral health products for many years. Several studies have confirmed the antibacterial properties of basil, making it a natural choice for use as a spice. It has been documented that the essential oils of OB exhibit efficaciousness against a diverse array of bacteria, fungi, and parasites.

Viral infections in the eyes, lungs, and liver are among the conditions in which various parts of the OB are treated. It has been observed that Ocimum basilicum contains a number of intriguing chemicals, including sesquiterpenoids (caryophyllene and farnesol), triterpenoid (ursolic acid), flavonoid (apigenin), and monoterpenoids (carvone, cineole, fenchone, geraniol, myrcene, and thujone). Several studies have shown that water and methanol extracts of basil leaf and seed oil boost the immune system's ability to fight various infections. This is achieved by increasing the number of T-helper and natural killer cells, lymphocytes, neutrophils, phagocytic activity, antibody titers, and other factors [28]. It has been observed that ursolic acid inhibits tumor growth and viral infections of the human immunodeficiency virus (HIV) and herpes simplex virus (HSV-1). Additionally, OB extracts and specific purified components have demonstrated a wide range of anti-DNA and anti-RNA viral properties. In a molecular docking investigation, vicenin, sorientin 4'-O-glucoside 2' - O-phydroxy-benzoate-, and ursolic acid, three phytochemical compounds of Tulsi, inhibited the main protease of SARS-CoV-2 [29].

Allium Sativum L. (Garlic)

The Liliaceae family, which includes the garlic plant, Allium sativum L., is native to Asia, although it is widely grown in China, North Africa (Egypt), Europe, and Mexico. It has been used as a drug for thousands of years. This plant is a bulb that can grow to 25–70 cm in height, and its blossoms are used to flavor and spice cuisine. Garlic has a high nutritional content, enhances food flavor, and relieves dyspepsia. Numerous low-toxicity pharmacological actions of garlic include anthelmintic, anti-inflammatory, antioxidant, and antifungal properties [15]. Alliinase, an enzyme found in garlic, converts alliin into allicin, also known as diallyl-dithiosulfinate. Allicin is an antiviral and an antifungal agent. The chemicals in garlic that killed the viruses were ajoene, allicin, allyl methyl thiosulfanate, and methyl allyl thiosulfanate. Studies of the antiviral action of garlic extract against influenza virus A/H1N1 in cell culture have revealed that the extract prevents the virus from penetrating and multiplying in culture. Garlic extract had an inhibitory effect on infectious bronchitis virus (IBV-a coronavirus) in chicken embryos [30].

Azadirachta Indica (Neem)

Azadirachta indica, the botanical name for neem trees, is a rapidly growing evergreen herb that is a member of the Meliaceae family. Neem, a traditional medicinal plant with Indian provenance, has long been used in various parts of Asia and Africa to treat a variety of acute and chronic ailments. Traditional medicine utilizes all components of the neem tree, including the seeds, roots, leaves, blossoms, and bark, as a do-it-yourself treatment for a range of human diseases. They possess spermicidal, insecticidal, larvicidal, antimalarial, antibacterial, and antiviral properties. Numerous terpenoids have been identified in the bark of this herb, including limonoids, β-sistosterol, 6-desacetylnimbinene, nimbione, margocin, quercetin, nimbin, nimbidin, and nimbolide [31]. Due to its capacity to scavenge free radicals, a substance extracted from neem leaves known as "hyperoside" has demonstrated promise as a universal medication against influenza strains. The

hyperoside components of the neem leaf extract, LGH, Naproxen, BMS-885838, and BMS-883559 chemical medicines, and conserved influenza virus nucleoprotein residues produced the highest outcomes [32]. The neem is a remarkable plant that has been dubbed the "tree of the 21st century" by the UN.

Owing to the proven and potent antiviral properties of neem, scientists have initiated investigations to explore its potential for the development of treatments against SARS-CoV-2.Naturally occurring bioactive compounds such as methyl eugenol, oleanolic acid, and ursolic acid, sourced from Tulsi and neem, have exhibited inhibitory effects on SARS-CoV-2.These compounds target key viral components, including spike glycoprotein, RNA polymerase, and proteases, thereby impeding viral attachment and replication. Research has identified approximately 20 bioactive chemicals isolated from neem leaf extracts that exhibit strong binding affinity to the COVID-19 major protease protein crucial for virus replication. Additionally, in silico screening of ligands from Nimba and Amrita (Azadirachta indica and Tinospora cordifolia) collectively known as Nimbamritam, revealed promising interactions with SARS-CoV-2 residues, inhibiting Mpro, or spike protease, indicative of potential anti-SARS-CoV-2 activity [33].

Tinospora Cordifolia (Giloy)

A member of the Menispermaceae family, Tinospora cordifolia, sometimes known as "giloy," is mostly found in Asian countries, such as China, India, Sri Lanka, and Myanmar. It is a native Indian medicinal plant known as Guduchi. Ayurvedic formulas are used to treat a variety of illnesses. Owing to its therapeutic value, T. cordifolia has been used extensively for commercial purposes. It is used as a potent medication to treat a wide range of illnesses including jaundice, urogenital disorders, skin conditions, diabetes, anemia, inflammation, and allergic conditions. Each of the various parts of T. cordifolia —leaves, stems, roots, flowers, and seeds —has the pharmacological properties listed above. Additionally, this plant is utilized in Ayurvedic "Rasayanas" to strengthen defenses against illnesses and boost immunity. The MTT test was used to evaluate the antiviral potential of the crude extract obtained from the dry stem of Tinospora cordifolia against herpes simplex virus [34]. Molecular dynamics techniques were utilized to investigate five phytoconstituents of T. cordifolia: berberine, beta-sitosterol, coline, tetrahydropalmatine, and octacosanol. Their findings revealed that berberine effectively inhibited the activity of the 3CLpro protein, thereby impeding viral replication [35]. Additionally, molecular docking studies showed that tinocordiside, a phytochemical found in T. cordifolia, inhibited the primary protease of SARS-CoV-2. Notably, among the four major SARS-CoV-2 target surface glycoproteins—receptor-binding domain, RNA-dependent RNA polymerase, and main proteases —berberine, isocolumbin, magnoflorine, and tinocordiside–compounds isolated from T. cordifolia exhibited significant binding efficacy 36].

Challenges and Opportunities in Integrating Ayurveda in the Post-Covid Healthcare

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)-caused coronavirus disease 2019 (COVID-19), the most significant global health crisis since the 1918 influenza pandemic, has had a catastrophic impact on global demographics and killed over 3.77 million people worldwide. COVID-19 has devastated many nations since it was proclaimed to be a global pandemic, overwhelming numerous healthcare systems in the process. Although significant advancements in clinical research have improved our understanding of SARS-CoV-2 and the treatment of COVID-19, there is growing concern about how to stop the virus from

spreading further. SARS-CoV-2 still seriously harms people worldwide, and many countries are currently experiencing second or third waves of outbreaks that are primarily caused by mutant variants of the virus. It takes time for someone who has contracted COVID-19 to return to their regular schedule. Patients with COVID-19 typically require two–three weeks for full recovery. Adhering to a general health regimen that includes a balanced diet, exercise, stress-relieving techniques, and yoga is frequently helpful for early healing. More than four weeks after infection, and occasionally even after initial symptom recovery, some SARS-CoV-2-infected individuals have new, recurring, or persistent symptoms and clinical findings. Patients with mild or asymptomatic acute infections can develop post-COVID problems. The medical and research sectors are still looking into clinical findings and post-acute symptoms. Health issues can affect physical and mental wellbeing. Following an acute COVID-19 episode, patients may experience a range of symptoms, the most common being lethargy, low-grade fever, and cough, all of which are subject to recurrence and resolution. Additional symptoms observed include dyspnea, headaches, dysphagia, dyspnea, rashes, gastrointestinal distress, metabolic disturbances (such as poorly controlled diabetes), thromboembolic disorders, depression, and other mental health issues [37].

Currently, there is little evidence of COVID-19's aftereffects; however, further research is needed and is being aggressively conducted. All post-COVID-19 patients must receive follow-up care and be in good health, which requires a holistic approach. Post-acute COVID-19 appears to be a multi-system illness. Considering the patient as a whole, a clinical treatment is necessary. The following factors may contribute to prolonged recovery: deconditioning, immune reactions, such as posttraumatic stress disorder, relapse or reinfection, and inflammatory and other immune reactions. It can be difficult to distinguish between the symptoms caused by various factors and those resulting from post-COVID issues. In addition to the social isolation brought on by pandemic mitigation efforts, patients suffering from the acute and post-acute impacts of COVID-19 often experience symptoms of depression, anxiety, or mood swings. Additionally, some patients with post-COVID symptoms might not have tested positive for SARS-CoV-2 due to declining antibody levels, false-negative antibody testing during follow-up, or a lack of testing or erroneous testing during the acute period. The natural history of the SARS-CoV-2 infection is currently being studied. Scholars have investigated the frequency, mode of action, length, and intensity of symptoms following acute infection with SARS-CoV-2, along with the risk variables linked to illnesses that accompany COVID-19.Young people, including those who are physically fit before SARS-CoV-2 infection, have also experienced symptoms that persist for several months following acute sickness, whereas elderly patients and those with underlying medical issues may be at a higher risk of severe disease. A comprehensive and coordinated therapeutic strategy for COVID-19 aftercare is currently being developed by multidisciplinary teams assembled in post-acute COVID care clinics at various medical sites. Survivor support groups build social connections, offer assistance, and distribute resources to individuals who have survived COVID-19 and to other affected parties.

The entire spectrum of COVID-19, from its acute phase to longer-term impacts and problems, is still being actively investigated by the Centers for Disease Control and Prevention. To improve healthcare practices, clinical judgment, and the public health response to this virus, a deeper understanding of the natural history of SARS-CoV-2 infection and associated post-COVID sequelae will be established with the aid of this effort. Thus far,

children have largely avoided major illnesses and unfavorable outcomes. According to the available ICMR survey data, children between the ages of 10 and 17 years were seropositive (25.3%), which was comparable to that of adults prior to the start of the vaccine effort. It is surprising that there are fewer people under the age of 20 with confirmed COVID-19 cases than anticipated. This implies that while most children do not experience any symptoms, they are as vulnerable to infection as adults. Most symptomatic patients have only minor illnesses. The percentage of children among new cases increases gradually, as shown in nations where a sizable number of adults have received COVID-19 vaccination (in the US, the proportion increased from 14% to 24% in the second week of May and changed to 19.8% in the third week). Several experts predict that a third wave will disproportionately affect children. Therefore, it is imperative to prepare for any potential unexpected spike in COVID-19 cases in children. PHCs and HWCs, or primary healthcare centers, should be strengthened in addition to the current children's facilities, especially the intensive care unit (ICU) and high-dependency unit (HDU). The Government of India's Ministry of Health and Family Welfare has published guidelines for the Operationalization of COVID Care Services for children and adolescents. In light of this, the Indian Ministry of AYUSH has published the Home Care Guidelines for Children and AYUSH Practitioners' Advisory on Prophylactics in Children during the COVID-19 pandemic.

In Ayurveda, the concept of immunity is emphasized under Vyadhikshamatva, where Ojas and Bala play crucial roles. Oja is seen as a person's biological strength or Bala. According to Ayurveda, immune illnesses can be roughly categorized as Oja visramsa, Oja vyapat, or Oja kshaya. Oja is responsible for immunity against infections and resistance to the deterioration of the body. When Oja is in appropriate amounts, it preserves health; when it is insufficient (Oja kshaya), it causes disorders related to immunity in the body. Being in a vulnerable group means that, whether the third wave occurs or not, it becomes imperative to be ready to handle the diagnostic and therapeutic issues specific to the pediatric population before it occurs. Therefore, age-appropriate guidelines are needed to boost immunity in children, in addition to diet-centered and medication-complemented strategies in adults. Prototypes of these features can be found in traditional podiatric treatises, both mainstream (Kāūyapa Samhitā and Hārīta Samhitā) and vernacular (Ārogyakalpadruma). The theoretical basis and practical applications of food modification can be found in Kāśyapa Samhitā's Bhojyopakramanīya adhyāya and Yūṣanirdeśīya adhyāya. Pragmatic immunomodulatory techniques, such as Prakarsa formulations, are included in Ārogyakalpadruma. The Ministry of the AYUSH, Government of India recently released home quarantine recommendations for children. These rules are practical and efficient and incorporate both traditional and modern knowledge. Furthermore, if applied in accordance with regional and seasonal variances, oil massage, nasal medication, oil pulling, and herbal paste patches in the vertex (tailam) will guarantee not only disease prevention but also healthy growth and development of children, which is essential for the future of society. Development of anti-COVID-19 treatments. A graphical overview of phytomedicines, herbal remedies, bioactive substances, functional foods, and nutraceuticals is presented in Figure 6 [38].

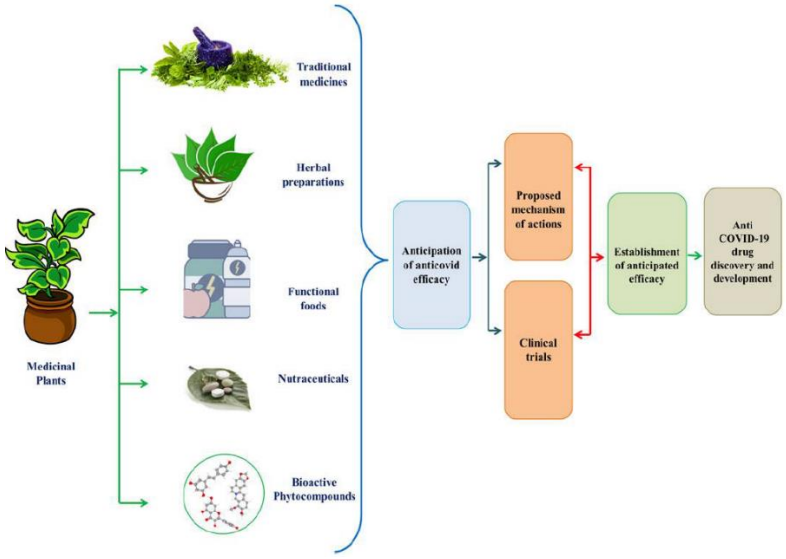

Figure 6. Phytomedicines, Herbal Remedies, Bioactive Substances, Functional Foods, and Nutraceuticals: A Graphical Overview for the Creation of Anti-COVID-19 Treatments [38]

Health Literacy and Informed Decision Making

A priority request for evidence and data was made by 170 member states of the World Health Organization (WHO) to enlighten policymakers, regulatory bodies, healthcare stakeholders, and the public about the safe, economical, and equitable use of traditional medicine. To maximize the contribution of traditional medicine to global health and sustainable development, the World Health Organization (WHO) has recently established the Global Center for Traditional Medicine in India. It focuses on innovation and technology; sustainability and equity; evidence and learning; and data and analytics. By 2030, the United Nations Sustainable Development Goals (SDG) of the United Nations will include 17 goals and 169 indicators. A distinctive holistic approach, in line with the SDG agenda, stresses environmental issues, societal health, and well-being through multidimensional performance indicators to address the growing need for value-based healthcare. Ayurveda is anticipated to substantially contribute to SDG 3 (Good Health and Well-Being), owing to its well-established practice and research in India. Numerous Ayurvedic research papers on COVID-19 during the most recent pandemic. Therefore, research on the development of an Ayurvedic clinical profile for COVID-19 patients has intensified. This is based on discussions with contemporary medical professionals who treat COVID-19 patients, as well as traditional Ayurvedic literature. Additionally, it witnessed the creation of workable plans in traditional medicine to handle crises during the pandemic. The transition from “pathy-based” to “people-centered holistic healthcare” demonstrates the necessity of a single healthcare system [39]. Potential phytochemicals from in silico investigations, such as Withaniasomnifera, have been found to have inhibitory effects on the SARS-CoV-2 virus in COVID-19.[20] According to certain studies, telemedicine has been used to facilitate Ayurvedic consultations during the COVID-19 lockdown. These studies highlight the platforms and communication channels used for patient evaluation, diagnosis, and prescription [40].

Originating in ancient India, Ayurveda is a complete system of natural healing with over 2000 years of evolutionary history. As opposed to “Veda,” which means “knowledge” or “science,” the Sanskrit word “Ayus” means “life process” or “life span.” Ayurveda, often translated as the “Science of Life,” places a

strong focus on preserving health and wellbeing as well as averting illness. Ayurveda is a knowledge system from which techniques for approving medication and treatment originate. To exclude chance, the clinical outcomes were thoroughly examined. To make the treatment plans, strict justification (yukti) was used based on cross-sectional (samanyatodrsta), prospective (sesavat), and retrospective (purvavat) observational methods. The cause and effect can be determined by comparing the therapy (paksa) to positive (sapaksa) and negative (vipaksa) controls. With its lengthy and continuous evolutionary history, Ayurveda produced an astonishing array of textbooks and teachers, making it the world's largest body of medical literature. Ayurveda's earliest manuscripts are at least a millennium older than the common period [10].

Research techniques derived from western science and medicine have been applied to Ayurveda, and ethnopharmacology is currently one of the most popular methodologies for studying Ayurveda. Serious ethnopharmacological research on Ayurvedic medicinal herbs began when the antihypertensive qualities of Rauwolfia serpentina were discovered. This resulted in the identification of the plant alkaloid reserpine, which has been shown to have antihypertensive properties. As Ayurvedic formulations and herbs are already used by humans and their clinical efficacy and safety are well established, there is great potential for breakthroughs in drug development. However, Ayurvedic formulas contain a variety of substances, and their intricate mechanisms of action depend on the interactions and antagonistic effects of a wide range of chemical components. Therefore, Ayurveda may not be a good fit for contemporary drug research techniques that separate the active compounds from herbs and herbal formulations. On the other hand, laboratory studies using in vitro, ex vivo, in silico, and in vivo models that examine the complexity of Ayurvedic formulations can help us understand how they work and make conventional formulations more effective and easier to deliver. This clinical-to-lab strategy, also known as reverse pharmacology, is pertinent to the scientific assessment of ethnopharmacological methods in traditional medical systems. Methods such as network pharmacology are more appropriate for dealing with the intricacy of Ayurvedic compositions. Researchers have found that the Ayurvedic mixture Triphala, which is made up of Terminalia chebula Retz, Phyllanthus emblica L., and Terminalia bellirica (Gaertn) Roxb, could be useful for studying how networks of drugs work. Traditional Ayurvedic medicine is constantly customized, and depending on the Ayurvedic diagnosis, multimodal treatments given to several patients with the same illness may change greatly. Consequently, it is difficult to perform clinical trials utilizing a randomized controlled design [9]. The need for scientific proof of safety and effectiveness is growing along with global interest in Ayurveda and other traditional therapies. Encouraging people to learn about the tenets, applications, and advantages of Ayurvedic treatment is part of promoting health literacy in the field. The following are some methods for increasing Ayurvedic health literacy.

1. Education Programs: To raise public awareness and comprehension of Ayurvedic concepts, including the three doshas (Pitta, Kapha), dietary recommendations, lifestyle choices, and herbal medicines, offer educational programs, workshops, and seminars [38].
2. Online Resources: Create and manage reputable informational pages, articles, videos, and other resources on websites, blogs, and social media channels devoted to Ayurveda, enabling people to study the principles and practices of the practice during their own leisure time.
3. Publications: To reach a wider audience, publish books, essays, pamphlets, and other materials on Ayurveda, which include a

range of topics such as fundamental concepts, real-world applications, case studies, and success stories.

4. Community Workshops: To engage people and solve their health concerns, arrange interactive sessions, demonstrations, and hands-on experiences at community workshops and health fairs centered around Ayurvedic principles and practices.
5. Collaborations: Work together with community organizations, wellness centers, holistic practitioners, and healthcare professionals to incorporate Ayurvedic concepts into current healthcare initiatives. This will expand the program's reach and encourage multidisciplinary collaborations.
6. Cultural Events: Take part in festivals, fairs, and other events to promote Ayurvedic practices, provide consultations, and hand out educational materials to promote awareness and appreciation of Ayurveda in a cultural context.
7. Continuing Education: To help healthcare workers, yoga instructors, and wellness coaches apply Ayurvedic principles to their work, improve their knowledge and abilities, and offer continuing education programs and certifications.
8. Online Courses: Provide flexible and accessible learning opportunities to learners globally by creating online courses and e-learning modules on Ayurveda for those who wish to enhance their comprehension and application of Ayurvedic concepts.
9. Public Health Campaigns: Start public health campaigns that highlight prevention, holistic well-being, and self-care techniques while endorsing Ayurvedic approaches to particular health issues or concerns.
10. Patient Education: Provide patients with the tools they need to use Ayurvedic principles and practices to make educated decisions about their health and well-being in healthcare settings such as clinics, hospitals, and wellness centers.

Through the application of these tactics, people can raise their level of Ayurvedic health literacy, enabling them to incorporate Ayurvedic principles into their daily lives for increased vitality and well-being [39].

Future Directions and Recommendations

Policy Recommendations for Integrating Ayurveda into Mainstream Healthcare Systems

Indian government officials created the Department of Indian Systems of Medicine and Homeopathy (ISM&H) within the Ministry of Health and Family Welfare in March 1995 to provide targeted attention to the advancement of the Ayurveda and other Indian medical systems. In November 2003, it changed its name to the Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homeopathy (AYUSH). Allopathic medicine is not the only recognized medical system; each letter in the word AYUSH represents an official medical system. Following the 2014 election of a new government, the Department of AYUSH was formally upgraded to become the Ministry of AYUSH, completed with an independent minister and mandate to bridge the gaps in healthcare delivery and outreach currently present in all areas of Indian medicine. The Ministry is in charge of developing policies, organizing, and carrying out plans and initiatives to improve the scope, caliber, and results of the AYUSH industry. Recently, Sowa Rigpa, a traditional medical system used by inhabitants of the Himalayan region, was acknowledged and included in the AYUSH family. The Ministry of AYUSH has many goals, some of which are as follows: (1) Improving the quality of education in teaching and training institutions; (2) Increasing the capacity of research and development organizations and ensuring that time-bound priority research programs are carried out; (3)

Putting plans into action for the promotion, conservation, cultivation, and sustainable development of medicinal plants used in AYUSH systems; (4) Standardizing and Quality Control of Drugs in accordance with Global Trends; (5) Mainstreaming and Integrating AYUSH services within the national health delivery network; and (6) Raising awareness of AYUSH through information, education, and communication.)[40].

Promotion of Ayurveda in Education and Practice

Education Policy

The Central Council of Indian Medicine (CCIM), a statutory body established under the terms of the Indian Medicine Central Council (IMCC) Act of 1970, oversees the Ayurvedic educational system and professional practice. To maintain consistent educational standards throughout the nation, the Central Government has enacted strict regulations governing the establishment of new colleges, the expansion of admission capacity in all fields of study or training, and the introduction of new or advanced programs in Ayurvedic colleges. Ayurvedic colleges number 265, of which 117 provide postgraduate programs in both public and private sectors. The World Health Organization (WHO) acknowledges Ayurveda because it embraced traditional medicine to accomplish the goal of “health for all” and because of its potential to help people receive primary healthcare. Ayurveda performed better than several other medicinal systems in terms of illness prevention and treatment. The present state of Ayurveda's workforce and institutional makeup in India is as follows: (i) 438,721 registered medical practitioners; (ii) 15,193 dispensaries; (iii) 753 hospitals; (iv) 35,182 beds; and (v) 219 teaching institutes. Ayurvedic physicians with degrees or comparable credentials are recognized as licensed medical practitioners under the Indian Medicine Central Council Act of the 1970s. The prerequisites for registration and the ability to practice Ayurvedic medicine clinically include Master's degrees in 22 different specializations from MD/MS programs and Bachelor of Ayurvedic Medicine and Surgery (BAMS) programs, as well as comparable training [40].

Industrial Initiatives

Formulation development and upholding quality requirements Authorized books listed in a schedule of the Drugs and Cosmetics Act, 1940 contain formulae or natural raw materials of plant, animal, mineral, or marine origin from which legally manufactured Ayurvedic medicines can be made with permission. Consequently, several formulations have been produced and used as Ayurvedic medications. The National Ayurvedic Formulary published 265 standardized formulations from classical texts in four volumes. This is to convince people that standardizing Ayurvedic medicines will lead to better quality control. The Ayurvedic Pharmacopoeia has published a total of thirteen volumes, split into two parts. These parts contained 645 monographs of quality standards for single drugs and 252 monographs of quality standards for formulations containing more than one ingredient. The pharmacopeial standards for Ayurvedic medicines are based on 12 assessment criteria: identity, purity, and strength. These include confirmed identification, chemical ingredients, allowable levels of heavy metals, pesticide residues, aflatoxins, and microbiological loads. Similarly, an Essential Drug List comprising over 250 medicines has been published to guarantee the availability of high-quality Ayurvedic medicines to health facilities nationwide. The states then assist in obtaining these medicines for the free public distribution of patients via dispensaries and other medical facilities. The framework for Ayurvedic drug quality control was developed by the Ayush Ministry, as shown in Fig. 7.



Figure 7. The Ministry of Ayush's Framework for Ayurvedic Drug Quality Control [40]

The Ayurvedic Pharmacopoeia Committee of Multidisciplinary Experts is responsible for developing and updating the standards for Ayurvedic medications, while the Pharmacopoeia Commission of Indian Medicine and Homoeopathy oversees this process. Using advanced machinery and analytical techniques, several scientific laboratories, including the Pharmacopoeial Laboratory for Indian Medicine (PLIM), which is an appellate laboratory under the terms of the Drugs and Cosmetics Act of 1945, are working to standardize the SOPs of Ayurvedic drugs. Even if the current pharmacopoeia setup has made significant progress, a unified pharmacopoeial infrastructure is meant to improve outcomes and coordination. Pharmacopoeial standards development is suggested to be enhanced for this reason by research carried out by government-accredited laboratories or other establishments. This endeavor will support the current pharmaceutical standards for single- and multi-ingredient medications made from plants, minerals, metals, and animals [8]. Standard Operating Procedures (SOP) pertaining to the manufacturing processes of formulations are utilized in the development of various quality standards. For example, chromatography atlases and pharmacognosy atlases are appended to quality standards to facilitate testing procedures and identify marker compounds or phytochemical standard materials for ASU&H drugs [8]. The framework for Ayurvedic medication quality monitoring combines parameters, such as DNA barcoding and fingerprinting of medicinal plant ingredients. Under the guidelines of the Pharmaceuticals and Cosmetics Act of 1940 and its regulations, the Ministry of AYUSH's Drug Control Cell is responsible for the regulation and quality control of Ayurvedic pharmaceuticals. To ensure that Ayurvedic and other traditional medicines meet the legal requirements for quality control, the Drug Control Cell collaborates with state licensing authorities, drug controllers, and drug testing laboratories. The process of amending regulatory regulations is ongoing and is conducted in response to perceived demands and new developments in the field of natural medicine quality control. Several efforts have been made to monitor the adherence of manufacturing companies to GMPs, recommended shelf lives, and proof of the efficacy and safety of pharmaceuticals. To establish a vertical organization for AYUSH drugs under the Central Drug Standards Control Organization, which is led by the Drugs Controller General, the government approved

the creation of extra senior-level regulatory roles. States receive financial assistance to improve their functional and infrastructural capacities for the manufacturing, examination, and regulation of Ayurvedic and other traditional medicines.

Conclusion

The COVID-19 pandemic has highlighted the importance of exploring complementary healthcare systems such as Ayurveda in the post-pandemic era. With its holistic approach to health promotion, personalized treatments, and emphasis on immunity, Ayurveda offers valuable insights and potential solutions to contemporary health challenges. The integration of Ayurveda into mainstream healthcare systems presents opportunities to enhance healthcare delivery, improve patient outcomes, and foster greater health literacy among individuals. Through policy initiatives, educational reforms, and industrial initiatives, governments and healthcare authorities can promote the integration of Ayurveda into modern healthcare systems, thereby empowering individuals to make informed decisions regarding their health and well-being. By leveraging the strengths of both traditional and modern medicine, we can create a more resilient and inclusive healthcare system that addresses the diverse health needs of populations worldwide.

Conflict of Interest

The authors (s) have no conflicts of interest regarding the research, authorship, or publication of this article.

Acknowledgements

The authors (s) wish to express their gratitude for the invaluable guidance and support provided by the coauthor throughout the preparation of this paper. The depth and soundness of the knowledge presented in this review article are the result of extensive reading and research. The views and interpretations expressed in this article are solely those of the authors, derived from their comprehensive understanding of the subject matter.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art019

Perceived Sociocultural Factors Associated with Violence Against Men and Preventive Strategies for its Reduction among Married Men in Ibadan, Nigeria

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Abstract

Domestic abuse against males is prevalent yet often undetected due to societal silence and stigma; this paper explores the sociocultural factors and preventive strategies for addressing Violence Against Men (VAM) among married men in Ibadan, Nigeria. This study employed a descriptive mixed-method approach in Ibadan's five LGAs, administering 600 semi-structured questionnaires to married men and conducting 20 FGDs with community gatekeepers, with data analyzed using NVivo 10 for qualitative data and SPSS for quantitative data. Respondents, aged 23-64 with a mean of 45.07 years, mostly had secondary education (47.7%), were artisans (47.2%), Muslims (61.2%), and Yorubas (95.3%). Among them, 90.7% believed heavy alcohol and drug use by women could lead to abuse, 69.8% felt financial superiority could cause abuse, and FGD participants identified factors like social and educational status, cultural beliefs, employment, and lack of home training as contributors to domestic violence against men. Preventive strategies for reducing the violence against men mentioned by the respondents include public enlightenment using mass and social media and the provision of counselling services, including premarital counselling. Legal provisions should be introduced to protect men from violence or threats of violence directed against them by their abusive partners.

Keywords: *Domestic Abuse, Preventive strategies, Socioeconomic factors, Violence Against Men.*

Introduction

The Nigerian Violence Against Persons (Prohibition) Act of 2015 defines domestic abuse as any act, omission, action, or behaviour of the respondent that qualifies as domestic violence [1] as harasses, injures, or endangers the aggrieved person to force her or any other person connected to her to comply with any unlawful demand for any dowry, other property, or valuable security; or harasses, harms, injures, or endangers the aggrieved person to cause physical abuse, sexual abuse, verbal abuse, emotional abuse, or financial abuse or otherwise harms or injures the offended party, whether physically or mentally [2]. As intimate partners commit 38 percent of all female homicides globally, 35 per cent of women have experienced either physical or sexual intimate partner violence or non-partner sexual violence, compared to 28.5 per cent of men who have also experienced physical/sexual intimate partner violence [3, 4].

Men are also the victims of a variety of situations and forms of violence. Although it is less frequently discussed and reported, sexual abuse, violence, and crime against men are not nonexistent. Men are more frequently forced into unintentional sexual acts to advance professionally, get promoted, avoid being lazy at work, or win the wife's approval. Additionally, several males have disclosed that they were sexually abused and/or harassed as kids or teenagers by both men and women who were either their family members or who were (molested) in public [5]. As a result of the excessive focus on female victims, it is necessary to profile those who commit

Received: 02.07.2024 ***Accepted: 23.07.2024*** ***Published on: 30.07.2024***
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domestic violence against men to comprehend better the special problems that surround the act in urban patriarchies. Women would hit their male partners with objects, throw objects at them, hit them with cars, bite them, and use weapons like knives and guns against them. However, this means that males will frequently suffer injuries because women typically employ a weapon or item while men normally damage their female partners solely with their bodies [6]. Victims, in general, are wary of reporting it due to a variety of reasons. Young [7] notes that the discourse on male victims of domestic abuse is relatively new and that there were many disputes when Gelles and Straus first reported in 1975 that males were just as likely as women to report being hit and that women were just as likely to hit their spouses. When the term "domestic violence" is brought up, the age-old and pervasive beating, molestation, and brutalisation of women by their spouses immediately comes to mind. According to McKeown and Kidd [8], men who experience domestic abuse must contend with a culture that views wives as the only victims and husbands as the perpetrators. The numerous media campaigns against the mistreatment of women in intimate relationships and the sympathy and assistance they receive in contrast to the complete incredulity shown to male victims serve to strengthen this broad idea [9]. Although domestic violence against women is common in Nigeria, where many women have been killed, brutalised, or permanently disabled by their violent male partners [10], domestic violence against men is also common, albeit it has mostly gone unreported. Domestic violence is nearly universally underreported, and Watts and Zimmermann [11] speculate that this may be because the topic is so delicate. Thus, this paper presents the sociocultural factors associated with Violence Against Men (VAM) and its preventive strategies among married men in Ibadan, Nigeria.

Methodology

Study Design

A descriptive mixed-method approach was used for this study.

Study Area

The study was carried out in all five Local Government Areas (LGAs) in the Ibadan metropolis, Nigeria: Ibadan-North, Ibadan South-East, Ibadan South-West, Ibadan North-East, and Ibadan North-West.

Study Population

The study population comprised married men and community gatekeepers (traditional and community leaders) between 18 years and above.

Inclusion Criteria

1. Men living in Ibadan who were married or in cohabitation (aged 18 years and above)
2. Eligible men residing within the study area are available in the house during the time of study.

Exclusion Criteria

1. Men who were not married or in cohabitation
2. Men who were not available in the house during the time of study.

Sample Size

The sample size n was determined using the Leslie Fischer's formula;

$$n = \frac{Z^2 pq}{d^2}$$

Where n = minimum sample size

P (Prevalence) = 11% (*Prevalence and correlates of intimate partner violence among men in a rural community of Oyo State, South-West Nigeria* [12]

q = 1-P (1 - 0.11) = 0.89

Z = confidence limit (95%) = 1.96

d = level of precision (5%) = 0.05

$$n = \frac{(1.96)^2 \times 0.12 \times 0.89}{(0.05)^2}$$
$$= \frac{3.842 \times 0.11 \times 0.89}{0.0025}$$
$$= \frac{0.3761}{0.0025}$$
= 150

The sample size was increased to 600 for the generalization of findings and to account for the no-response.

Sampling Technique

For the quantitative study, six hundred consenting respondents were used, and the following five-stage sampling technique was adopted in selecting the respondents.

Stage 1: One out of five LGAs in the Ibadan metropolis was randomly selected by balloting, and Ibadan North was chosen.

Stage 2: The twelve wards in the selected LGA were stratified into rural and urban wards.

Stage 3: Four out of twelve wards in Ibadan North were randomly selected for this study (two each in rural and urban strata).

Stage 4: Three communities were randomly selected from each ward.

Stage 5: Respondents were chosen from every other household until the required respondents were obtained.

For the qualitative study, one Focus Group Discussion (FGD) was conducted in all the 20 selected wards, and the number of participants in each FGD was 6 participants. The FGD discussants were selected using a non-probability sampling technique involving purposive sampling. This implies that the FGD discussants were chosen because of their position as either community and/or traditional leaders in their community.

Method for Data Collection

Both quantitative (semi-structured questionnaire) and qualitative (Focus Group Discussion) methods were used for data collection.

Validity and Reliability of instruments

The instruments were pre-tested among a population in Akinyele's local government area that is similar to the sample population to allow the researcher to make any necessary corrections and determine how reliable and consistent the questions were. The dependability of the instrument was evaluated using Cronbach's Alpha Model method. As a result, the coefficient reliability was assessed using SPSS computer software, and the result showing a correlation coefficient greater than 0.05 was deemed reliable. This involved giving the questionnaire to 10% of the research population once.

Data Management and Analysis

All the data collected through the audio recordings was transcribed verbatim. Transcripts were checked regularly to ensure completeness of the transcription. The analysis was done by reading through the transcribed interviews, and Nvivo 10 software was used to analyze the results. For the questionnaire, the data were exported from the electronic database (KoboCollect), validated, and analysed using the Statistical Package for Social Science (SPSS). Descriptive and inferential statistics were used for analysis. Results were presented in frequency tables, and some variables were cross-tabulated.

Ethical Consideration

Ethical approval was obtained from the Oyo State Ethical Review Committee at the Ministry of Health, Oyo State. Oral informed consent was obtained from all the quantitative respondents before administering the questionnaire, while written consent was obtained from the qualitative participants. The participants were informed that their participation was optional and that abstaining from it had no adverse effects. Privacy and confidentiality were ensured as serial numbers, not the names of the respondents, were used. The respondents were assured that their

responses would be kept confidential as the questionnaire would be stored in a place where only the research team had access.

Results

Socio-demographic Variables

The socio-demographic characteristics of the respondents are shown in Table 1 below. The respondents ranged from 23-64 years, with a mean age of 45.07+11.34 years. Most (79.8%) practiced monogamous marriage, 78.2% have had only one marriage, and 85% reported providing the family's main source of income. Almost half (47.7%) of the respondents had secondary education, 47.2% were artisans, 61.2% were Muslims, and 95.3% were Yorubas.

Perceived Sociocultural Factors Associated with Violence Against Men

Table 2 shows the perceived sociocultural factors associated with violence against men. Majority (90.7%) of the respondents agreed that heavy alcohol and drug use by women could influence them to abuse their husbands, 69.8% agreed that a woman would abuse her husband if she has more money than him, 65.3% agreed that a woman would abuse her husband if she is more educated than him, 88.2% agreed that low self-esteem of a man could make his wife be abusing him, and 81.7% agreed that a woman whose mother is abusing her father would also abuse her husband. In addition, 35.8% agreed that a woman getting married at a younger age (less than 25 years) would not abuse her husband, and 13.3% agreed that a history of physical or emotional abuse in childhood would not make a woman abuse a man. The FGD participants mentioned social status, educational status, cultural belief, employment status, contentment and covetousness, and lack of home training as the sociocultural factors associated with the violence some men faced in their homes from their wives.

Table 1. Respondents' Socio-demographic Variables (n= 600)

Socio-demographic Variable	Frequency	%
Age (years)		
23-33	86	14.3
34-44	220	36.7
45-55	203	33.8
56 and above	91	15.2
Religion		
Christian	228	38
Islam	367	61.2
Traditional	5	0.8
Ethnicity		
Yoruba	572	95.3
Igbo	27	4.5
Hausa	1	0.2
Type of marriage		
Monogamous	479	79.8
Polygamous	121	20.2
If polygamous, the number of wives		
1	1	0.2
2	86	14.3

3	24	4.0
4	9	1.5
6	1	0.2
Education		
No Formal	20	3.3
Primary	130	21.7
Secondary	286	47.7
OND/NCE	70	11.7
HND/BSc	80	13.3
Postgraduate	14	2.3
Occupation		
Civil servant	107	17.8
Unemployed	1	0.2
Artisan	283	47.2
Retired	5	0.8
Trader	164	27.3
Driver	22	3.7
Professional	9	1.5
Company Executive	9	1.5
Age of first marriage		
12-22	76	12.7
23-33	452	75.3
34 and above	72	12
Years of Marriage		
1-11	216	36.0
12-22	212	35.3
23 and above	172	28.7
Number of Children		
0-2	211	35.2
3-5	330	55.0
6 and above	59	9.8
Average Monthly Income (#)		
Less than 35,000	135	22.5
35000 and above	460	76.7
Number of marriages		
1	469	78.2
2	94	15.7
3	28	4.7
4	8	1.3
5	1	0.2
Description of how they came to marry their current or most recent wife		

Chose each other	577	96.2
Marriage was arranged	23	3.8
Provides the main source of income in your home		
Self	510	85.0
Partner	10	1.7
Both	80	13.3

Mean Age 45.07+11.34

Social Status: Majority of them mentioned that if a woman is in a higher position than the husband or influential in society, it would pose a difficult situation in the family because of the pride that will come with it from the woman. Some participants added that such a woman would find it difficult to subject to her man, which would threaten the peace in their home. One of the participants specifically said;

> *"If a woman has higher status than her husband, their pride is always too much. To the extent that some won't listen to their husband again, there is nothing the husband can do, and there is nothing he can say; she will be looking at him as if it is not God that created him; she will be looking at him as if he has not been one doing things right from the beginning before God did his things but if the husband then sees that this woman, the way she is doing it can cause fight between them, it causes malice that doesn't make them relate again."*

However, a participant mentioned that most of the violence from women to men due to social status is sometimes caused by the irresponsibility of the men. He pointed out that some men leave most of the responsibilities to their wives once they see they are financially capable. In addition, another participant mentioned that when a woman is financially dependent on a man and the man is unable to meet financial expectations, this can lead to changes in behaviour and mistreatment.

Educational status: Some of the participants reported that a woman who is educated is liable to perpetrate violence against her husband, especially if the husband is not educated at all or not as much as she is. They further mentioned that such a woman would be abusive and would lack respect for her husband because she would see herself as a better person than the man and would start to behave as if she did the man a favour by marrying him. A participant specifically said;

> *"Regarding educational status, it gets a man angry, the women also normally abuse the privilege, in the sense that the way they will be talking to their husband at home can make a woman proud of her husband since she knows that those she is controlling at work have more standard compared to her husband. Anyways, it causes it when a woman is more educated than the husband."*

Employment status: Few of the participants reported that the employment status of a woman could make her violent toward her husband at home, especially if the husband is unemployed or what he is doing is not bringing in enough money. It was said that such a woman would be proud, and it would be difficult for the man to have a say in the house. One of the participants said;

> *"In this discussion, love is paramount in it all. But nowadays, many children don't remember the cultural belief that husbands are the head of their wives. Once they have more money than their husbands, they will abuse the men; in fact, what he is not supposed to do in the house, they will be pushing it on*

him. Once he fails at that, they will mock him, so if they are in a position, people will know he is no longer her husband because she will take the husband as the driver or take him as her servant; so in all, God should put love between the husband and the wife and then children of nowadays should walk with the elderly so that in one or three advice given by them, at least they can make use of one because it has been long that they say the husband is the head of a wife even till now. Still, the children of nowadays no longer use that, everyone is doing what they like."

Cultural belief: Above half of the participants reported cultural belief as one of the major sociocultural factors causing violence against men in their homes. They mentioned that having a different cultural or religious background should be taken seriously because some women who are idol worshippers tend to be more violent compared to those other religions. Further, they stated that their level of violence depends on the kind of ancestral God in her family, and it takes a lot of patience on the part of the man and even some sort of sacrifice to appease them when they get angry. A participant specifically said;

"You see on that cultural belief, yes, it is, some families are always aggressive, the gods they are worshipping may be powerful ones, if the gods enter into some women's life against their husband, that is what makes some women cut their husband with something because devil, may he not use us, some gods are being worshipped in a family that could cause that but some women when they see it is like that, it is important to be patient on her dealings with her husband at home."

Other mentioned sociocultural factors associated with domestic violence perpetrated against men, as noted by participants, are the fight for gender equity, peer pressure, and lack of love.

Contentment and Covetousness: Majority of the participants reported that the factors associated with violence against men are the bad habits the women have, like not being contented with little things and covetousness; one of them specifically said that;

"Some of the things, lack of contentment, lack of submission for someone, makes someone carry out violence. Part of endurance is when a husband does not have money today and doesn't know what will happen the following morning; then she sees her friend who has a car. Covetousness part of violence, and maybe that is what is causing it; maybe she sees that this one has money, that this one just spoke to her once that she gave her Five Naira; she will think because her husband doesn't have, she can follow him, covetousness led her there. Another one that causes it again, she will be like, "I will do whatever I wish to do." after all, I own my body, let me live my life, is also part of what causes it."

Lack of Home Training: A participant said that lack of home training from childhood also causes it when the woman is not properly trained well; he specifically said that;

'Why women perpetrate violence against men, some people, he has said the other time, it starts from the foundation of the house if the child is not well trained at home once she gets married, she will be doing the wrong things. Number two, when a woman is growing up, there are some things that she could have seen, because part of the violence we are talking about, I saw a movie yesterday, so that movie is on what you have come to ask, she later frustrated the husband till the husband eventually died because of what the

husband had done to her before they got married, but what the husband did for her that she saw, that he did for her, they have not started dating, they didn't know each other at all, but it was what she started doing when the husband eventually got married to her that she frustrated the husband. So, what she has seen out there or what she has seen about girlfriend/boyfriend that they were doing before, whatever she sees outside is what makes some women carry out violence. So, home number one and also what they have experienced and even between their father and mother, maybe there is a way their mother behaves to their father, it is the training that causes it."

Table 2. Respondent' Perceived Sociocultural Factors Associated with Violence Against Men

Statements	**Agreed (%)**	**Undecided (%)**	**Disagreed (%)**
A woman will abuse her husband if she has more money than him	419 (69.8)	47 (7.8)	134 (22.3)
A woman will abuse her husband if she is more educated than him	392 (65.3)	59 (9.8)	149 (24.8)
Heavy alcohol and drug use by women can influence them to abuse their husbands	544 (90.7)	13 (2.2)	43 (7.2)
Low self-esteem of man can make his wife to be abusing him	529 (88.2)	18 (3.0)	53 (8.8)
A woman whose mother is abusing her father will also abuse her husband	490 (81.7)	33 (5.5)	77 (12.8)
A history of physical or emotional abuse in childhood will make a woman abuse a man	473 (78.8)	47 (7.8)	80 (13.3)
A woman who believes in strict gender roles (female dominance) will abuse her husband	482 (80.3)	37 (6.2)	81 (13.5)
A woman getting married at a younger age (less than 25 years) will abuse her husband	315 (52.5)	70 (11.7)	215 (35.8)

A perceived cultural belief that a man is the head of the household and can never experience abuse from his wife does not allow men to speak out about their abuse experience	469 (78.2)	50 (8.3)	81 (13.5)

Preventive Strategies for Reducing the Violence Against Men

Table 3 shows the preventive strategies for reducing the violence against men among the respondents. The preventive strategies for reducing the violence against men, as mentioned by the respondents, include public enlightenment using mass and social media (53.5%), provision of counselling services, including premarital counselling (13.7%), provision of employment opportunities to men (11.3%), the establishment of programme by religious organisation (9.8%), good home training (9.8%), provision and enforcement of the law against violence (3.2%), economic support from the government (5.2%) and creating an educational platform (0.8%). The FGD participants mentioned the role of family, religious leaders, government, community leaders, those in authority (police, the judicial system, etc), non-governmental organisations (NGOs), provision of law against women, and establishment of support group systems as strategies to reduce VAM.

Family role: Some of the participants mentioned that the role of family in reducing violence against men is that parents should give their girl child proper home training while growing up so that she can behave well when married. Some also added that love conquers all, and if couples can love each other, then violence can be prevented within the family. Finally, a few participants reported that prayer is the key because no matter how hard a situation is, prayer can solve it.

Role of religious leaders: Some of the participants mentioned that a religious leader must have good behaviour that can be emulated by their followers, which could reduce women being violent to their husbands because they tend to attend religious houses more than men. One of the participants said;

> *"The roles of religious leaders are many in society to reduce violence against men. Firstly, you will see that in this community, we have many mosques, as well as many churches, but what they can be telling her will be the things that the religious leaders are also doing, that the followers will emulate, such that they are teaching them what they are also doing. It is from there that we see in the church that they will mix both men and women. Still, this one will make them separate them so that violence can be reduced in our society because once men and women roll together in the church, or whenever they are seen, there is a possibility there will be violence there because they will see each other there, this will make the violence in our society to reduce."*

However, a few of the participants mentioned that the religious leaders are parts of those causing violence in the family because some women, instead of staying at home to take care of the family, would prefer to go to Prayer Mountain instead, and the religious leaders won't caution them.

Role of community leaders: Most of the participants reported that the role of the community leader in curbing violence perpetrated against men by their wives is mainly monitoring and cautioning. It was said that a community leader should be able to follow up on the residents and know which of the houses is facing family crises and warn them. They added that part of their role is to call the couple, talk to them, and help them settle their differences amicably. A participant said specifically;

> *"The role of the community leaders like the chairman of a community, like a leader or elders in the house, once they see that a particular couple always fight, they have the opportunity to call both of them and ask them what is causing the problem, it could be a little thing that they will say "you husband listen to your wife, you wife listen to your husband," it could be that that is what they will say and if we see that the fights you don't stop it, you fight every day, you will be sent away from the community, maybe that is what they will tell them that will make them not to fight again, they have the role to play to monitor them."*

Role of those in authority (Police, the judicial system, etc.): Some of the participants implore those in authority to be fair and honest in their dealings and stop supporting women when it comes to domestic violence because some men have been wrongly accused just because their wives reported them. Further, they mentioned that authorities should be able to call the couples involved and advise them to solve their issues amicably among themselves, outside of court or police station. One of the participants said;

> *"In addition to what our judicial system and police officers can do, this one is common, in the sense that it is rampant in Yoruba land; we would love that they reduce it a bit; they should have it at the back of their minds that we don't go to court come back and still be friends, if they let them understand this among husband and wife that brings their case, they should let them know that they want to resolve the issue between them, peace can reign between them. They won't see it that the wife was the one who reported the husband and then locked up the husband; rather, they should call both of them; they should resolve it amicably."*

In addition, another participant recommends the establishment of stipulated punishments for extreme acts such as killing or maiming their husband to deter others from engaging in violent behaviour.

Role of Government: Some of the participants mentioned that the role of government includes organizing seminars or lectures for both men and women on how to relate with each other as a family; organizing counselling sessions for intending couples before getting married, and putting men in a high position at the workplace so that they can easily take care of their responsibilities as this will prevent been bullied by their wives, among others. A participant reported that once the government can help the citizens eradicate poverty and also the creation of more jobs violence will reduce.

Role of NGOs: Many of the participants mentioned that NGOs should be giving public enlightenment on the dangers of violence in the homes because they are the ones that move around the society and relate with people the most; they also said they should give feedback back to the government because they are believed to be closer to them. Few participants indicate that NGOs can contribute to addressing the root causes of domestic violence by focusing on societal issues such as poverty, lack of education, and inadequate healthcare.

Provision of law against women: When the participants were asked if they think there should be a law against women who are violent

to their husbands, most of the participants reported that if it's going to be a working law, and won't just be used then it is okay because if there is the law that punishes perpetrators, it will reduce the rate of violence in the homes. A participant said;

> *"If the government makes a law for the women, it will be immediately she does it, they will monitor it, without monitoring it, the law will not stand, laws that you make without doing an investigation that once you beat another woman on the road, you know you are in trouble when someone is not mad, may God not make us mad. The government can punish any male or female who goes against the law."*

However, a participant said no law can stand in the aspect of violence going on in homes and that the only solution is if the individual is ready to change because most of the women who violate their husbands are majorly those of high social status.

Establishment of support group system: Some of the participants mentioned that a support group system should be established in the community such that experienced women like older people can come around to share their stories and inspire them; this will lead to the reduction of violence among the women. A respondent said;

> *"Ha, but we are human; if they get there, they will hear this person's story, hear this person's story, so when you say your own is hard, if you hear another person's story, you will know that this your own is not anything at all when she even gets home she will think, that what she is fighting over does not even worth fight, that there are others issue that is more serious than her own, so that can reduce the problem, that is still okay, that can still bring reduction."*

Table 3. Preventive Strategies for Reducing the Violence Against Men among the Respondents

Variables	Frequency	%
Public enlightenment using mass and social media	326	54.3
Provision of counselling services, including premarital counselling	82	13.7
Provision of employment opportunity	68	11.3
Establishment of programme by religious organisation	59	9.8
Good home training	59	9.8
Provision and enforcement of law against violence	19	3.2
Economic support from government	31	5.2

Discussion

This study aimed to determine the socio-cultural factors associated with violence against men and strategies for its reduction in Ibadan, Nigeria. The majority of this study's respondents agreed that heavy alcohol and drug use by women can exert a substantial influence, leading to abuse against their husbands. This aligns seamlessly with Deshpande's seminal work in 2019, where the author identified alcohol as a significant risk factor contributing to violence against men [13]. The intricate nexus between substance abuse and domestic violence is reiterated across various studies, emphasizing the pervasive impact on intimate partner dynamics [14].

As regards socioeconomic status, this study unfolds a significant finding, as many of the respondents perceive a heightened likelihood of abusive behaviour when a woman holds a higher income than her husband. This alignment resonates with the findings of Malik and Nadda [15], who established a linkage

between unemployment, low family income, and the manifestation of gender-based violence [15, 16]. This association underscores economic factors as critical contributors to domestic violence, highlighting the imperative need for targeted interventions addressing the stressors embedded within financial disparities. Moreover, regional and sociocultural disparities emerge as pivotal considerations in understanding domestic violence perpetration. Drawing insights from Nwanna and Kunnuji's [17] study, our findings emphasise that highly educated, divorced, separated, and employed women in specific zones exhibit a higher likelihood of perpetrating violence against their partners [17]. This underlines the influential role played by regional and sociocultural factors in shaping the dynamics of domestic violence. The nuanced variations underscore the need for region-specific interventions to acknowledge and address diverse sociocultural landscapes.

Another factor reported by this study is the history of physical abuse, which is similar to a survey by Alsawalqa [16] that stated that their wives were exposed to childhood trauma by their parents, including physical, psychological, and emotional abuse and neglect. Additionally, suffering from bad parenting led to their negative self-perception, low self-esteem, feelings of inferiority, and deprivation. A few others stated that their wives witnessed violence in childhood and adulthood, which was reflected in their attitudes, goals, values, roles, and priorities in their marital life.

This study showed the preventive strategies for reducing the violence against men, as mentioned by the respondents, is public enlightenment using mass and social media. This is in accordance with Ademuson et al. [18] study which stated that to curb the issue of domestic violence against men, there should be a campaign to enlighten the public that domestic violence is not gender specific, but it can go both ways. Dealing with this stigmatized topic in an open and supportive way is a mandatory prerequisite to identifying victims of domestic violence in routine clinical practice [14]. In agreement with these findings, Adebayo [19] mentioned that there should be greater advocacy to enlighten the public about the existence and reality of the evil of domestic violence against men by government agencies, religious groups, and civil rights organizations. This will help in balancing the gender discourse on domestic violence and bring about better families in Nigerian society. To this end, more training measures for physicians should be made available to raise awareness of the subject. Hospital staff have a key role in setting the course and should thus be supported by targeted training measures [20].

The under-reporting of domestic violence against men due to embarrassment or fear of ridicule is a major challenge in Nigeria because of the sensitive nature of the subject. The victims are often in self-denial. Male victims are frequently disbelieved due to the patriarchal nature of Nigerian society, wherein it is believed that men are usually spouse abusers [21]. Battered husbands cut across all ages, educational levels, and socioeconomic classes. Male victims of domestic violence deserve the same recognition, sympathy, support, and services as female victims [19].

This study also mentioned other preventive strategies, which include the provision of counselling services, including premarital counseling, employment opportunities to men, the establishment of programmes by religious organisations, good home training, provision and enforcement of the law against violence, economic support from the government, and creating educational platform. In addition, Karimi (2018) stated that existing campaign programs need to be strengthened and sustained for awareness creation on the issue of domestic violence against men. This will give the phenomenon equal weight in the media and general society to that of violence against women. The program would also break gender stereotypes that provide fertile grounds for the

perpetration of violence against men. Social networks for men need to be strengthened through welfare and support groups. These would give the men the capacity to not only air their marital problems but also provide a source for better coping mechanisms [22].

This study also mentioned that a religious leader has a role to play in reducing women being violent to their husbands because they tend to attend religious houses than men. Thomas [23] found that religious leaders play vital roles in handling domestic violence issues. Still, the problem is that most of them do not have the needed skills and capacity to deal with the issue and mostly rely on the teachings of the Bible, Quran, and other religious book, which are patriarchal. It is recommended that they be given some form of education to enable them to do their counselling according to the constitution. In most societies, religious leaders play an influential role in constructing gender norms. The premarital or couples counselling course is one setting in which they exert their influence [24]. Faith, religion, and spirituality are frequently cited as helping survivors of domestic violence to recover from trauma [25]. Engagement with religious leaders, especially faith leaders, is of critical importance as they are understood to be gatekeepers to local communities, with considerable influence on their communities' beliefs and behaviours [26].

This study reported that the role of the community leader in curbing violence perpetrated against men by their wives is mainly monitoring and cautioning. It was said that a community leader should be able to follow up on the residents, know which of the houses is facing family crises, and warn them. They added that part of their role is to call the couple, talk to them, and help them settle their differences amicably. The study stated that policymakers, development practitioners, and researchers are to address violence adequately; a useful starting point is to build on community leaders' perspectives, attitudes, and responses to violence as a collective issue. By building on these, it will be easy to challenge and deconstruct the multiple ways in which community leaders' approaches to addressing violence are reinforcing gendered [27].

In this study, it was seen that the role of those in authorities (Police, the judicial system, etc), government, and NGOs are important in the prevention of violence against men. Aboderin et al. [28] emphasised the need for the reorientation and re-socialisation of members of society on the need to see abuse as gender-neutral through various media channels, and initiatives are recommended. Government agencies such as the National Orientation Agency, as well as other non-government agencies and civil and religious associations, are implored to raise awareness of the dangers of human abuse, irrespective of gender. In contrast, relevant security agencies get requisite training on how to handle male victims of abuse and as well cater for the protection of human rights irrespective of gender biases or appeal. Muia et al. [29] stated that there is a need to equally implement gender-based violence laws and policies to challenge the held societal perceptions of domestic violence against men (DVAM). An action that will see female perpetrators brought to due process of law. There is a need to advocate for change in gender and alcohol abuse lifestyle that expose men to victimization and stigmatization at various levels in society. Police and society response must be objective to facilitate reporting, protection, and prevention of DVAM [29].

Conclusion

In conclusion, preventive strategies for reducing the violence against men identified in this study include public enlightenment using mass and social media, provision of counselling services, including premarital counselling, provision of employment opportunities to men, provision and enforcement of the law against violence, etc. Domestic violence can even trigger suicide attempts. Consequently, male victims should be listened to and cared for.

Based on the findings, the following are recommended: Legal provisions should be introduced to protect men from violence or threats of violence directed against them by their abusive partners. Future research should focus on a comparative approach where the occurrence of domestic violence among men in rural households is compared with the same in urban areas. This would help identify patterns and differences in the occurrence and experience.

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Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.11.03.Art020

Enhancing Public Sector Productivity in Ghana: A Qualitative Study

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Abstract

In recent times, there have been calls on public sector workers to increase productivity in the public sector of Ghana. This comes against the backdrop that productivity in Ghana "s public sector appears to be consistently declining. While this seems to be the situation, it appears there is paucity of literature on the actual causes of productivity and how it can be improved in Ghana. Using secondary data and content analysis, this paper examines the phenomenon of low productivity in the public sector and recommends measures for improvement. Findings of the study revealed that poor remuneration systems in the public sector, political interference, and bureaucratic inertia are among the causes of low productivity in the public sector. The study recommended that public sector productivity could be enhanced through the establishment of a flexible bureaucracy, improvement in remuneration, regular monitoring and evaluation of the performance of the public sector and appointment of personnel based on merit. Political will as well as effective leadership is considered useful instrument to propel productivity in the public sector.

Keywords: *Corruption, Employee, Ethics, Ghana and Government, Leadership, Performance, Public Sector, Productivity.*

Introduction

In recent months, the productivity of Ghana's public sector has become a concern to scholars and public servants alike. There have been numerous calls on the public sector to increase its productivity to enhance quality service delivery and to get value for money. These calls can be understood in the light of the fact that the performance of the public sector has implications for economic development for the country. One of such concerns was reiterated in the President's State of the Nation's Address on February 21, 2013, when he lamented about the inefficiency that is replete in Ghana's in public sector. He stated that "the meat is now down to the bones, and it is time for serious rethinking about the level of wages in relation to our national competitiveness and the related productivity issues. Explaining the prevalence of low productivity in the public sector despite increase in wages and salaries, a senior policy advisor at the office of the President, Dr. Sulley Gariba also lamented that, **"**ordinary citizens of this country, especially poor farmers, have now made the supreme sacrifice of actually giving public sector wages nearly 70% - 7 pesewas of each cedi collected from the toiling people of this country, the real productive people….and he is basically challenging public sector workers that: is this still not enough? But at the same time as they are getting 70% on sector.

The importance of productivity in the public sector has been affirmed by [59] when he suggested that the public sector is crucial for three reasons: it is the major employer, it is also major provider of business and social service, and it is also the consumer of tax resources.

Received: 13.05.2024 ***Accepted: 30.05.2024*** ***Published on: 30.07.2024***
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The relevance of public sector productivity has necessitated an avalanche of attempts to reform the public sector in Ghana with the aim of enhancing efficiency, effectiveness, and the quality of public service [51]. This wave of reforms in the public sector could be explained against the backdrop that an effective public sector is critical to the development of Ghana [43]. Irrespective of these reforms, governments" performance in developing countries, including Ghana reveals that deployed resources show a record of less-than-optimal performance on delivery of value-for-money and accountability [46] in the public sector. Available evidence also indicates that revenue to the Government of Ghana fell by 11.9% due to under-performance of domestic VAT and petroleum taxes (Ghana Government Budget Statement, 2010, 2011and 2012). It is against such background that the study aimed at investigating the causes of low productivity in the public sector of Ghana and also to propose measure to enhance productivity in the sector.

Methodology

This paper aims at exploring and explaining the causes of low productivity in the public sector and how it can be improved. Based on this, the study is situated within the qualitative paradigm of social research which is for exploratory and explanatory studies. The design for this paper is the content analysis design. This was used to analyze written reports, journal articles, and other relevant sources of data about the topic. The source of data for this paper is secondary data. This was obtained from government agencies, conference proceedings and articles about the causes of low productivity in Ghana. The data was presented and analyzed using the narrative method. deemed appropriate.

Theoretical Framework

This study is guided by the public choice theory. Public choice theory of policy making argues that the public sector may be engulfed with incompetence because policy makers are fraught with self- interest. Public choice theory assumes that all political actors seek to maximize their personal benefit in politics as well as in the marketplace. The theory recognizes that government must perform certain functions that the marketplace is unable to perform such as providing rules of the game to curb market failure as well as solving externalities [20]. This point has been argued by [12] that each individual is a rational being pursuing his or her interest; government and social order simply provide a stable environment in which free individual choice may be exercised.

Downs [19] states that public office-holders act solely in order to attain the income, prestige and power which come from being in office. Thus, politicians never seek office as means of carrying out policies to benefit the citizens but as a means to attain their private ends which they can reach only by being elected. The basic assumption of rational choice theory is derived from neo-classical economic theory, utilitarian theory and game theory [24;17] cited in Zey, 1992. The fundamental notion of rational choice theory is that social interaction is basically an economic transaction that is guided in its course by the actor's rational choices based on rigorous calculus approach. It argues that individuals are very purposive and intentional, and they are actors who have ends or goals toward which their actions are aimed at. [30] provides a strong perspective of rationality as "efficient in securing ones self-interest." This point has forcefully been brought home by the early economic theorists such as [58] that individual contribute to the general productiveness of society although their interest is to be only interested in their own gain.

A rational or economic man according to [22] is the one who has "preferences that are not only consistent, but also complete, continuous and selfish." [22] describes the latitude that this premise provides to economists research strategies when they explain behavior, in that they "assume first it is selfish, if not then at least rational, if not intentional."

"efficient in securing one"s self-interest." This point had forcefully been brought home by the early economic theorists such as Smith (1776) that individuals contribute to the general productiveness of society although their intent is to be only interested in their own gain. Arational or economic man according to Elster (1983, p. 10) is the one who has "prefer that are not only consistent, but also complete, continuous and selfish." Elster (1983, p. 10) describes the latitude that this premise provides to economists" research strategies when they explain behavior, in that they "assume first it is selfish; if not then at least rational; if not intentional."

From the foregoing, it could be observed that the self-serving nature of man illustrates why public sector employees usually abuse their offices and neglect official duties. There is poor productivity because individual employees neglect what ought to be (the systems) in order to pursue personal gains. Leaders who should give broad direction and framework seek self-interest, which ultimately affects the morale of the entire public sector. The public choice school, therefore, suggests that poor productivity in the public sector is mainly as a result of public sector personnel seeking their self-interest at the expense of societal maximum gain.

Literature Review

Lienert [37] suggests that defining the public sector is to identify the functions that the public sector is called to perform. In the view of [40], the public sector encapsulates all that is called government. [53] also points out that the public sector comprises the domain of human activity which is regarded as requiring governmental intervention or common action. Based on these definitions, it could be concluded that the public sector constitutes the realm within which governmental action takes place. It includes national governments, sub-national governments, local government units and regulatory bodies [32]. In Ghana, the public sector is defined along the lines of four organizations. These are: public services, regulatory agencies, public enterprises, and regional and local government units [6].

The public sector has defining characteristics that distinguish it from other sectors of the economy. [45], identify four peculiarities of the public sector. These peculiarities are that the public sector has bureaucratic hierarchies, multiple hierarchies, renders services other than manufacturing products and serves the common good.

Ayee [9] noted that the public sector has an enormous impact on all citizens…. because the public sector provides goods and services (sanitation, water and electricity) that are important for development; spearheads economic policy making and management; responsible for the maintenance of law and order. The public sector, therefore, refers to those institutions charged with providing services for the public, although increasingly their roles are being transformed from actual production to provision using a variety of public and private entities [9].

However, there has been evidence of gross discrepancies in the performance of the state and consequently there have been attempts to re-arrange state structures to allow space for other actors to participate in service provision [38; 54; 60; 11]. The public sector has been shrouded with low productivity which is the ratio of work output with respect to input invested; the productivity of an entity or organization is the ratio of work output with respect to resource input. For instance, [60] argues that dissatisfaction with the

public bureaucracies, implementation of programs and their provision of services has been rapidly increasing…. Consequently, its comparative advantage is preferably to privatize it [62].

Productivity

Several scholars have given various definitions of productivity based on their own orientation. [33], define productivity as the quantitative relationship between input and output. [36] also defines productivity as the efficiency in producing goods or services or the ratio between the units produced or services provided by an organization unit and the resources consumed in production during a specific period of time. The Organization for Economic Co-operation and Development (OECD, 2001) defines productivity as a ratio of volume measure of output to a volume measure of input use. A careful examination of these definitions suggests that productivity can be understood by examining the proportion of inputs used in the production of goods or services and the output or gains made. In this case, if the measurement of input is not commensurate with expected output, then productivity is low. If output measurement is commensurate with input or exceeds it, then productivity is high or optimum. In Ghana, a chunk of the tax resources goes as input to the operations of the public sector, yet it appears the relative output of most of the public sector organizations do not match the resources used and returns are low. In the era of New Public Management, it is expected State Owned Enterprises and corporations to produce with economy, efficiency and effectiveness. Yet, if one compares the performance of public banks and private banks; public manufacturing corporations and private ones, the difference is clear as the latter appears to be doing relatively better.

Olaoye [41] identifies two dimensions of productivity. These are total factor productivity and partial factor productivity.[56] and [57] identify the third dimension of productivity as multi-factor productivity. They explain that the partial factor measure of productivity considers a single input in the ratio while the total factor measure combines the effects of all the resources used in the production of goods and services. The multi-factor measure utilizes more than a single factor. These dimensions seem to reveal that measuring productivity could be cumbersome and therefore means the combination of all the dimensions of productivity in order to arrive at a holistic measurement. [47] seems to support the argument of the difficulty in measuring productivity by rejecting the idea of including outcomes in productivity measurement. What perhaps adds to the difficulty in measuring productivity is that it is intermingled with the concept of performance [64]. A further ground for the difficulty in the measurement of productivity relates to the intangible nature of services [63]. It is clear from these views that while productivity is important to the development of Ghana's economy, its measurement is difficult. Researchers have identified the concept of productivity and performance in different ways. They are the function of many factors- ranging from top management support, committed personnel at all levels, a performance measurement system, employing training, reward structures, community involvement and feedback to correction of budget-management decisions [31].

Causes of Low Productivity in the Public Sector

The public sector works within an institutional and legal framework that can inhibit efficiency and responsiveness. (16) suggest that public bureaucracies are excessively formal and overly reliant on written communication. In Ghana, for example, it takes an unduly long time for clients

to get their documents processed at some public sector institutions. Another cause of low productivity in the public sector is political interference in the official work and actions of civil servants. [29] describes political interference as threats or inducements from politicians which cause or attempt to cause public sector employees to act in a particular fashion, and thus hurts the independent relationship expected to characterize their relations. The notion that political interference in decision making is detrimental to corporate performance is well documented throughout studies on governance [14]. In Ghana, political interference usually manifests in appointments, recruitment and promotions [42]. Political interference in the activities of public organizations is partly culpable for the poor performance of the public sector [52]. The argument is that, if public sector workers are appointed based on political considerations other than meritocracy, it sets the stage for low productivity, corruption and patronage in the system. Writing on the relevance of recruitment and selection, [23] argued that "I believe the only game in town is the personnel game; my theory is that if you have the right person in the right place you do not have to do anything else but if you have the wrong person in the job, there's not a management system known to man that can save you."

have to do anything else but if you have the wrong person in the job, there's not a management system known to man that can save you."

Yet, it has been observed that " patronage and nepotism appear to characterize the bank and file of the public sector which inadvertently harbor inept and incompetent individuals leading to low productivity of public bureaucracies [25].

The literature provides evidence that the public sector is engulfed in all sorts of negative tendencies that undermine the productivity of the sector and hence the role of the sector in total national development has been ineffective. Several weaknesses have been identified in the Ghanaian public administration, these include; apparent lack of clear objectives at agency level, weak leadership at administrative level, shortage of expertise in critical areas, unclear policy goals, policy goals insufficiently related to resources, proliferation of duplication and fragmentation, inadequate internal and external audit systems, ineffective systems for managing financial and human resources, uneven overstaffing, inefficiency, over centralization; corrupt officials, fraud, abuse and waste, lack of ethics and general low level of productivity [65; 8].

Poor remuneration is also another cause of low productivity in the public sector. This is connected with the formulation and implementation of strategies and policies to reward people fairly, equitably and consistently in accordance with their value to the organization [5]. In Ghana, the wages and salaries of the public sector generally appear less attractive compared to those in the private sector [42]. Low productivity in the public sector can also be linked to inadequate knowledge of performance expectation and evaluations on the part of public sector workers. Performance expectation refers to the degree to which employees are given clear signals about how diligently they should work and about the quality of work expected of them [66], and performance evaluation refers to the degree to which employees know and understand, on a continuous basis, how effectively they are performing [28]. It has been argued that organizations or sectors that have clear and consistent policies about performance expectations and evaluation procedures would be expected to perform better [43]. The problem of low productivity in the public sector is further heightened by issues that bother on autonomy. Autonomy is defined as the degree to which employees are offered the freedom, independence and discretion to make decisions pertaining to the

substantive and procedural aspects of their jobs, such as scheduling and determining the procedure to be used in executing the task [28]. The absence of inadequacy of this privilege or mechanism for officials in the public sector tend to make them less innovative since they are likely to exercise greater cautiousness and rigidity in their actions, presenting a barrier to achieving the breakthrough in thinking required for high public sector productivity. The resultant effect is increased difficulty in setting public sector objectives and benchmarking. It also tends to cast public organizations into operating under strict legal and formal constraints, resulting in less autonomy for public managers [55].

Recommendations: Improving Public Sector Productivity

The literature suggests useful strategies for enhancing productivity in the public sector most of which have achieved maximum successes in other jurisdictions or political systems. This ranges from meritocratic recruitment, capacity training and staff development, motivation and proper compensation, performance contracts, flexible management, promotion of high ethical standard, restructuring or reengineering, deregulation, introduction of provider-purchaser arrangement, right span of control, re-orienting personnel, and public service ethics among others. [39; 27; 8].

There is no blueprint for enhancing public sector efficiency. OECD countries have thus adopted diverse approaches to reforming key institutional arrangements, which include:

Increasing devolution and decentralization; strengthening competitive pressures; Transforming workforce structure, size, and HRM arrangements; Changing budget practices and procedures; and introducing results-oriented approaches to budgeting and management.

Although the majority of OECD countries have engaged in some institutional reforms, the empirical evidence of their impact on efficiency is so far limited due to the lack of resources to conduct evaluations; the lack of pre-reform measures of performance; the complexities in measuring efficiency1 in the public sector; and the problem of isolating the effects of specific institutional reforms on efficiency from other external influences. Empirical evidence nevertheless suggests that the following three institutional factors may improve public sector performance**:** Decentralization of political power and spending responsibility to sub-national governments. Appropriate human resource management practices. In the education and health sectors, there is evidence that increasing the scale of operations may improve efficiency. Increasing the use of performance information in budget processes is an important initiative that is widespread across OECD countries. It is part of an ongoing process that seeks to move the focus of decision making in budgeting away from inputs (how much money can I get?) towards measurable results (what can I achieve with this money?).

Notwithstanding, organizational restructuring requires altering the processes and procedures for executing organizational functions and activities. In light of this, the traditional and bureaucratic procedures must be made flexible. Moreover, to ensure productivity, managers must be given decision space to make tailor-made and responsive decisions that would be contextually relevant rather than being dictated by an "iron cage" top-down decision, push down their throat. This point has variously been described as, let the managers manage" and has been argued by [67] that governments must "steer and not row".

The next measure involves proper personnel management and innovative approach to managing the most valuable assets - human resources - of the organization. This is because in spite of all the restructuring, proper systems and innovation, without the meanings that are

provided by the human mind, organizations are only piles of stone and metal and blobs of ink on pieces of paper [68]. The need, therefore, for organizations to institute such policies that would create the kind of environment which would motivate employees to give out their best cannot be over-emphasized [4].

It is important to note that various human resource components–human resource management policy, recruitment and selection, employee rights and welfare compensation and benefits, human resource development, work environment, ethical issues among others- in the 1992 Constitution of Ghana. A very positive approach to the above attributes, motivates the people to enhance productivity. It is very unfortunate that compensation in the Ghanaian public sector has been in a complete mess for some time now partly because of lack of concrete and systematic policies and guidelines as well as tendency to apply ad hoc measures and solutions to chronic compensation and could be described as the politician's nightmare [4]. A productive work environment is that which motivates employees to show commitment and give their best towards realization of organizational goals.

In Ghana, the year 2013 has witnessed many labor agitations and strikes mainly as a result of compensation and remuneration issues with regard to public sector workers. Unions such as Judicial Service Staff Association of Ghana (JUSSAG), Federation of University Senior Staff Association of Ghana (FUSSAG), Ghana Medical Association (GMA), The teaching profession or academia also witnessed many strikes as Ghana National Association of Teachers (GNAT), National Association of Graduate Teachers (NAGRAT) and the University Teachers Association of Ghana (UTAG) went on strike for almost three consecutive weeks which made public Universities go on a brink to closure. These suggest that compensation in the public sector is problematic in Ghana and implementation of personnel remuneration is system is a big challenge. It is therefore appropriate to take a multi-sectoral approach in resolving all these labor agitations so that there will be equity and fairness in the system in order to enhance productivity.

[49] conducted research for bureaucracies of 35 less developed countries and his conclusions highlighted that meritocratic recruitment is the most important structural feature for improving bureaucratic performance. This explains that competency must be given priority before selection; nepotism, cronyism, communalism (in Riggs' term) must be avoided at all cost. Above all, there must be constant training and development of the capacity of personnel of the public sector. According to [18], advances in knowledge have been the largest and most basic reason for the growth of productivity in the U.S. between 1929 and 1983, accounting for 55 percent of the growth in actual national income per employed person during the period. Education per worker accounted for an additional 27 percent of that growth. [69] has stressed the central importance of human capital to America's economy.

Meritocratic recruitment, training and development, and sound human resource practices are very critical for the overall performance of the public sector. This point of view has forcefully been brought home by [23]: "I believe the only game in town is the personnel game. My theory is that, if you have the right person in the right place, you don't have to do anything else. If you have the wrong person in the job, there's not a management system known to man that can save you."

In addition to the above, enhancing public sector productivity could be achieved through motivation. Employee performance depends on a combination of ability and motivation. Because employee selection process should ensure that

employees have the ability to do their jobs, it becomes the manager's responsibility to ensure that the employee performs [15]. Some students of motivation believe that it is possible for one person to motivate another [15]; others believe that motivation comes from within the person and that all that management can do is to provide the situation in which the individual can reach his full potential; Managers must deal with it and the successful manager must find ways to ensure the highest-level performance possible [15].

Finally, after a proper organizational system has been instituted, it demands great deal of leadership that is very committed to ensuring that organizational goals are met. Currently, Shellukindo & Baguma have presented a vivid picture of the extent of degeneration of ethics among African professionals when they pointed out that the situation is such that chief leaders are what [8] refers to saints. When leaders, especially political elites and bureaucratic officials lead exemplary lives full of trust that trickle down to the whole system.

The public sector does not necessarily need managers but leaders who are very entrepreneurial to transform problems into opportunities.

A great deal of leadership would encourage and propel public sector ethics. This would create a sense of commitment in the public service; corruption, waste, abuse and fraud would be eschewed. Without the leader's commitment to ensuring productivity, all efforts are likely to fail. This tendency has been reiterated by [13] that the public sector needs strong political will to act, to strengthen preventive measures and support corruption fighters. [33] had pointed out the cynical claim that the political will is weak because too many politicians profit from corruption or they fear that they have too much to lose should they balk the corrupt. There should be an overhauling of character starting from the top so that the perception of lower grade employees would be positive towards their leaders and work.

Institutional Drivers of Efficiency in the Public Sector

This section briefly summarizes the findings of the literature regarding the potential institutional drivers of efficiency. The institutional arrangements that have been reviewed in the literature summarized here include: i) practices ensuring increased results orientation, such as budget practices and procedures and performance measurement arrangements; ii) arrangements that increase flexibility, including devolution of functional and fiscal responsibilities from central to sub-national governments, agencification, intra-governmental coordination, human resource management arrangements and e-government; iii) methods for strengthening competitive pressures through privatization and other means; and iv) various workforce issues, including workforce size, its composition, the extent and nature of unionization and the attractiveness of the public sector. Overall, the evidence is surprisingly scant. Available research is inconclusive with respect to the impact on efficiency of varying the mix of inputs used or of changing structural and managerial arrangements.

However, some findings emerged in three areas. First, it seems that efficiency gains could be obtained by increasing the scale of operations, based on evidence collected mainly in the education and health sectors. This effect is attributed to economies of scale that result from savings in overhead costs and fixed costs in tangible assets. However, the impact on other public sector values such as equity, access to services, and the quality of services needs to be taken into account.

Secondly, functional and political decentralization (i.e. spending responsibility) to sub-national governments also seems beneficial for efficiency. In principle, devolution of

functional responsibilities, if accompanied by appropriate fiscal and political decentralization, provides incentives for sub-central governments to deliver locally preferred services more efficiently, as the burden and the benefits of public service delivery both accrue in the communities. Evidence from federal countries shows that decentralized taxation reduces the size of government; however, evidence on the comparison of countries is inconclusive in this regard.

Lastly, human resource management practices also matter a great deal. The soft aspects of human resource management, such as employee satisfaction and morale, are considered to be the most important drivers of performance. While wages are still important for staff, non-monetary incentives are also essential. High wage levels – compared to similar work in the private sector – could lead to inefficiencies, although governments often are model employers, and their wage policies reflect equity concerns as well. Wages are also important for attracting and retaining qualified staff, especially in case of skill shortages. Performance-related pay initiatives appear to have a low impact on staff motivation.

Conclusion

In conclusion, ensuring a holistic and eclectic approach is the best strategy for an effective public sector management in Ghana. It is argued that a piecemeal approach or concentrating on just one approach would not work sustainably. This point has been summarized by Turner & Hulm [70] that organizational improvement is not a panacea for improvement; development is multi-faceted, and success or failure is based on more than one organizational design, administrative reform or human resource management. Such items have a strong bearing on whether developmental progress will occur, but they are never the sole determinants. This paper has argued out a framework which suggests that factors that enhance productivity emanate from leadership or political will; such leadership foresight and commitment propel them to institute proper systems and restructuring which might even at times lead to shedding part of their own control and sphere of influence, committing enough resources for proper human resource management including compensation and motivation.

Low productivity in the public sector in Ghana calls for reform, which is an induced, systematic, permanent improvement in the structure, processes, and management of public sector organizations in order to attain efficiency and effectiveness in the provision of public services [44]. However, as argued by [51], reforms should not be viewed as a one-time event but as a dynamic process of change which should be pursued and sustained.

Additionally, the system of assessment must be based on periodic monitoring and evaluation. There should be a constant and systemic effort to measure the productivity of the public sector at any point in time, and re-adjustment made according to the feedback received. This may be successful when it is backed by a strong governmental commitment and dedication but not a mere lip service and public or media display.

Conflict of Interest

Professionally, I have handled this research with fairness and neutrality. I hereby declare that there is no conflict of interest during study.

Acknowledgement

Best appreciation is hereby extended to the following: Dr. Samuel Bonsu, Margaret Epperson and my family who have been helpful in my studies, research and even during the preparation of this project report.

I thank God for the knowledge and understanding he has given me, for the privilege

of life and good health to be able to carry out my project successfully.

I also would like to declare my thankfulness to my coordinator Ms Dharani for the guidance and support. Last but not least, I would like to thank my wife, Mrs. Linda Mensah Bonsu for the unlimited and unconditional support at every point and moment during my study. In a special way I say thank you my lovely wife and may God bless you for being there for me.

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