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Use of Ultrasound to Check Diaphragmatic Thickness to Assist in Weaning

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Abstract

Dysfunction of the respiratory muscles is now considered to be a serious complication of critical health issues. Diaphragm dysfunction has been associated to higher mortality and complications weaning with mechanical ventilation in patients getting invasive mechanical ventilation treating acute respiratory failure. Diaphragm dysfunction can occur in mechanically ventilated patients for a variety of factors, involving disuse atrophy with mechanical ventilation. Therefore, it is becoming increasingly essential for clinical and research priorities to measure and track diaphragm contractile activity, structural dimensions, as well as strength during mechanical ventilation. It is generally accepted that ultrasound may be used to visualize the diaphragm. The key indicators of diaphragm function have been developed over the past 15 years for mechanically ventilated patients to monitor changes in diaphragm size as well as function over time, to evaluate and diagnose diaphragmatic dysfunction, and to determine whether these indices can predict successfully exiting mechanical ventilation. These indices include diaphragm thickness, thickening fraction, as well as excursion.

Keywords: *Diaphragm, Diaphragm thickening fraction, Diaphragmatic excursion, Ultrasound, Weaning.*

Introduction

It might be difficult for anesthesiologists to wean mechanically ventilated patients inside the intensive care unit (ICU). 20% of ventilated patients had trouble weaning, on average. The main muscle associated with active inspiration is the diaphragm, and dysfunction of this muscle results in inadequate coughing along with respiratory failure. The majority of patients are weaned based on the intensivist's subjective clinical evaluation of them, which can occasionally result in errors of judgment. Numerous objective measurements as well as indices have been developed to increase weaning success but have limitations of their own. These include minute ventilation, tracheal occlusion pressure 0.1, rapid shallow breathing index (RSBI), as well as the CROP (Compliance, Rate, Oxygenation, Pressure) index. The most widely used method is RSBI, and numerous studies have shown it to be helpful in weaning; despite this, the suggested cut-off values in these studies vary, and some have come to the conclusion that RSBI is an insufficient tool for weaning ventilated patients.

The technical difficulties, lack of availability, and expensive cost of the methods that can evaluate the diaphragm function include fluoroscopy, trans-diaphragmatic pressure measurements and phrenic nerve conduction study. In order to evaluate diaphragm dysfunction, ultrasonography of the diaphragm has been used. The utilization of diaphragm ultrasound as a tool for detecting and tracking atrophy to determine which patients will eventually wean from mechanical ventilation and who will continue to be ventilator-free has generated a lot of support. In paediatric critical care, mechanical ventilation (MV) equipment is commonly used. In the pediatric critical care unit (PICU), MV

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assistance is provided to about 30% of the children [1]. MV assistance is not the end of treatment, though; the ultimate purpose is to help patients in weaning off MV support. It was suggested that weaning be divided into three categories: simple weaning, difficult weaning, as well as prolonged weaning at a worldwide consensus meeting on weaning from MV in 2007 [2]. According to a multicenter study, 10% of MV patients had a difficult weaning period lasting longer than 1 day but less than one week, while 9% had a lengthy weaning period lasting 1 week or more [3]. Weaning that is difficult and takes a long time is known as failure to wean (FTW). Clinical results for FTW are noticeably worse. FTW has been associated with the onset of ventilator-induced diaphragmatic dysfunction and intensive care unit-acquired weakness, according to studies. It is also an independent risk factor with mortality in ICU patients and a prolonged length of ICU stay [4-6]. As a result, every patient's weaning through mechanical ventilation represents an important step. A shorter MV and reduced difficulties can result from weaning at the appropriate time. In adult studies, weaning predictors have been used to increase the success rate of weaning. Examples include rapid shallow breathing index, maximum inspiratory pressure (PImax), airway occlusion pressure 0.1 s, as well as weaning index [7-9]. Unfortunately, there is not sufficient evidence to support the efficiency of predictors being superior to clinical judgment in terms of weaning success in children [10].

Many conditions, including acquired weakness, malnutrition, nervous system disorders, cardiovascular dysfunction, infections, and other diseases, might make it difficult to wean off MV [11-13]. Diaphragm weakening is frequently observed in MV patients and is probably a contributing reason to weaning failure, which is something that is becoming more widely recognized [14-16]. Diaphragmatic dysfunction (DD) has been identified in recent years as a common cause of weaning failure [14, 17-19] The direct visualization of a patient's diaphragmatic function is made possible by a relatively new medical technology called diaphragm ultrasonography [17-19]. This technique is rapid, simple, and noninvasive, making it suitable for use at the bedside. As a result, with the advancement of critical care ultrasonography, physicians can now utilize ultrasound to dynamically assess the pulmonary or extrapulmonary variables that may be contributing to respiratory failure and weaning failure. It is appropriate for use in ICU patients with MV [18, 19]. Today, it is simple to assess diaphragmatic movements at the bedside, including the amplitude, force, and velocity of contraction, specific motion patterns, and changes in diaphragmatic thickness during inhalation [17]. As a result, ultrasonography is a useful tool for the early detection and assessment of acquired weakness at the intensive care unit (ICU). It has been demonstrated that the amount and quality of the diaphragm as well as skeletal muscles as examined by ultrasound are connected to muscular strength and function [19].

The diaphragmatic excursion (DE) as well as diaphragm thickening fraction (DTF) are two potential diaphragm sonographic predictors. An ultrasonic probe is used to measure DE in the right midline of the axillary as well as left axillary posterior lines, respectively, of patients who are lying supine. The distance between the diaphragm movement's highest and lowest points in the M-mode is DE. DTF is calculated as (thickness at the end of inspiration-thickness at the end of expiration)/thickness at the end of the expiration and reflects the change in the thickness of the diaphragm throughout respiratory effort. The diaphragm is visible when the probe is positioned between the axillary frontline as well as the midline perpendicular to the chest wall, around ribs [8–10]. Between the peritoneum and the hyperechoic pleura is where the hypoechoic diaphragm can be found. The growing amount

of evidence demonstrates that DD is essential to the weaning process.

Diaphragmatic ultrasound could better predict the results of weaning, according to numerous adult studies, and this evidence is of great value in guiding weaning in MV patients [20-22]. The evidence from diaphragmatic ultrasound, however, is insufficient because there aren't enough studies of it in the field of pediatric critical care medicine. The goal of this study is to briefly evaluate the ultrasound-based diaphragm measurement method and to list the most recent research results.

Role of Diaphragm

Goligher observed that the development of diaphragm atrophy was related to a prolonged period of mechanical ventilation, an increased length of stay in the intensive care unit, and a greater rate of complications. The implications of diaphragm atrophy secondary to mechanical ventilation have been recently documented [23]. It's interesting to note that patients who experienced a critical illness and had an increase in diaphragmatic thickness also had a greater the risk of needing prolonged mechanical ventilation, with too much respiratory effort possibly serving as the underlying cause. It was acknowledged by the authors that tissue oedema brought on by fluid resuscitation might possibly be a factor in this thickening. Patients who are mechanically ventilated have been shown to see a 6% or 7.5% reduction in diaphragmatic thickness daily. Although nearly half of the patients in their trial did experience atrophy, a subsequent investigation showed that the same proportion did not experience any loss, and an additional 10% reported increases in diaphragmatic thickness [4]. According to a recent study on children who are mechanically ventilated, diaphragmatic atrophy happens on average at a rate of 3.4% each day and is made worse by the application of neuromuscular blockade [25]. However, ultrasound-based diaphragmatic atrophy was not demonstrated in two papers [26,27]. However, compared to controls, one of these studies involved extubated sepsis survivors who had undergone at least five days of mechanical ventilation and were infected with sepsis (82% of whom had severe sepsis or septic shock). The authors acknowledge that rather than being based on data collected during the acute episode of sepsis, these results were based on a single measurement taken at a time in the patient's recovery from sepsis.

Ultrasound and the Diaphragm

Since well over 40 years ago, it has been possible to use ultrasonography to see the diaphragm [28] However, measuring the size and function of the diaphragm during mechanical ventilation has only recently been done using diaphragmatic ultrasound. Diaphragm thickness and diaphragm excursion are two measurements generated from ultrasonography that are frequently utilized [29]. A phased array probe is typically used to assess diaphragm excursion, with the goal of imaging the posterior third of the diaphragm. The probe is positioned in the subcostal margin near the mid-clavicular line. Even though some studies have employed B-mode imaging to quantify diaphragmatic excursion [30], M-mode imaging generates images that show the diaphragm's movement over time and enables precise measurement of diaphragmatic displacement across a respiratory cycle [31]. The diaphragmatic excursion may be consistently measured in a supine or recumbent position in healthy volunteers, and it varies with sex and height [32]. Excursion is higher throughout forced inspiratory breathing [33,34] and is known to favorably correlate with lung inspiratory volumes [30].

In order to see the diaphragm as a three-layered structure positioned between the two echogenic layers of the pleura as well as the peritoneum, the thickness of the diaphragm is measured in the zone of apposition utilizing a higher-frequency (> 10 MHz) linear probe [35]. It is possible to measure thickness using both

B- as well as M-mode techniques [36]. (Figure 1) The strength of the diaphragm has previously been linked to its thickness [37], but not to its endurance / fatigability [38]. It can be assessed at expiration either end inspiration, as well as during both tidal and maximum breathing. It seems to be thicker in an upright position compared to supine posture [39]. The thickening fraction, which is typically expressed as [(End Inspiratory Thickness End Expiratory Thickness) or End Expiratory Thickness [40] and serves as a measure of the work of breathing, is obtained by comparing expiratory with inspiratory thickness [41]. Although there are differences in these definitions, diaphragm dysfunction can be defined using these measurements: Based on the existence of paradoxical movement in the instance of the paralyzed diaphragm [29] or utilizing non-ultrasound techniques like the measurement of twitch pressures, it has been described as a thickening fraction of 32-36% and a tidal excursion of below 11-14 mm [42, 43]. However, it has been demonstrated that using ultrasonic techniques is more efficient than using traditional techniques like fluoroscopy to identify diaphragm dysfunction [44].

In 2017, a systematic review as well as a meta-analysis46 were conducted to evaluate the evidence regarding the utility of diaphragm ultrasound in predicting effective weaning from mechanical ventilation [45]. The combined work of greater than 30 individual publications was evaluated in two more meta-analyses that were published in 2018 [47, 48] (with the exception of three additional papers that focused just on lung ultrasonography rather than diaphragm ultrasound).

The systematic review concentrated on the utilization of diaphragmatic ultrasound in four key areas: diagnosis of diaphragmatic dysfunction, prediction of successful weaning from mechanical ventilation, assessment of ultrasound's ability to measure muscular workload in comparison to other well-known measurements like transdiaphragmatic pressure, as well as description of variations in diaphragm atrophy across studies [45, 48].

Four studies were examined with regard to weaning from artificial ventilation, and two of them described diaphragm excursion either using M-mode ultrasound [49] or by calculating organ displacement [50]. The diaphragmatic thickening fraction was evaluated in the two final experiments. [51, 52]. All four investigations came to the same conclusion: each measurement can indicate whether weaning will succeed or fail, with the most sensitive and specific cut-off values being [11–14] mm for excursion and 30–36% for thickening fraction.

Weaning failure was defined by Li et al. as the need for re-intubation within 48 hours, while Llamas-lverez et al. defined it as death, unscheduled non-invasive ventilation, tracheostomy formation, as well as the failure of a spontaneous breathing trial within 72 hours. Qian defined weaning failure more widely as a failed spontaneous breathing trial, re-intubation, the application of non-invasive ventilation, or death. Similar AUC characteristics were reported by Li and Llamas-Lverez when using the diaphragm thickening fraction (0.83 vs 0.87). Both Llamas-lverez et al. and Li et al. came to the conclusion that any measurement is suitable to predict successful extubation, as well as that thickening fraction may aid to predict weaning failure. Weaning failure was more common when diaphragmatic dysfunction was present, and excursion as well as thickening fractions were greater in patients who were successfully weaned, according to Qian, who also discovered that pooled specificity for predicting weaning success was comparable to Llamas-Lverez's work.

Re-intubation limitations were set at 48 or 72 hours for certain trials, while some research used non-invasive ventilation to identify weaning failure. Individual studies varied regarding ways they defined weaning failure. Each study's inclusion criteria are different;

whereas some studies only involved patients who had already experienced a failed experiment [51], another study only included patients who had undergone their first spontaneous breathing trial [52]. In Li's meta-analysis, 4 of the studies used the patient in a supine posture, while the remaining 9 studies used semi-recumbent patients. These changes in the ultrasonic technique used also result in additional differences. Although probe position was the same throughout all trials, there were significant differences in probe frequency as well as ultrasound machine manufacturer due to the use of 12 distinct types of ultrasound machines with frequencies ranging from 3.5 to 10 MHz. The patient population growth varies as well, notably in terms of age and sex. It is well known that diaphragmatic excursion in deep breathing is adversely correlated with age and that females exhibit less diaphragmatic excursion [30]. However, several research only reported measurements of the right side of the diaphragm, possibly because it is more challenging to image the left diaphragm since the lung blocks the view. Many investigations included both the left as well as right sides of the diaphragm [33]. At the final least, there are differences in the time points during a spontaneous breathing trial during which measurements are taken, through ultrasound images being obtained at the beginning or end of spontaneous breathing. Additionally, some researchers assessed diaphragmatic function following extubating, while others did so during mechanical ventilation, with further differences in the ventilatory mode used. In order to evaluate the diaphragm at a time when it might be fatigued, it has been recommended that pre-extubating is the ideal time to perform a diaphragm ultrasound. The methodology for a new study has been released, but the findings are not yet available. The study involved doing ultrasounds at regular intervals over two hours of spontaneous breathing [53].

Prior to a trial of spontaneous breathing, a recent study specifies cut-offs for diaphragm thickness to forecast successful weaning [54]. The outcomes are consistent with the previously established cut-offs with patients weaning through pressure support [55]. However, there are also outcomes that are in conflict. For instance, a study analyzing diaphragm excursion using the displacement of the spleen and liver discovered that the organs' displacement by 1.2 cm was the optimum cut-off for predicting effective extubation [56]. However, it has been noted before that there is limited correlation between solid organ movement as well as diaphragm excursion [57]. Another recent study indicated that the best predictor of extubation failure in patients undertaking their first spontaneous breathing trial was diaphragmatic excursion rather than thickening fraction [58]. In line with the larger range of Intra Class Correlation (ICC) coefficients provided by the systematic review, the most recent reliability study has established values for inter- (0.987) as well as intra-observer variability (0.986) [59].

Dres and colleagues evaluated the effectiveness of tracheal pressure measurements made throughout supra-maximal phrenic nerve stimulation during a spontaneous breathing experiment versus diaphragm ultrasound readings [22]. They not only discovered that the optimal sensitivity as well as specificity for liberation from mechanical ventilation were associated with a lower stimulated pressure than previously believed [19], but they also noted that a thickening fraction of higher than 25.8% gave equivalent accuracy of estimation in comparison to phrenic nerve stimulation, with AUC-ROC values of 0.80 as well as 0.82 for phrenic nerve stimulation as well as diaphragm thickening fraction, respectively.

Considering the probable cardiac causes of a failed respiratory weaning, combining diaphragmatic ultrasonography with echocardiography may be a possible method for the prediction of successful weaning [60]. Transthoracic echocardiography has been used to evaluate diaphragmatic excursion and the

ratio of mitral Doppler inflow velocity (E) with annular tissue Doppler wave velocity (Ea, E/Ea ratio) in patients who were extubated following a successful spontaneous breathing trial (SBT) [61]. The authors discovered that both E/Ea as well as left ventricular ejection fraction values could be used to predict respiratory failure after 48 hours of extubation, while diaphragmatic excursion was more effective at predicting reintubation within a week of extubation.

In a different study, diaphragmatic excursion, lung ultrasonography, and echocardiography were all combined to determine whether they could accurately predict extubation failure in patients undergoing a pressure support ventilation trial [62]. Although diaphragm ultrasonography contributed the least of the 3 modalities to successfully predicting weaning, the findings were validated in a smaller sub-study of patients breathing through a T-tube. Additionally, recent small observational research that combined echocardiography as well as lung ultrasound for the assessment of aeration with diaphragmatic ultrasound found that the only reliable indicators of effective extubation were lung aeration and indications of diastolic dysfunction [63].

Another combination strategy used the Rapid Shallow Breathing Index (RSBI) and the diaphragm thickening fraction. A cut-off value of 100-105 breaths/min/liter is associated with effective extubation, according to the 1991 description of RSBI,64 which is defined as the ratio of respiratory frequency to tidal volume [65, 64, 66]. According to a recent study, RSBI alone, with a ROC-AUC of 0.96 and a sensitivity and specificity of 100%, was the most accurate technique for predicting the outcome of extubation when compared to measures obtained from diaphragm ultrasonography [66]. This confirms earlier research showing a thickening fraction cut-off of 36% had sensitivity, specificity, as well as positive predictive value that were equivalent to but ultimately lower to RSBI [52]. However, when combined with a diaphragm thickening fraction larger than 26%, RSBI was a more accurate measure of a patient's ability to successfully wean of mechanical ventilation than RSBI alone [67]. The right diaphragm's thickening fraction was found to be just as accurate as this combined technique, according to the researchers who suggested that in the future it would take the place of RSBI as the most frequently employed weaning measure.

Summary

Since a few years earlier, it has been unable to accurately measure diaphragm activity at the bedside. When used to evaluate diaphragmatic function, chest X-rays frequently have low sensitivity and specificity. Alternatively, the gold-standard technique of twitch magnetic phrenic nerve stimulation and measurement of transdiaphragmatic pressure using oesophageal and gastric balloons are invasive and difficult to perform at the bedside [68]. Due to its easy availability, non-invasiveness, and ability to take repeated measurements, ultrasound has been essential in the evaluation of diaphragmatic function.

Zambon et al. examined the importance of diaphragmatic ultrasonography in ICU patients earlier this year, finding that it performed well as a weaning index [69]. In contrast to these earlier findings, more extensive research, particularly from China, where ultrasound had quickly emerged in the ICU, revealed DE or DTF had a higher sensitivity and same specificity for predicting weaning outcomes. Increased DE and DTF were found in the weaning success group, and these factors were strongly associated with the weaning outcome. When used as weaning indices in mechanically ventilated patients, DE and DTF measurements conducted during an SBT both performed well. Studies found that weaning success groups had considerably higher DE than failure groups did [18, 19, 70-74]. Extubation failure is also caused by an imbalanced load on the respiratory muscles [75, 76]. Since it produces over 70% of

the total tidal volume through inspiration in healthy individuals, the diaphragm is regarded as the major respiratory muscle and plays a crucial role in the development of respiratory muscle endurance [77]. Strength in the diaphragm as well as intrathoracic and intra-abdominal pressure combine to produce diaphragmatic movement. Thus, ultrasonography-based evaluation of the DE may be a significant tool for assessing a patient's capacity for sustained respiration. According to one study [28], DE was not significantly different between the success and failure groups (15.8 ± 5.2 mm vs 18.4 ± 10.2 mm, $p>0.05$), but DE (30 min to 10 min during SBT) was greater in the failure group than in the success group (1.07 ± 0.64 mm vs 3.33 ± 3.17 mm, $p <0.05$). The timing of the measurements may be responsible for the difference. While DE was measured by Gong and Zhang at 0, 10, and 30 min after the start of SBT [78], others did so during MV18 or after SBT [73]. The mean values of the maximal DE were considerably higher in individuals who were successful at their first attempt at weaning in one study [79] that employed maximal rather than mean DE as the ultrasonography assessment (4.1±2.1 vs 3±1.8 cm, $p=0.04$). The sensitivity and specificity of diaphragmatic ultrasonography in predicting weaning failure were 59% (39%-77%) and 71% i.e., (57%-82%) with an AUC of 0.65 i.e., (0.51-0.78) at a threshold of MDE 2.7 cm. For predicting weaning failure, there was no statistically significant difference among MDE values as well as Medical Research Council scores ($p=0.73$). Since the diaphragm thickness measured by M-mode ultrasound is non-invasive and repeatable, it is helpful for evaluating how well the muscles are working and how much that contributes to the respiratory workload [80]. DTF is thought to be a more reliable measurement for the assessment of diaphragmatic function because of the individual variability in the thickness of the diaphragm. However, there was a considerable amount of variation among the component studies. Early on during their stay in the ICU, DD is prevalent in patients who are mechanically ventilated and is to blame for delayed weaning, more days spent on MV, and mortality [81, 82] Despite the diagnostic criteria for DD by ultrasound have not yet been unified, pressure support ventilation [83] found that DTF and DE were, respectively, very strongly as well as moderately correlated to endotracheal pressure following phrenic nerve stimulation, which was thought to be the gold standard for DD ($r=0.87$, $p <0.001$ and 0.45, $p=0.001$).

Future Directions

The focus of additional study is on predicting the success of extubation in particular patient categories. In the future, there should be more high-quality studies performed. In critical care medicine, small trials have a greater possibility of reporting larger positive results than large trials. The interpretation of meta-analyses incorporating small trials should be done with caution.

Conclusion

The effectiveness of diaphragmatic ultrasonography as a predictor of successful weaning regarding mechanical ventilating has been well investigated and is still being investigated. In ICU patients, DD has been discovered to be a predictor of weaning failure. However, more research is required to establish the diagnostic standards for DD with ultrasound and the diagnostic performance of DD to predict weaning results. Due to the significant variance in study design and demographic, it is still challenging to draw general generalizations from specific studies. It is impossible to compare outcome measures because definitions of terms like a failed breathing trial or a failure extubating have not been defined across research. There are currently no randomized control trials available, and established cut-offs for assessments of diaphragmatic ultrasonography have not yet been agreed upon.

Despite the fact that diaphragmatic ultrasound is a promising diagnostic tool, greater standardization in protocols, measurements, and ventilatory settings is needed for future study and clinical application. In this section, should have a discussion corresponding to the results. To achieve good think:

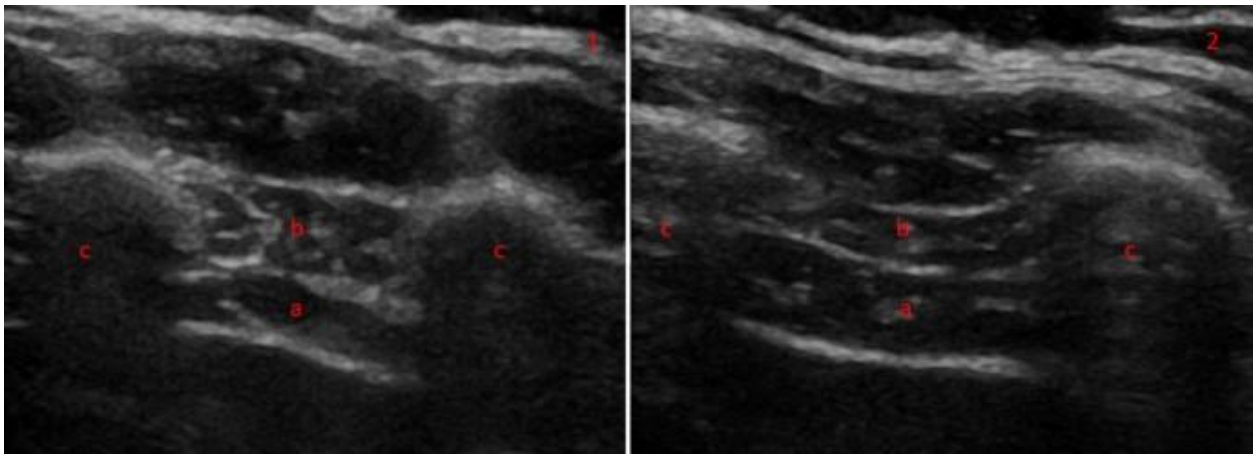

Figure 1. Diaphragm Thickness in B-mode Thoracic View at end Expiration (1) and Inspiration (2) in a Healthy Volunteer. The Diaphragm can be between two Echogenic Layers (a) with the Intercostal Compartment above (b). The Two Muscle Layers Sit between Two Ribs (c).

Conflict of Interest

No conflict of interest.

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Staff Turnover in National Non-governmental Organizations (NNGOs) in South Sudan: 2011-2021

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Abstract

The high turnover of staff is unhealthy for the smooth running of institutions since it affects the growth, profitability, beneficiary satisfaction and general reputation of the institution whenever it occurs in the workplace. This study focused on studying staff turnover in national non-governmental organizations in South Sudan. This was a qualitative study which adopted descriptive survey research design, which allowed the researcher to use semi-structured questionnaires when collecting the data. The survey method used in this study because the target population only composed of 30 employees from 30 organizations in South Sudan. The study employed purposive, sampling and convenience sampling techniques. A high response rate of 100% obtained. The study revealed that, poor renumerations and lack or inadequate fringe benefits, autocratic leadership style in which the manager retaining as much power and decision-making authority is more prevalent in NNGOs leading to staff turnover and poor working conditions contributed to staff turnover in national non-governmental organizations in South Sudan. The recommendations for this study are based on the observation of the data as reflected in the histograms, pie charts and tables under each research objective. The study therefore recommended that the management should improve the working conditions for the employees by ensuring a hazard free and safe environment, improving salaries, which also enhances efficiency and productivity. Management of national non-governmental organizations should improve their leadership styles by embracing transformational leadership.

Keywords: *Staff Turnover, Salary & Fringe benefits, Leadership styles, Poor working Conditions.*

Introduction

The Republic of South Sudan attained independence on 9th July 2011 after several decades of civil war. During 2011–2013, South Sudan had a short period of relative peace after its independence from Sudan. Donors started to plan for longer-term, more development-orientated funding, aligned with the government of South Sudan's Development Plan 2011–2013 [4]. This attracted many Non-Governmental Organizations both local and international. There is an estimated 650 Non-Governmental Organizations in South Sudan, categorized into International Non-Governmental Organizations (INGOs) and National Non-Governmental Organization (NNGOs). National non-governmental organizations (NNGOs) refer to those NGOs founded in South Sudan and headquartered in South Sudan [1].

According to the NGO Forum there are about 201 national non-governmental organizations (NNGOs) in South Sudan Most of the 109 international NGOs deliver their services work through NNGOs [2]. These shifts are also taking place in the context of global commitments to 'localize' humanitarian response, with humanitarian organizations and donor governments committing to shift power and resources closer to affected populations [3].

Having skillful, honest, and dedicated employees in national non-governmental

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organizations in South Sudan for a longer period can help them to achieve their goals and complete the projects successfully within a specific time frame and desired quality.

However, high turnover rate within national non-governmental organizations (NNGOs) in South Sudan continues to be a concern for them and various stakeholders [4]. This is because organizations spend a lot of resources in training and investing in their employees. Losing a talented and expert workforce will result in not having the competent staff to run the organization at various levels. Also, it will require new investments in human resources to close the competency gaps. If the company is aware of the most common causes of employee turnover, it would certainly be able to address them to operate effectively and efficiently. A need, therefore, arises to investigate the factors behind employee resignations in the NNGOs in South Sudan.

Review of Literature

Existing Solutions to the Problem

Salary, Fringe Benefits and Staff Turnover

It is often said that job dissatisfaction is the major cause of poor pay scale procedure, leading employees to leave the job. When employees" receive a lower salary and insufficient financial rewards, they tend to stay no longer with the organization [5]. This is in line with the findings of [6] who concluded that when high performers are insufficiently rewarded, they leave. Generally, employees who are paid handsomely are likely more committed to the company because they do not want to lose their high-paying jobs [7]. [8] conducted a study on the influence of remuneration on staff turnover in the humanitarian sector in Afghanistan. The study adopted descriptive survey design. The population of this study was drawn from the employees of various NGOs registered with the 4 NGO coordinating bodies. Data was collected through questionnaires distributed to 384 respondents. The study findings revealed that remuneration was important in explaining staff turnover. The study recommended that the human resource managers should establish competitive human resource practices that are meant to control staff turnover.

[9] carried out a study to determine the factors affecting recruitment and retention of employees in the International Non-Governmental Organizations operating in Southern Sudan. The study was a descriptive survey. Chief among the factors that influence employee recruitment are pay attractiveness. The study recommended that the International NGOs working in southern Sudan should focus on and improve on pay attractiveness.

Leadership Style and Staff Turnover

Many organizations are facing turnover issues due to unsupportive leadership. Poor leadership can cause employee turnover, which ends up costing the organization time and [10]. According to [11] employees who claim to receive poor support from their leaders or organization are less committed to their job and prefer to leave the job, and thus, lead to intentional turnover. Similarly, [12] in a quantitative study on how leadership styles and followers' regulatory focus will mitigate followers' turnover intention, found that transformational leadership was unfavorably related to turnover intention.

[13] empirically examines, at the organizational level, the impact of quality public managers on turnover. The findings reveal that quality middle managers exert a significant and negative effect on organizational turnover and quality upper-level managers do not directly influence turnover. [14] carried out a quantitative study that seeks to discover the effects of poor managerial skills on employees and to assess if employees still quit regardless of conducive working conditions. The results of this study show that administrators and employees have a huge role to play in reducing the rate of turnover.

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[15] undertook a study to investigate the relationship between leadership behaviors (transformational and transactional), satisfaction with the leaders, and voluntary turnover intention on 200 participants from National Collegiate Athletic Association Division I softball and volleyball assistant coaches in the USA. The outcome of their study showed significant negative correlation between transformational leadership style and voluntary turnover intention as well as the relationship between transactional leadership behaviour and voluntary organizational turnover intention. Based on the foregoing review, it was conjectured that transformational leadership behavior would have a significant inverse relationship with employees' turnover intention.

[16] carried out a study to explore the possibilities and methods of retaining great employees without undue sacrifices on the part of managers, leaders, and employees, while at the same time allowing an organization to develop and progress. The study concluded that styles of leadership and followership have a direct impact on employee turnover or retention. This is in line with the research conducted on the state of South African Training industry which indicated that management style was the most prominent retention factor in South Africa [17].

[18] carried out a study to establish the relationship between leadership style, organizational climate, employee commitment and employee retention in Non-Governmental Organizations operating in Juba-South Sudan. The study used a cross sectional research design using 269 questionnaires. The study revealed that leadership style is a predictor for staff retention. The study recommends that for the NGOs who operate in conflict and humanitarian areas like South Sudan, concentrate on leadership styles to retain good talents. However, the study had limitations such as concentrating on NGOs in Juba only and selecting respondents from both international and national Non-Governmental Organizations.

Career Development Opportunities and Staff Turnover

Investing in employee professional development is a high-commitment human resource strategy that offers organizations a competitive advantage by enhancing the skills and knowledge of their employees as well as increasing employee commitment and motivation [19]. When employees are satisfied with and have positive perceptions of career development opportunities, they are more likely to remain with the organization.

[20] carried out to explore the impact of work support and potential for career advancement on the nurse turnover intention to find an effective approach to curb high turnover. It was a cross-sectional survey of 526 nurses from eight teaching hospitals in Tianjin, China, was conducted to test the hypothesized multilevel model. The study showed a lack of work support and career advancement negatively and directly associated with nurse turnover intention. This is in line with the study by Mendis [21] whose study findings also revealed that career commitment strongly predicts employees' turnover intentions. Employees who are highly committed to their organization are less likely to leave.

Working Environment and Staff Turnover

According to [22] employees benefit from an environment that provides them a sense of belonging; and that will encourage them to stay committed and loyal to the workplace for longer. [23] found that recognition, job security and work environment have positive and significant influence on employee retention. In a related perspective, [24] explained the role of work life balance has a direct relation in employee's decision to stay or leave the organisation. Furthermore, there is significant links between the employee support policies in place and the levels of female employee turnover in more recent studies [25].

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[26] explored the effects of physical surroundings on humanitarian assistance service workers' satisfaction in South Sudan and Syria. The study found out that four primary dimensions of physical surroundings (i.e., safety, communication tools, physiological needs, and ambient conditions), affect humanitarian assistance service workers' job satisfaction, and willingness to stay in the organizations.

Best Solution

Since the retention of skilled workers is influenced by a range of issues including among others: health, safety and security concerns; living/working conditions, including housing and access to basic amenities (water, electricity, sanitation); lack of access to adequate healthcare and schools; long working hours and burnout; poor management styles and practices as well as lack of equipment and infrastructure: uncertainty associated with short-term contracts due to reliance on donor funding; difficulties with cultural adjustment; and tensions between local staff, regional workers, and expatriates, addressing the above named issues will help curb the issue of staff turnover. However, the study is limited in terms of geographical scope since the studies focused on NGOs operating in Central Equatoria State and Jonglei. Therefore, this study found out whether poor workplace environment do contribute to staff turnover in NNGOs.

Limitations

The study was limited in scope as it focused on only 30 national non-governmental organizations. The study is practically limited in that there was a problem with time and budget. There was a huge challenge accessing literature on the research topic that were conducted in South Sudan. The study was conducted in one of the 10 states in South Sudan and thus the findings may not be generalized to the whole country. Thus, this calls for future research to widen the scope of the study by including other states.

Methodology

Research Design

Descriptive research design was used in this study for its flexibility and appropriateness based on the type of data required data collection methods and the research timing. [27] define descriptive research as the study concerned with the frequency or relationship between two variables. The design adequately helped in answering research questions apart from it being fast and cheap. This design has the advantage of allowing flexibility in data collection by use of closed and open-ended questions.

Research Approach

A multiple case study case design approach involving 30 national non-governmental will be employed to conduct the study. A multiple case study design contains more than one case in a different setting. Researchers use a multiple case study design to ask the same interview questions to multiple participants in a different setting to layer the findings [28]. The proposed strategy enabled the researcher to collect a large amount of data from a sizeable population in an economical manner.

Research Site

The study was deployed within Juba city in Central Equatoria State which hosts the headquarters of most national non-governmental organizations. Juba is the capital and largest city of South Sudan. The city is situated on the White Nile and serves as the capital of the Central Equatoria State. It is the world's newest capital city to be elevated as such and had a population of 525,953 in 2017. It has an area of 52 km^2 (20 sq mi), with the metropolitan area covering 336 km^2 (130 sq mi). Juba was established in 1920–21 by the Church Missionary Society (CMS) in a small Bari village, also called Juba. The city was made the capital of Mongalla Province in the late 1920s.

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The growth of the town accelerated following the signing of the Comprehensive Peace Agreement in 2005, which made Juba the capital of the Autonomous Government of Southern Sudan. Juba became the capital of South Sudan in 2011 after its independence.

The reason for choosing Juba as the study area was due to the fact that I could easily meet the employees and get enough information that required on time as all the participants have their head offices within it.

Size of Sample and Sampling Techniques

The study adopted the non-probability purposive sampling technique on the selection of samples the appropriate study size was estimated at 30 using the Taro Yamane's formula [29] is as follow:

$$n = \frac{N}{1} + n\,(e)^2$$

Where N = is the total number of the population, I = is constant, e = error margin (5%) constant

n = sample size

$$n = \frac{N}{1} + n\,(e)^2$$

$$n = \frac{33}{1} + 33\,(0.05)^2$$

$$n = \frac{33}{1} + 33\,(0.025)$$

$$n = \frac{33}{1} + 0.0825$$

$$n = \frac{33}{1.0825} = 30.48$$

$$n = 30$$

From the formula, the size of the sample is thirty (30). Hence, the study focused on the thirty non-governmental organizations in Central Equatoria State. The researcher used non-probability purposive sampling technique to administer questionnaires which were all written in English language.

Inclusion Criteria

National non-governmental organizations which are over ten (10) years old with head offices in Central Equatoria state.

Exclusion Criteria

National non-governmental organizations which are less than ten (10) years old without offices in Central Equatoria state.

The Instruments for Data Collection

The main instruments employed for the data collection of the data were structured questionnaires administered to the thirty (30) human resource managers of the thirty (30) national non-governmental organizations.

The questionnaire contained two main sections. Section A captured demographic information of the participants and Section B contained both open and closed-ended questions under each objective to stimulate reaction from the participants in respect to their experiences to determine the status of the variables within their organizations.

Analysis of Data

The collected data was thoroughly reviewed to check and correct possible errors and omissions that might have occurred to ensure consistency across the participants. The data was then coded. Microsoft Excel software was used for the analysis. The processed data were presented in narrative, tables, and graphs for easy analysis.

Ethical Standard

The researcher ensured that all applicable ethical criteria for conducting research were upheld. Prior to involving the participants informed consent, disclosures to the study subjects about the goals and advantages of the study, the confidentiality of their information were made.

All the data obtained was managed carefully. The data results were kept secured based on Texila American University guidelines. The process of destroying the data is considered environmental safety.

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Results and Discussions

Descriptive Analysis

Out of the four hundred (30) human resource managers who were sampled, thirty (30) responded to the questionnaires that were administered, resulting to a 100% response rate hence it was considered satisfactory to conduct data analysis and interpret the results [30].

Table 1 shows a wide range of gender disparity among the human resource managers who responded to the questionnaires since 70% were female while 30% were male.

The majority of the human resource managers were 26 and 30 years (47%) and worked for 1 to 3 years (50%) on education level, majority of the respondents (67%) had bachelor's degree.

Table 1. Demographic Characteristics of the Human Resource Managers

Characteristics	Category	Freq.	Percentage
Gender	Male	9	30
	Female	21	70
	Total	30	100
Age Bracket	20 -25	6	20
	26- 30	14	47
	31 – 35	7	23
	36 - 40	3	10
	Total	30	100
Number of Years Served in the NNGO	1 - 3	15	50
	4 - 6	10	33
	7 - 10	3	10
	More than 10	2	7
	Total	30	100
Education Level of Respondent	Diploma level	8	27
	Bachelor's degree level	20	67
	Post graduate level	2	6
	Total	30	100

Presentation of the Findings

The research question for this qualitative multiple case study was: To what extend do salary and fringe benefits, leadership style, career advancement and working conditions cause staff turnover in national non-governmental organizations in South Sudan? After receiving approval of the data collection tools and the bonafide letter from Texila University, the Human Resource Managers at each of the thirty NNGOs received a hand-delivered letter of participation and a copy of the consent form for review. I distributed questionnaires to Human Resource Managers of 30 NNGOs in Juba and followed it up with interviews.

Each participant's name was changed to a code (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14….P30) to mask their identities and maintain confidentiality, while organizations' names were allotted the following codes: O1, O2, O3, O4, O5, O6, O7, O8, O9, O10, O11, O12, O13, O14….O30. All participants shared relevant company documents, which were mainly HR policies. The main objective for reviewing company documents was to corroborate information that I gathered from questionnaires and interviews.

Research Question 1: Does low salaries and other benefits cause high employee turnover in national non-governmental organizations in South Sudan?

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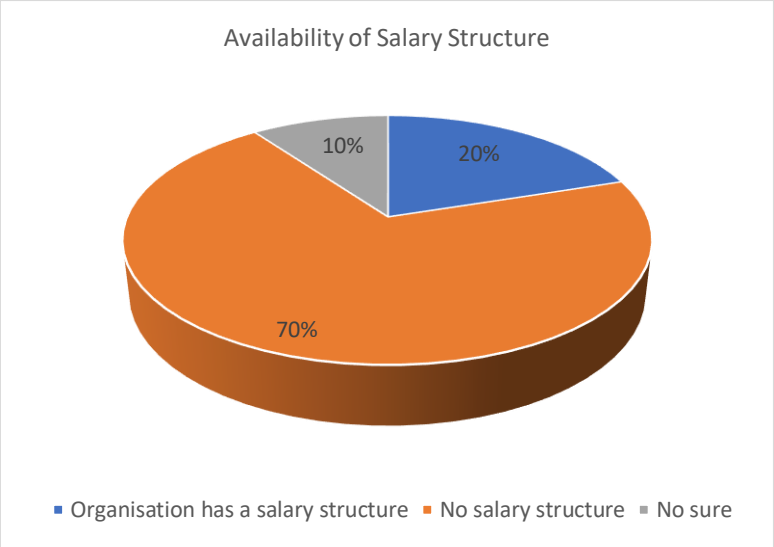

Figure 1. Availability of Salary Structure

Table 2. Salary Adequacy and Effect of Staff

Response	**Freq.**	**Percentage**
The salaries offered are adequate	3	10%
The salaries offered are inadequate	24	80%
Not sure	3	10%
Inadequate salaries led to staff turnover	27	90%
Inadequate salaries never led to staff turnover	1.5	5%
Not sure		5%

From Table 2, the majority (80%) of the participants responded that the salaries offered by their organizations are not adequate and only 10% said that they were adequate.

"Due to the low salaries here, which are not adequate to meet my needs I will resign if I get another job that pays better." P11.

The results in Table 2 indicate that most (90%) of the participants mentioned that the inadequate salaries led to staff turnover in their organizations. 5% of the participants mentioned that adequate salaries led to staff turnover in their organizations.

"In our organization salaries have never been adequate for the last 10 years and there has not been any increment either. This is one of the main reasons for the high staff turnover". P8

Participants were asked to mention the types of benefits offered by their organizations and the findings are shown in Figure 2 below:

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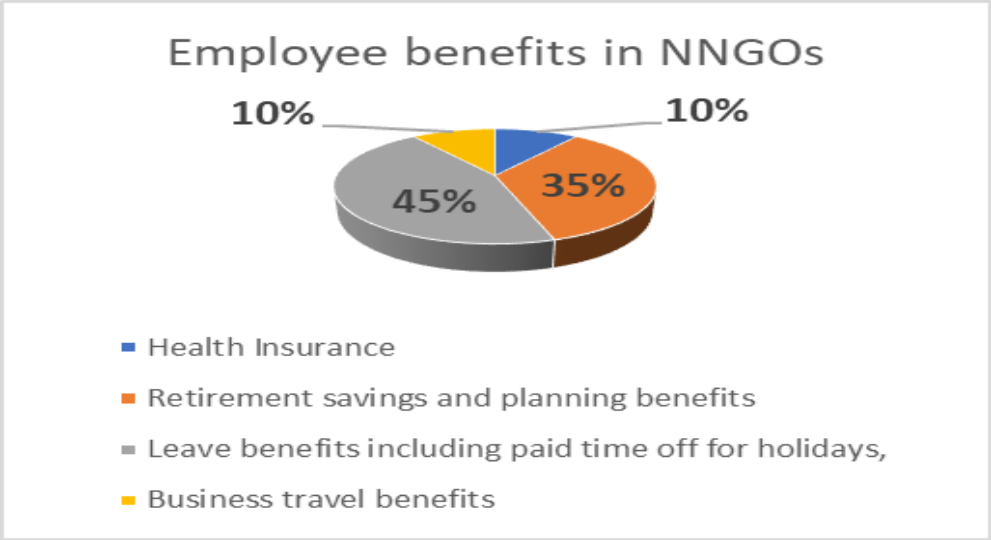

Figure 2. Types of Fringe Benefits

Participants mentioned leave benefits including paid time benefits as the most common (45%) type of benefit in NNGO in South Sudan. Results from Figure 4.7 indicate that 35% of the participants mentioned retirement and savings as one of the employment benefits. However, for some NNGOs it is something on paper in their benefits as the staff find it difficult to get it.

"We have many staff that were not paid their social security funds and some even when to the court before the organization paid them. In the contract it is very clear but when you leave it will take you months before you can get. They are even happy when you give up." P23.

Few participants (10%) mentioned that their organizations offer medical insurance as one of the benefits. Most of the NNGOs do not offer this benefit to their employees who often end up resigning.

"When we asked for medical cover, the management usually tells us it is a benefit in international NGOs, and we should never dream about it at the NNGO. Staff just end up resigning after finding an opportunity elsewhere." P14

Many NNGOs do not offer medical insurance for their staff because donors refused to fund it. When they include it in their project budgets, they are often told to delete it.

"Our partners refused us to include lines for medical insurance in our budget and yet they do insure their own staff." P4.

Research Question 2: To what extent does leadership style cause employee turnover in national non-governmental organizations in South Sudan?

Results from the findings indicated in Table 3 showed that 47% of the participants mentioned autocratic leadership as the most common style in NNGOs in South Sudan. 70% of them stated that it had contributed to staff turnover in non-governmental organizations in South Sudan.

"We are not consulted always, and meetings are very rare here. Everything is determined by the Executive Director who wields a lot of powers". P.4

Most of the participants (86%) mentioned democratic leadership as the type they most expect in their organization. The democratic leadership style was conceived in terms of the decision-making power and authority derived from followers. Through participation in the formulation of policies that serve as guidelines for the organization's functioning, a leader considers the wishes and recommendations of followers [31]. Although undesirable, 6% of the participants expect laissez-faire leadership styles.

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Table 3. Responses on Leadership Style and Staff Turnover

Characteristics	Category	Frequency	Percent
Common Leadership Style in NNGOs	Autocratic leadership style	14.1	47%
	Democratic leadership style	9.9	33%
	laissez-faire leadership style	6.0	20%
Expected Leadership Style	Autocratic leadership style	1.8	6%
	Democratic leadership style	25.8	86%
	laissez-faire leadership style	2.4	8%
Effect of Leadership Style	Led to staff turnover	21.0	70%
	Never led to staff turnover	6.0	20%
	Not sure	3.0	10%

Based on the findings of this study, this research concluded that when each leadership style is practiced in exclusion of other leadership styles, Autocratic leadership style positively influences NNGO staff turnover intentions, democratic leadership style negatively influences NNGO staff turnover intentions, and laissez-faire leadership negatively influences NNGO staff turnover intention.

Objective 3: To what extent does lack of career development opportunities cause employee turnover in national non-governmental organizations in South Sudan?

The third objective of the study sought to establish the extent to which lack of career development opportunities cause employee turnover in national non-governmental organizations in South Sudan. Participants were asked to state the types of career opportunities that exist in their organizations and their responses are indicated in Table 4.

From the results in Table 4, the participants (54%) stated that there were no career opportunities in their organizations. Results indicate that 75% of the participants agreed that lack of career opportunities contribute to staff turnover in NNGOs in South Sudan.

the participants (54%) stated that there were no career opportunities in their organizations.

"Career opportunities only exist in international organizations because they have enough money to plan for them. Although important, our management always complained that there are no funds for the implementing career development programs." P12.

From the results 23% of the participants mentioned that there is a training opportunity in their organizations. Results in Table 4 indicate that only 10% of the participants stated that there is promotion in their organizations. Only 3% of the participants stated that mentoring and coaching exist in their organizations.

"I have never been mentored since I joined this organizations three years ago." P25.

Table 4. Responses on Career Development and Staff Turnover

Characteristics	Category	Freq.	Percent
Common career opportunities in NNGOs	Training opportunities	6.9	23
	Career counseling	3	10
	Job promotion	3	10
	Mentoring and coaching	0.9	3
	No career development opportunities	16.2	54
Career Opportunities expected at NNGOs	Study tour	3	10
	Training opportunities	3	10

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	Job promotion	10.5	35
	Mentoring and coaching	1.5	5
	Scholarships	12	40
Effect of Lack of career opportunities on staff	Led to staff turnover	22.5	75
	Never led to staff turnover	4.5	15
	Not sure	3	10

Research Question 4: Does poor working environment cause employee turnover in national non-governmental organizations in South Sudan?

From the results in Table 5, most of the participants (80%) are not satisfied with the working environments in their organization and only 20% stated that they were satisfied.

Table 5. Responses on Working Conditions and Staff Turnover

Characteristics	**Category**	**Frequency**	**Percent**
Current status of working conditions in NNGOs	Lack of teamwork	8.7	29%
	poor motivation	5.1	17%
	Lack of recreational activities	8.1	27%
	Rigid working hours	3	10%
	Conflicts	5.1	17%
Working environment expected by participants	Teamwork encouraged	6.9	23%
	High motivation	8.1	27%
	Reduced conflicts	4.8	16%
	Work-life balance	3	10%
	Presence of recreational activities	5.1	17%
	Flexible working hours	2.1	7%
Effect of Lack of bad working environment on staff	Led to staff turnover	10.5	35%
	Never led to staff turnover	19.5	65%

From Table 5, lack of teamwork is the major factor (29%) which makes staff dissatisfied with the working environment in national non-governmental organizations in South Sudan leading to staff turnover. Furthermore, 27% of the participants mentioned lack of recreational activities as a factor that makes staff dissatisfied with the working environment in NNGOs in South Sudan.

Conclusion

The objectives of the study were to find out whether low salaries, leadership style, career advancement and working conditions contributed to high staff turnover in national nongovernmental organizations in South Sudan. The findings of the research conclude that low salaries, leadership style, career advancement and working conditions contributed to high staff turnover in national nongovernmental organizations.

The major contributing factor to high staff turnover is low salaries, followed by leadership style and working conditions. Therefore, national nongovernmental organizations will curb the situation if they improve on their salaries, leadership, career advance opportunities and working conditions.

"Working environment is one of the main factors in terms of managing voluntary employee turnover. Unfortunately, we are not satisfied with the working environment here at all and the chances of leaving are high unless there is an improvement. There are many things that need to be improved." P6

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Conflict of Interest

I do certify that I have no affiliation with or involvement or any personal relationship with any of the directors of the Publishing House or any entity with financial interest. I am a candidate for Doctorate in Business administration of Texila American University.

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New Drugs for Breast Cancer Treatment

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Abstract

Breast cancer is the most common type of cancer in women, affecting approximately 12% of women over the course of their lifetime. It was estimated that there would be 81,550 new cases of invasive breast cancer in women in the United States (US), along with 49,290 new cases of non-invasive breast cancer. A search was conducted to find out the number of new breast cancer drugs that have been approved by US Food and Drug Administration (FDA) in the last 2 years (2020-2021), and the number of breast cancer drugs that are currently under Phase 3 clinical trials. Between 2020 and 2021, 4 new drugs have been approved by FDA for the treatment of breast cancer: Tukysa (Seagen), Margenza (MacroGenics), Phesgo (Genentech), and Trodelvy (Gilead Sciences). Research continues to find out new drugs that can help treat breast cancer. Currently, there are several breast cancer treatment drugs in Phase 3 clinical trials including two major new breast cancer drugs Palbociclib (Pfizer) and Ribociclib (Novartis). Pharmaceutical and biotech companies are making incredible contributions by developing many innovative and effective treatments for breast cancers. We are hopeful that many new breast cancer drugs will be approved in the coming years.

Keywords: *Breast cancer, Food and Drug Administration(FDA), New Drugs, Clinical Trials.*

Introduction

Breast cancer is the most common type of cancer in women, affecting approximately 12% of women over the course of their lifetime [1]. In 2021, it was estimated that there would be 81,550 new cases of invasive breast cancer in women in the U.S., along with 49,290 new cases of non-invasive (in situ) breast cancer [2]. Breast cancer occurs when normal cells in the breast undergo changes in their molecular characteristics, allowing them to grow and multiply uncontrollably. Breast cancers are of the following types [3 and 4]:

Estrogen Receptor-positive (ER) Breast Cancer

In estrogen receptor (ER) positive breast cancer, cancerous cells receive their growth signals from estrogen hormone. Estrogen receptors are the most common type of hormone receptor on breast cells; hence, ER-positive breast cancers are the most common and the most treatable form of breast cancer. According to the American Cancer Society, about 2 out of every 3 cases of breast cancers are hormone receptor-positive. While most people treated for early stage HER2-positive breast cancer do not relapse after their treatment, breast cancer can return in some cases. Recurrent ER-positive breast cancers are less likely to respond to the same therapy that was used to treat primary breast cancer.

Human Epidermal Growth Factor Receptor 2 (HER2) - Positive Breast Cancer

Human epidermal growth factor receptor 2 (HER2) positive breast cancer is when breast cancer cells have a protein receptor called HER2. Normally, this protein helps breast cells grow, divide, and repair themselves. But

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sometimes, something goes wrong in the gene that controls the HER2 protein and our body makes too many of these receptors. This causes the breast cells to grow and divide uncontrollably. About 1 of 5 breast cancers are HER2-positive.

Triple Negative Breast Cancer (TNBC)

Triple negative breast cancers lack estrogen, progesterone, and HER2 receptors. Triple negative breast cancers are considered to be more aggressive and have poor prognosis compared to other breast cancers. Growth of TNBC cancer is not fueled by the hormone's estrogen and progesterone, or by the HER2 protein. TNBC accounts for about 15% of breast cancer cases in the US and is known for high relapse rates and poor overall survival (OS) [5].

Breast cancer is treated in different ways. Breast cancer patients often get more than one treatment at a time.

1. Surgery involves cutting out/removal of the cancer tissue.
2. Chemotherapy involves use of drugs that shrink or kill the cancer cells.
3. Hormonal therapy blocks the cancer cells from getting the hormones they need to grow.
4. Radiation therapy involves use of high-energy rays to kill the cancer cells.

Breast cancer deaths have declined significantly in recent years. Treatment advances play a major role in the reduction of breast cancer related deaths. Researchers around the world are working to find better ways to prevent, detect, and treat breast cancer, and to improve the quality of life of patients and survivors [6]. This review presents available literature on the recently approved (2020-2021) breast cancer drugs and breast cancer drugs currently under Phase 3 clinical trials.

Methods

A search was conducted on *fda.gov* and *clinicaltrials.gov* sites to find out the following:

1. How many new breast cancer drugs or treatments have been approved by the US Food and Drug Administration (US FDA) in last 2 years (2020-2021)?
2. How many breast cancer treatment drugs are currently under Phase 3 clinical trials (2017-2021)? (***Search criteria***: breast cancer≠females≠interventional clinical trials≠Phase 3≠Active≠2017 to 2021).

Results

The following sections present search results for the following:

1. Drugs approved by FDA for the treatment of breast cancer between January 2020 to July 2021.
2. Breast cancer treatment drugs currently under Phase 3 clinical trials (2017-2021).

Breast Cancer Drugs Approved Between 2020-2021

Four new drugs have been approved by FDA between 2020 and 2021 for the treatment of breast cancer. These drugs are presented Table 1 and are described in detail below.

Table 1. Breast Cancer Drugs Approved by FDA in 2020-2021

Year	Drug Name	Approval Date	Indication	Manufacturer
2020	Tukysa (tucatinib)	17 April 2020	HER2-positive metastatic breast cancer that cannot be surgically removed	Seagen
	Margenza (margetuximab-cmkb)	16 December 2020	Metastatic HER2-positive breast cancer	MacroGenics
	Phesgo (fixed-dose combination of pertuzumab, trastuzumab, and hyaluronidase–zzxf)	29 June 2020	Triple-negative breast cancer	Genentech
2021	Trodelvy (sacituzumab)	07 April 2021	Triple-negative breast cancer who received at least two prior therapies for metastatic disease	Gilead Sciences
FDA=Food and Drug Administration; HER2=human epidermal growth factor receptor 2				

Breast Cancer Drugs Approved in 2020-2021

Trodelvy (Gilead Sciences) [7 and 8]

Generic name: sacituzumab govitecan-hziy.

Clinical indication: For adult patients with unresectable locally advanced or metastatic triple-negative breast cancer (TNBC) who have received two or more prior systemic therapies, at least one of them for metastatic disease.

Mechanism of action: Trodelvy is a first-in-class antibody and topoisomerase inhibitor conjugate directed to the Trop-2 receptor, a protein frequently expressed in multiple types of epithelial tumors.

Results of clinical study that led to drug approval: The regulatory body (FDA) granted accelerated approval to Trodelvy in April 2020 based on a Phase 1/2, single-group, multicenter trial involving patients with advanced epithelial cancers who received sacituzumab govitecan-hziy intravenously on days 1 and 8 of each 21-day cycle until disease progression or unacceptable toxic effects. Trodelvy demonstrated a statistically significant and clinically meaningful 57% reduction in the risk of disease worsening or death. Trodelvy also extended median OS to 11.8 months versus 6.9 months, representing a 49% reduction in the risk of death. Four deaths occurred during treatment; 3 patients (2.8%) discontinued treatment because of adverse events. Grade 3 or 4 adverse events (in ≥10% of the patients) included anemia and neutropenia; 10 patients (9.3%) had febrile neutropenia.

Serious side effects: Trodelvy also caused serious side effects, including neutropenia, severe diarrhea, serious infusion-related reactions, and allergic reactions that can be life-threatening, and nausea and vomiting in the phase 3 trial. Serious adverse reactions occurred in 27% of patients receiving Trodelvy [9]

Margenza (Macrogenics) [7 and 10]

Generic name: margetuximab-cmkb.

Clinical indication: Treatment of adult patients with metastatic HER2-positive breast cancer who have received two or more prior anti-HER2 regimens, at least one of which was for metastatic disease.

Mechanism of action: Margenza is an HER2-targeting antibody. Margenza produces its anti-cancer effects by binding to and disabling a growth stimulatory pathway on cancer cells referred to as the human epidermal growth factor receptor 2 (HER2) pathway.

Results of clinical study that led to drug approval: FDA approval was based on a randomized, multicenter, open-label trial of 536 patients. Median progression-free survival in the margetuximab arm was 5.8 months (95% CI: 5.5, 7.0) compared with 4.9 months (95% CI: 4.2, 5.6) in the control arm (HR 0.76; 95% CI: 0.59, 0.98; p=0.033).

Possible side effects: Margenza may cause serious side effects, including weakening of the heart, harm to unborn baby and infusion reactions.

Tuksya (Seagen) [7 and 11]

Generic name: tucatinib.

Clinical indication: A triple-combination therapy for people with previously treated advanced or metastatic HER2-positive breast cancer.

Mechanism of action: Tiksya is a tyrosine kinase inhibitor of HER2 and blocks the activity of HER2, a protein receptor that is known to promote the growth of certain types of breast cancer.

Results of clinical study that led to drug approval: FDA approval of Tuksya was based on results from a pivotal Phase 2 trial in 612 people with HER2-positive breast cancer that was inoperable or metastatic. Compared with a placebo, Tukysa significantly extended patients' progression-free survival (median 5.6 vs. 7.8 months), representing a 46% reduced risk of disease progression or death with the therapy.

Possible side effects: Tukysa may cause serious side effects including severe diarrhea, liver damage, and harm to an unborn baby.

Phesgo (Genentech) [7 and 12]

Generic name pertuzumab, trastuzumab, and hyaluronidase-zzxf.

Clinical indication: As neoadjuvant treatment of patients with HER2-positive, locally advanced, inflammatory, or early-stage breast cancer as part of a complete treatment regimen for early breast cancer and as adjuvant treatment of patients with HER2-positive early breast cancer at high risk of recurrence.

Mechanism of action: Phesgo is a combination of two HER2/neu receptor antagonists and the endoglycosidase hyaluronidase.

Results of clinical study that led to drug approval: Phesgo is a subcutaneous formulation of pertuzumab and trastuzumab with recombinant human hyaluronidase in one ready-to-use, fixed-dose combination vial (pertuzumab, trastuzumab, and hyaluronidase-zzxf) and was approved by the FDA on June 29, 2020 based on the results of a non-inferiority study in patients with HER2-positive early breast cancer, which demonstrated Phesgo had comparable efficacy and safety as IV pertuzumab and IV trastuzumab, except for administration-related reactions, which were higher with Phesgo due to the subcutaneous route of administration.

Possible side effects: Phesgo may cause serious heart and lung problems [13]. Please see Phesgo prescribing information/label for more details.

Breast Cancer Drugs Currently Under Phase 3 Clinical Trials

Currently, there are several ongoing Phase 3 clinical trials of breast cancer drugs; of these, those clinical trials that are active since 2017 but not recruiting patients are presented in Table and are described below [14].

Table 2. Breast Cancer Drugs Currently Under Phase 3 Clinical Trials (Active but not Recruiting [2017-2021])

Study	Clinical Trials.gov Identifier	Intervention	Sponsor/Collaborator
Neoadjuvant Hormonal Therapy Plus Palbociclib in Operable, Hormone Sensitive and HER2-Negative Primary Breast Cancer	NCT03969121	Palbociclib	Kyoto Breast Cancer Research Network/Pfizer
PAlbociclib Plus Tamoxifen for the Treatment of Hormone Receptor-positive, HER2-negative Advanced Breast Cancer Women - Asian studY (PATHWAY)	NCT03423199	Palbociclib, Tamoxifen, and Goserelin	National Cancer Center, Japan/Pfizer
Study of the Molecular Features of Postmenopausal Women With HR+ HER2-negative aBC on First-line Treatment with Ribociclib and Letrozole and, in Patients with a PIK3CA Mutation, on Second-line Treatment with Alpelisib Plus Fulvestrant (BioItaLEE)	NCT03439046 Novartis Pharmaceuticals	Ribociclib, Letrozole, Alpelisib, and Fulvestrant	Novartis Pharmaceuticals
A Study of evaluating the Effects of Pyrotinib After Adjuvant Trastuzumab in Women with Early Stage Breast Cancer	NCT03980054	Pyrotinib	Jiangsu HengRui Medicine Co., Ltd.
The Neoadjuvant Combined Hormone Therapy in Premenopausal Women with Locally Advanced ER+/HER2- Breast Cancer	NCT04753177	Doxorubicin, cyclophosphamide, paclitaxel	Saint Petersburg State Budgetary Healthcare Institution, City Clinical Oncology Dispensary
ER=estrogen receptor; HER2=human epidermal growth factor receptor 2			

Study 1

Neoadjuvant Hormonal Therapy Plus Palbociclib in Operable, Hormone Sensitive and HER2-Negative Primary Breast Cancer.

Clinical Trials.gov Identifier: NCT03969121.

Recruitment Status: Active, not recruiting.

First Posted on ClinicalTrials.gov: May 31, 2019.

Last Update Posted on ClinicalTrials.gov: June 22, 2021.

Sponsor: Kyoto Breast Cancer Research Network.

Collaborator: Pfizer.

Intervention/Treatment: Palbociclib.

Study Description: The study is a randomized, double blind, placebo controlled, Phase 3 clinical trial with the primary objective of demonstrating the efficacy of palbociclib in

combination with Endocrine therapy over Endocrine therapy alone measured by PEPI and EndoPredict™ EPclin Score in women with operable HR+, HER2 negative breast cancer. The Clinical Response Rate, drop in Ki67 index ≤ 2.7% and Breast conserving rate will be compared between two arms.

Study 2

PAlbociclib Plus Tamoxifen for the Treatment of Hormone Receptor-positive, HER2-negative Advanced Breast Cancer Women - Asian studY (PATHWAY).

Clinical Trials.gov Identifier: NCT03423199.

Recruitment Status: Active, not recruiting.

First Posted on ClinicalTrials.gov: February 6, 2018.

Last Update Posted on ClinicalTrials.gov: November 19, 2020.

Sponsor: National Cancer Center, Japan.

Collaborator: Pfizer and Korean Cancer Study Group.

Intervention/Treatment: Palbociclib, Tamoxifen, and Goserelin.

Study Description: This study is conducted to evaluate the benefit of adding palbociclib in hormone receptor (HR)-positive, HER2-negative advanced or metastatic breast cancer patients, regardless of menopausal status, treated with tamoxifen (with or without goserelin) versus tamoxifen alone (with or without goserelin).

Study 3

Study of the Molecular Features of Postmenopausal Women With HR+ HER2-negative aBC on First-line Treatment with Ribociclib and Letrozole and, in Patients with a PIK3CA Mutation, on Second-line Treatment with Alpelisib Plus Fulvestrant (BioItaLEE).

Clinical Trials.gov Identifier: NCT03439046.

Recruitment Status: Active, not recruiting.

First Posted on ClinicalTrials.gov: February 20, 2018.

Last Update Posted on ClinicalTrials.gov: May 27, 2021.

Sponsor: Novartis Pharmaceuticals.

Intervention/Treatment: Ribociclib, Letrozole, Alpelisib, and Fulvestrant.

Study Description: The purpose of this clinical trial is to study of the molecular features of postmenopausal women with hormone receptor-positive (HR+) HER2-negative advanced breast cancer on first-line treatment with ribociclib and letrozole and, in patients with a PIK3CA mutation, on second-line treatment with alpelisib plus fulvestrant.

Study 4

A Study of evaluating the Effects of Pyrotinib After Adjuvant Trastuzumab In Women With Early-Stage Breast Cancer.

Clinical Trials.gov Identifier: NCT03980054.

Recruitment Status: Active, not recruiting.

First Posted on ClinicalTrials.gov: June 10, 2019.

Last Update Posted on ClinicalTrials.gov: May 24, 2021.

Sponsor: Jiangsu HengRui Medicine Co., Ltd.

Intervention/Treatment: Pyrotinib.

Study Description: This is a randomised, double-blind multicenter Phase III study for evaluating the efficacy and safety of pyrotinib in women with early-stage high-risk breast cancer after adjuvant trastuzumab. The main purpose of this study is to investigate whether pyrotinib can further reduce the risk of recurrence from previously diagnosed HER-2 positive breast cancer after adjuvant treatment with trastuzumab.

Study 5

The Neoadjuvant Combined Hormone Therapy in Premenopausal Women with Locally Advanced ER+/HER2- Breast Cancer.

Clinical Trials.gov Identifier: NCT04753177.

Recruitment Status: Active, not recruiting.

First Posted on ClinicalTrials.gov: February 15, 2021.

Last Update Posted on ClinicalTrials.gov: February 15, 2021.

Sponsor: Saint Petersburg State Budgetary Healthcare Institution, City Clinical Oncology Dispensary.

Intervention/Treatment: Doxorubicin, cyclophosphamide, paclitaxel.

Study Description: The proposed research is an innovative investigation. The study will consist of two modes of treatment, combined hormone therapy with CDK4/6-ingibitors and chemotherapy (the control), each replicated four times in a randomized, complete block design. This research aims to improve the results of treatment, namely, to increase the percentage of successfully treated patients and reduce toxicity from treatment. Primary study endpoints will include the frequency of objective response and complete pathomorphological response (according to the Miller-Payne classification). Secondary endpoints will include a decrease of the Ki67 level in postoperative material compared to primary biopsy, the frequency of organ-preserving operation after neoadjuvant treatment and quality of life. Study hypothesis: neoadjuvant combined hormone therapy with CDK4/6-ingibitors in premenopausal women with luminal breast cancer leads to at least the same results as neoadjuvant chemotherapy, but with less toxicity.

Discussion

Breast cancer is a cancer that develops from breast tissue. Breast cancer is the most common type of cancer in women. Outcomes for breast cancer vary depending on the cancer type, the extent of disease and the person's age [15]. Worldwide, breast cancer is the leading type of cancer in women, accounting for 25% of all cases [16]. In 2018, it resulted in 2 million new cases and 627,000 deaths [17]. It is more common in developed countries and is more than 100 times more common in women than in men [16].

Over recent decades, there have been significant advances in the variety of therapies available for the treatment of breast cancer. These developments have produced many improvements in patient response and survival. In primary breast cancer, chemotherapy has been shown to provide significant long-term benefits in the prevention of recurrence and prolongation of patient survival [18, 19, 20].

Pharmaceutical and biotech companies are making incredible contributions by developing many innovative and effective treatments for breast cancers. Despite increasing cases, survival rates of breast cancer are improving significantly. In this article, we presented the breast cancer drugs that have recently been approved by US FDA. Between January 2020 and July 2021, FDA approved 4 new drugs for the treatment of breast cancers, Tukysa, Margenza, Phesgo, and Trodelvy. Research continues to find out new drugs that can help treat breast cancer. Currently, there are several breast cancer drugs undergoing Phase 3 clinical trials including two major new breast cancer drugs Palbociclib (Pfizer) and Ribociclib (Novartis).

Conclusion

Pharmaceutical and biotech companies are making incredible contributions by developing many innovative and effective treatments for breast cancers. Despite increasing cases, survival rates of breast cancer are improving significantly. We are hopeful that many new breast cancer drugs will be approved in the coming years.

Conflict of Interest

There is no conflict of interest.

Acknowledgement

None.

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Associated Comorbidities in Children under 5 Years with Severe Acute Malnutrition Attending Magumeri General Hospital: Retrospective Hospital-Based Study

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Abstract

Malnutrition is a global health challenge essentially because of its role as a preventable cause of several morbidities and mortality around the globe, especially in children under 5 years. Associated comorbidities and types of morbidity common in children admitted with severe acute malnutrition in Magumeri General Hospital were investigated. This was a retrospective quantitative hospital-based study. Hospital records, ward admission and discharge registers, and patient cards were reviewed focusing on demographic, clinical, and mortality data extracted on all children under 5 years admitted to the Hospital. Data during the period of December 2018 to March 2020 was collected and analyzed using Microsoft Excel 2013 and SPSS version 17.0. 367 children under 5 years with complicated SAM were identified from the reviewed total hospital admissions of 537. 217 cases were male (59.1%) while 150 were female (40.9%). Marasmus was the most common type of severe acute malnutrition (75.2%) while diarrhea, respiratory tract infection, and malaria were the top three comorbidities, majority of the cases were managed successfully with 79.6 % reported to have fully recovered and were discharged, while 17 (4.1%) died. Magumeri is a locality disproportional affected by various insecurities due to the Boko Haram insurgency, resulting in the high prevalence of severe acute malnutrition among children under 5 years, representing 68.3% of total hospital admissions in the same age group, while 81.2 % had at least more than one comorbidity with a significant association between prolonged hospital stay and treatment ($p < 0.001$).

Keywords: *Admission, Magumeri, Morbidity, Severe acute malnutrition, and Under 5 children.*

Introduction

The world health organization (WHO) defines severe acute malnutrition (SAM) as a condition of very low weight for height (below -3z scores of the median growth standards), of visible severe wasting, or of nutritional oedema. Severe acute malnutrition (SAM) is one of the leading causes of morbidity and mortality among children aged under 5 years worldwide [1]. SAM in children can be classified as either complicated or uncomplicated. SAM in children is said to be complicated if they have clinical features indicating the presence of comorbidities like infection or metabolic disorders, severe oedema, or poor appetite, while children with uncomplicated SAM are clinically well, alert, and have retained their appetite [2].

Children with complicated SAM are managed as inpatients in stabilization centers or special units in tertiary hospitals, while uncomplicated SAM can be managed as outpatients where

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suitable services with access to ready-to-use therapeutic food (RUTF) exist [3].

Globally, the impact of malnutrition on infant morbidity and mortality has been recorded, with an estimated 45% of all child deaths linked to malnutrition [4]. The most severe form of malnutrition, namely severe acute malnutrition (SAM), is associated with negative outcomes for children, including increased susceptibility to infection and other morbid complications [5], increased muscle loss [6], impaired wound healing [7] and longer length of hospital.

In sub-Saharan Africa, most under 5 hospital admissions are related to conditions such as diarrhea, pneumonia, measles, malaria, tuberculosis, human immunodeficiency virus (HIV), acquired immune deficiency syndrome (AIDS), and malnutrition [8] leading to varying degrees of outcome in these age group. Studies have also linked the interrelationship that exists between these common comorbidities and malnutrition.

Malnutrition is a direct or underlying cause of 45 percent of all deaths of under-five children [1, 9]. Data from the nutrition and health situation reports of Nigeria conducted in 2018 show that each year about 1 million Nigerian children die before their 5th birthday with malnutrition contributing to nearly half of these deaths [10, 11]. Nigeria has the second highest burden of stunted children in the world, with a national prevalence rate of 32 percent of children under five. An estimated 2 million children in Nigeria suffer from severe acute malnutrition (SAM) [12].

In 2019, the conflict in Northeastern Nigeria entered its eleventh year. Borno state is one of the states of the northeast geopolitical zone, with an estimated amount of 4.7 million people needing emergency food assistance in Borno as reported by the Famine Early Warning Systems Network Food Security Outlook (October 2020). Magumeri is a local government area of Borno State, Nigeria. Its headquarters are in the town of Magumeri where the general hospital is located. It has an area of 4,856 km2 and a recently estimated population of 213,975 of which 42,795 are children under the age of five years [13].

Across the globe, an estimated 16 million children under the age of 5 are affected by severe acute malnutrition resulting in several morbidities and mortalities. These outcomes are the direct result of malnutrition as well as the indirect result of childhood illnesses like diarrhea and pneumonia in that malnourished children are too weak to survive [14]. Reducing malnutrition and its consequences is a global development goal as stated by the Sustainable Development Goals (SDGs) and the Nigeria Nutrition in Emergency Working Group, it imposes significant costs on the social and economic development of the entire Northeast region, predisposing the children to different morbidities, psychosocial apathy, and cognitive deficiencies. This research hopes to provide relevant information backed by reliable data that may assist in improving currently available services aimed at providing care and treatment of complicated SAM, especially in low-resource countries like Nigeria and conflict-affected populations.

An understanding of how children with comorbidities present and initial management strategies are crucial for health workers dealing with new presentations of SAM. Therefore, this research aimed to:

1. Determine the associated comorbidities in children under 5 years with severe acute malnutrition admitted at Magumeri General Hospital (Stabilization unit).
2. Determine the prevalence of common morbidities and presentations in children under 5 years with severe acute malnutrition attending Magumeri General Hospital.
3. Explain how the associated comorbidities affect inpatient care among children under 5 years admitted during the period of the study.
4. Determine vaccination status among children under 5 years admitted during the study period.

5. Investigate admission and treatment outcomes of complicated SAM among children under 5 years admitted at Magumeri General Hospital.
6. Determine the distribution of severe acute malnutrition among children under 5 years by gender and month of admission during the study period.

Materials and Methods

Research Setting

Magumeri is a local government area of Borno State, Nigeria. It has an area of 4,856km2, 14 wards, and a population of 140,231 as per the 2006 census which has since increased to an estimated 213,975 (current population will be preferred to give inside of the targeted age group e.g., using displaced tracking matrix DTM). Magumeri

General Hospital currently runs comprehensive healthcare services as well as a stabilization center for the management of severe acute malnutrition with medical complications.

Source of Data

Identified cases and analyzed data were collected from hospital registers. Secondary data and all relevant information about the study population were collected and collated from hospital records during the period of the study.

Methods

This was a sixteen-month retrospective, quantitative, and hospital-based study. A well-structured National Inpatient Therapeutic Program Admission Card for discharged patients who benefited from the management of severe acute malnutrition from December 2018 – March 2020 was used to retrieve the required information.

The admission card has the following components:

1. Biodata: Child's name, caregiver's name, age, sex, address, and ward.
2. Admission anthropometry: MUAC, weight, height, and oedema.
3. History associated with SAM: diarrhea, vomiting, cough, appetite, and fever.
4. Physical examination at admission: Respiratory rate, temperature, hydration status, state of consciousness, lymph nodes, and skin change.
5. Routine admission medication and immunization: Anti-malaria, antibiotics, vitamin A, and measles immunization.
6. Other treatments for Human Immunodeficiency Virus, Tuberculosis.

A weekly summary of anthropometry, medical history, and physical examination throughout the minimum period of eight weeks and the maximum period of twelve weeks in the program is captured. The sample collected comprised some records with incomplete information especially for some age groups with missing vaccination status, ward locations, and detailed discharge information due to continued disruption of services because of the ongoing conflict.

Research Instruments

Instruments and equipment necessary for the conduction of the research already provided for by the facility:

1. Weighing Machine: Weighing machine with a capacity of 100 kg and having the least count of 0.1 kg.
2. Height measuring scale (stadiometer).
3. MUAC Tape: For measuring mid-upper arm circumference.
4. Health management information system: a well-designed and pretested set of registers already in use.

Inclusion and Exclusion Criteria

All children aged under 5 years admitted to Magumeri General Hospital (Stabilization unit) with complicated severe acute malnutrition were included, admission to the unit is based on the presence of bilateral pitting oedema and /or weight for height Z-scores (WHZ) < −3 standard

deviations (SD) using the WHO weight-for-length reference card (growth standards charts). Those with severe malnutrition complicated by chronic illness like cardiovascular disease, cerebral palsy, microcephaly, or sickle cell disease were excluded.

Ethical Considerations

Ethical approval was obtained from the hospital administration board to review patients' records at the hospital statistical office.

Statistical Analysis

Data collated during the study period were collected using Microsoft Excel 2013 with great attention to detail to minimize data entry errors. Descriptive statistics were employed in the analysis of the data and Statistical Package for Social Sciences (SPSS) version 17.0 software was used to analyze the data.

Limitations

The sample collected comprised some records with incomplete information especially for some age groups with missing vaccination status, ward locations, and detailed discharge information due to continued disruption of services because of the ongoing conflict.

Results

The period of the study was from December 2018 to March 2020. A total of 537 cases were reviewed from the hospital records. 367 children aged under 5 years with complicated SAM were identified based on the inclusion criteria and accepted for the study. This represented 68.3% of total hospital admissions, a fallout of the ongoing crisis in the Northeast region of Nigeria where the study population was drafted. 217 of the cases were male (59.1%) while 150 were females (40.9%).

The prevalence of complicated SAM cases peaked among children within the combined age group 0 to 24 months: 306/367 (83.4%). Children in the combined age groups 25 to 59 months recorded 54/367 (14.7%) while the least occurrence of complicated SAM cases was seen among the age group of 48-59 months 7/367 (1.9%). The morbidity pattern indicated that marasmus was the most frequently recorded type of SAM accounting for 75.2% of the children. This was followed by kwashiorkor which accounted for 18.5% of the children while Marasmic–kwashiorkor had 6.3%.

The co-morbidities recorded (n = 367), showed that 161 of the children with SAM under 5 years admitted during the study period had diarrhea (43.9%), while 122 (33.2%) had respiratory tract infections, 143 (39.0%) had malaria and other comorbidities to include, pneumonia (13.9), measles (6.5%) and anemia at 3.8%, etc. (See Table 2). 81.2 % of the study population had more than one comorbidity. The average days of admission at the Hospital was 7 days. The vaccination status of the children during the study period showed that 20.7% were fully immunized based on the National Programme on Immunization, while 13.9% were partially vaccinated and 32.2% had no vaccination data (Table 1).

The age group 48-59 months had the least cases while age group 0-12 months were most affected.

Table 1. Background Distribution of Children under 5 Years with Complicated SAM Admitted to Magumeri General Hospital During the Study Period According Age Groups of 0-59 Months

Age Group	Frequency	Percent
0-12	194	52.9
12-24	112	30.5
24-36	36	9.8
36-48	18	4.9
48-59	7	1.9
N	367	100

75.2 % of cases had Marasmus while 6.3 % had symptoms diagnosed as Marasmic-kwashiorkor. Data from the study showed that 161 of the children with SAM under 5 years admitted during the study period had diarrhea (43.9%), while 122 (33.2%) had respiratory tract infections, 143 (39.0%) had malaria and other comorbidities to include, pneumonia (13.9), measles (6.5) etc.

Table 2. Background Characteristics of Children Aged under 5 Years Admitted at Magumeri General Hospital According to Sex, Morbidity and Comorbidity During the Study Period

Sec (n-367)	**N**	**Percent**
Male	217	59.1
Female	150	40.9
Morbidity		
Marasmus	276	75.2
Kwashiorkor	68	18.5
Marasmic Kwashiorkor	23	6.3
Comorbidity		
Diarrhea	161	43.9
Respiratory Tract Infection	122	33.2
Malaria	143	39.0
Pneumonia	51	13.9
Dehydration	45	12.2
Conjunctivitis	19	5.2
Dermatosis	28	7.6
Measles	24	6.5
Anaemia	14	3.8
Otitis Media	12	3.2

Tested using One-way analysis of variance, (p-value<0.05). Marasmus was more prevalent in the male children when compared to the females (61.9% versus 38.1%).

Table 3. Morbidity Distribution and Demographic Presentation of Children Under 5 Years Admitted during the Study Period with Severe Acute Malnutrition

Characteristics	**Marasmus**	**Morbidity**	**Marasmic-Kwashiorkor**	**P-value**
		Kwashiorkor		
Sex				
Male	171(61.9%)	40(58.8%)	8(34.7%)	0.023
Female	105(38.1%)	28(41.2%)	15(65.2%)	
Demography				
Mean Age	15.8 months	16.1 months	15.9 months	0.094
Mean Weight	5.1 kg	5.4 kg	5.1 kg	0.102
Mean Height	68.3 cm	67.0 cm	66.3 cm	0.113
Mean MUAC	9.6 cm	10.6 cm	10.1 cm	0.098

Bulamari ward had the least cases at 2.2% while Magumeri ward had the highest cases at 17.4 based on accessibility and proximity to the health facility.

Table 4. Background Distribution of Children Aged Under 5 Years Admitted at the Hospital During the Study Period by Local Government Wards in the Local Government Area

N-367	Number	Percent
Male	217	59.1
Female	150	40.9
Morbidity		
Marasmus	276	75.2
Kwashiorkor	68	18.5
Marasmic Kwashiorkor	23	6.3
Local Government Wards		
Ajeri	17	4.6
Aduran	22	6.0
Atorom	18	4.9
Bulamari	8	2.2
Furam	26	7.1
Gajigana	35	9.5
Hoyo	24	6.5
Kajeri	19	5.2
Kareram	31	8.5
Kasula	14	3.8
Kazallari	11	3.0
Kupti	18	4.9
Magumeri	64	17.4
Maitari	9	2.5
Nngama	13	3.5
Titwa	18	4.9
No ward Identified	20	5.5

Fully vaccinated children during the study period were 20.7% while 13.9% were partially vaccinated and 32.2% had no vaccination data (Table 5).

Table 5. Vaccination Status of Children Aged Under 5 Years with Complicated Severe Acute Malnutrition Admitted to the Hospital During the Study Period

Vaccination Status	Frequency	Percent
Fully vaccinated	76	20.7
Partially Vaccinated	51	13.9
No Vaccination	122	33.2
No vaccination record	118	32.2
N	367	100

Many cases were managed successfully, with 79.6 % reported to have fully recovered and discharged from the hospital, and 8.7% of the cases were referred to other health facilities like the University of Maiduguri Teaching Hospital, MSF, and ALIMA facilities for more specialized care and due to interrupted care because of the crisis.

Table 6. Background Description of Admission and Treatment Outcomes of Complicated SAM Among Children Under 5 Years Admitted to the Hospital during the Study Period

N=367	Number	Percent
Males	217	59.1
Females	150	40.9
Outcome	122	33.2
Cured and discharged	292	79.6
Referred	32	8.7
Defaulted	26	7.1
Death	17	4.6

n=367. 217 were males while females were 150. With an average of 5 days of admission during the study period, the months of February and August 2019 had the highest admission for both sexes with 40 (10.9%) and 43 (11.7%) admissions respectively.

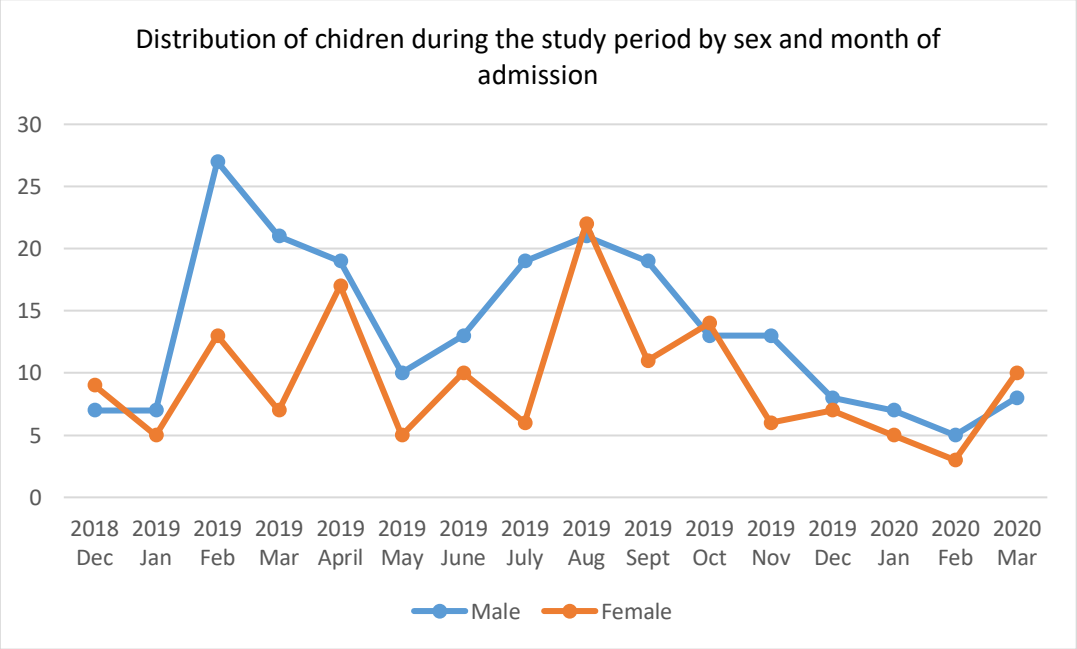

Figure 1. Distribution of Children during the Study Period by Sex and Month of Admission

n=367. 276 (75.2%) had Marasmus during the study period, with the highest prevalence of Marasmus in the months of February, April, and August with 31 (11.2%), 28 (10.1%), and 34 (12.3%) respectively. While 68 (18.5%) had Kwashiorkor and 28 (7.6%) had Marasmic-kwashiorkor.

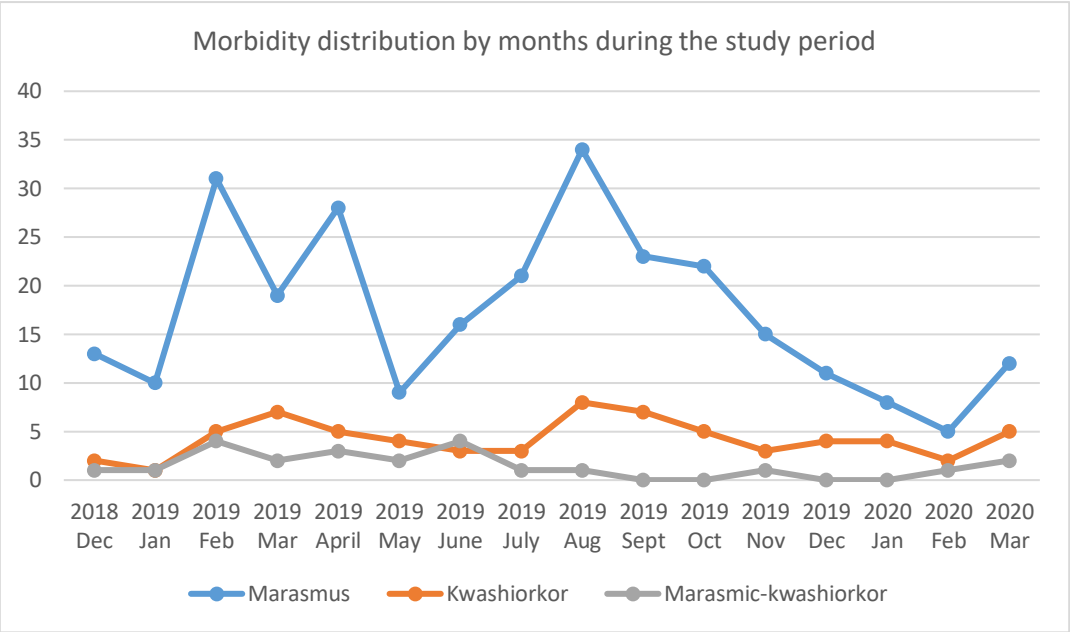

Figure 2. Morbidity Distribution by Months During the Study Period

Discussion

In this research, associated comorbidities in children under five years with severe acute malnutrition and how these morbidities affected inpatient care for the children attending Magumeri General Hospital (Stabilization unit) was studied, immunization status among under five with SAM was determined, admission and treatment outcomes of complicated SAM in under-five children was investigated, and the prevalence of associated comorbidities was also determined.

The mean age of the children in this study was 17.4 months, with most of the children with SAM being less than two years (83.4%), this was consistent with other studies conducted in Valgado Oua Drago Teaching Hospital, Burkino Faso [15] and some selected hospitals from Ethiopia [16].

217 of the cases were male (59.1%) while 150 were female (40.9%) which is like a study conducted in Ayder Referral Hospital, Tigray Ethiopia by [17], in 2015 and in Tamale Teaching Hospital Ghana [20].

The distribution of morbidity among the study population; marasmus 75.2%, kwashiorkor 18.5 %, and marasmic-kwashiorkor 6.3, this was consistent with a study by [17, 19], but differed from a study in Zambia [19] that reported kwashiorkor as the most common form of SAM.

Analysis of comorbidities showed that 59.4% had at least two comorbidities treated during the study period of which 61.9% were males compared with females at 38.1 %, while 21.8% had three comorbidities with a male-to-female ratio of 75.7 to 24.3 (percent).

The distribution showed that 161 of the children had diarrhea (43.9%), 122 (33.2%) had respiratory tract infections, and 143 (39.0%) had malaria as the top three associated comorbidities with children under 5 years admitted at Magumeri General Hospital during the study period, this is consistent with the body of evidence that shows that the most significant comorbidities reported in children with SAM are infectious disease i.e. diarrhea, pneumonia, acute respiratory tract infections as well as malaria and measles [16, 17, 19, 20]. Concerning admission and treatment outcomes, many of the cases were managed successfully, with 79.6 % reported to have fully recovered and discharged from the hospital, 8.7% of the cases were referred, 7.1% defaulted and 17 (4.1%) died, this is similar to a study in Ethiopia [16]. The average hospital admission days were 7 days, with a

significant association between a prolonged hospital stay and treatment of comorbidities ($p < 0.05$). Fully vaccinated children during the study period were (76) 20.7% while (51) 13.9% were partially vaccinated, (118) 32.2% had no vaccination data and (122) 33.2% were not vaccinated, this is consistent with studies by [24, 25] that reported poor immunization coverage in Nigeria and especially the northeast region. The vaccination status in this study is linked to the ongoing crisis in the region resulting in population displacement, inaccessibility to healthcare, non-compliance to the insufficient vaccines as well as information of mothers and caregivers.

Conclusion and Recommendation

This research was conducted as a retrospective quantitative hospital-based study, while the data used in this study was collected amidst several strengths and limitations which could have biased the results, the level of data quality was assured and the missing information from the hospital records did not significantly affect the analysis of the results.

This study found diarrhea, respiratory tract infection, and malaria to be the top three comorbidities associated among children with severe acute malnutrition under 5 years admitted at Magumeri General Hospital, with 21.8% of the children presenting with more than three comorbidities on admission, prolonging treatment and hospital stay. This can be remedied by educating health workers both at the hospital and community level on early detection and treatment of severely malnourished children in the catchment areas and by creating strong community-based screening and timely referral of malnutrition cases.

Although the mortality rate of this study at 4.6% is below the WHO target of < 5% (WHO, 1999) for children with severe acute malnutrition, there is still the need for improvement in the treatment and management outcomes of children admitted for SAM as most of the studies show that these comorbidities common among children with SAM are vaccine-preventable complications. This can be remedied by improving mother and caregiver counseling, improving access to vaccinations, offering combination vaccines, and using alert and mobile notification systems.

Ultimately Government has a role in stabilizing the region and ensuring the security and safety of the population as well as improving access to healthcare, education, water, sanitation, and hygiene in these communities as studies have shown a direct link with the overall improvement in the lifestyle and health outcomes of a population.

Conflict of Interest

The author and coauthors listed hereby declare no conflict of interest in the conduct of this research. Affiliated institutions included the Borno State Ministry of Health, INTERSOS Humanitarian Aid Organization, UNICEF, and OFDA.

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Cost of Initial Care for Preterm Infants at Bolgatanga Regional Hospital, Ghana

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Abstract

Preterm birth is an important public health problem due to its medical, economic, and social impact and constitutes about 10% of annual global births. To improve access and equity to health care delivery of preterm infants, identification of major cost areas and strategies to improve efficiency in those areas must be prioritized. This study estimated the health system cost of neonatal intensive care unit (NICU) services for preterm babies in the Regional Hospital, Bolgatanga (RHB). A costing study based on health system perspective designed to estimate cost of initial hospital care for preterm babies was carried out in RHB. Participants were selected based on systematic sampling procedure of preterm babies admitted at the facility from January 2019 to December 2019. The health system and cost estimates of NICU services were done using both top-to-bottom and micro-costing approaches. Preterm births constituted 30% of NICU admissions in 2019. Most preterm infants were of low birth weight (LBW). The total cost for providing initial hospital care for preterm infants in 2019 was GH₵212,776.96 ($35,462.83). The major cost component was shared cost making up 59.20%, especially staff salaries. Direct medical cost constituted 40.80% of the total cost. The RHB would have saved GH₵212,776.96 ($35,462.83) in 2019 if preterm births were eliminated. Prioritizing efficient use of shared resources would save cost for increase access to preterm care.

Keywords: *Cost of initial hospital care, LBW, NICU, Preterm birth, Prevalence, Direct medical cost, shared cost, RHB.*

Introduction

Every year, 15 million babies are born preterm and in 2014 preterm births constituted 10.6% of global births and 12 million (81.1%) of these occurred in Asia and Sub-Saharan Africa [1, 2]. Preterm birth is birth before 37 completed weeks of gestation [3-7]. A preterm birth may arise either spontaneously or provider initiated because of either maternal or fetal indication [3, 4, 8-12]. It is an important obstetric and pediatric problem because of its association with enormous medical, economic, and social impact.

Preterm birth is of public health importance due to its contribution to neonatal mortality. These infants are prone to complications responsible for 35% of deaths among newborns because of prematurity [3, 4].

Preterm birth is the most important determinant of newborn outcomes in terms of survival and quality of life. Among the complications associated with preterm infants are impaired respiration, feeding difficulties, poor body temperature regulation, and high risk of infection. Globally, preterm birth remains the leading cause of adverse perinatal outcomes;

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neonatal morbidity and mortality, [5] which is a key index of health standard in a country [13].

With improvement in technology and medication, preterm infants that would have died in the past are now surviving. Survival is however associated with long hospital stays, use of specialized equipment and medications resulting in increased costs compared to term birth infants.

These costs are borne by both the health system, families, and society at large. Knowing the cost of providing care and areas to improve efficiency will assist the health system to save costs for other critical areas of health care delivery.

This is particularly important for health facilities in developing countries which are already underfunded. High-cost interventions such as preterm infant care which is resource intensive can lead to poor quality care.

In Ghana, newborn deaths account for 65% and 40% of infant and under 5 mortalities, respectively [14]. Geographical access, financial constraints and socio-cultural factors remain major barriers to facility-based maternal and newborn care. To increase financial access, the government of Ghana in 2008 introduced free antenatal, delivery and postnatal care as part of social health insurance to help achieve the Millennium Development Goals (MDGs) [15, 16].

A 5-year newborn Health Strategy and Action Plan was developed and launched in 2014, as policy guide to improving newborn outcomes in Ghana [14, 17-21]. In RHB, the proportion of preterm births among LBW infants is about 60% (2019 annual projections). These infants need special care for survival. The RHB with support from UNICEF has a NICU where special care is given to LBW and other sick neonates. This unit has improved survival of preterm neonates supported by available evidence (unpublished data).

This study is to estimate the health system cost of caring for preterm newborns at the NICU of the RHB. The study perspective is the health system.

Materials and Methods

Study Design and Study Population

This was a costing study designed to estimate the cost of initial hospital care for preterm babies at the newborn care unit of RHB. The Drummond's Guidelines for economic evaluation was used in this costing study [22]. The study perspective was the health system. The study took a retrospective reference period from 1st January 2019 to 31st December 2019. The RHB is a secondary referral facility with a 220-bed capacity providing medical, surgical, obstetric, gynecological, pediatric, and newborn care services.

The hospital serves a population of over 1.2 million people [14]. The study population was preterm babies admitted into the NICU of the hospital. Out of a total of 1,171 patients admitted to the unit within the reference period, 352 were preterm babies.

Sampling Strategy

Using systematic sampling procedure, a sample of 150 preterm babies were selected for study. Medical records of these infants were retrieved, and data abstracted. The information retrieved was on socio-demographic characteristics of parents, newborn characteristics and resources consumed in the course of care.

Classification of Preterm Birth and Low Birth Weight

In this study, preterm births were diagnosed using the gestational age at time of birth. Preterm births were accordingly classified as late preterm (34 - <37 weeks), moderate preterm (32 -33 weeks), very preterm (28-31 weeks) and extreme preterm (< 28 weeks).

The infants were also categorized according to birth weight as normal birth weight (≥2500 gm), LBW (1500 – 2499 gm), very LBW (1000 – 1499 gm) and extremely LBW (<1000 gm).

Data Analysis and Cost Calculations of Preterm Care

Two approaches were used to identify, quantify and estimate monetary value of the resources used in providing initial hospital care. These were the top-to-bottom approach and the micro-costing approach. The cost estimates were limited to resources used directly by the NICU and as such, the general hospital resources such as administrative and management staff resources of the hospital not directly involved with service delivery at the unit were excluded from the estimates. A top-to-bottom approach was used for shared cost resources such as staff, equipment, and utilities. A micro-costing approach was used for direct medical costing of resources by documenting and quantifying resources consumed by each of the 150 preterm infants from their medical records. The hospital fees based on national health insurance tariffs were used to cost resources consumed by each preterm infant. Staff salaries were obtained from the payroll and equipment cost from the assets register. Utility costs were obtained from bills submitted by utility companies as well as estimates for cleaning and accommodation. The costs were estimated per capita expenditure for preterm infants for initial hospitalization. The cost of equipment was discounted using straight-line depreciation method [23] to obtain annualized cost based on the assumption of average useful life of the equipment. In this study, the average useful life of all the equipment was assumed to be 10 years. Sensitivity analysis was done by varying the number of useful life of equipment.

Variables Used in Costing Preterm Care

The dependent variable was the total cost of initial preterm hospitalization. The independent variables investigated were educational level of parents, employment status of parents, gestational age, sex of baby, birth weight, type of preterm complications, type of laboratory investigations, type of medications consumed, type of NICU service and outcome of care. The main costs studied were the direct cost of delivering the initial intensive care service to preterm infants.

Results

Socio-demographic Characteristics of Parents

Approximately 50% of the mothers with preterm infants were aged 20-29 years. Mothers under 20 years constitute about a quarter (24.6%) and 26.6% were above 30 years. Fathers had higher educational status than mothers. Similarly, 83.3% of fathers were gainfully employed compared to 54.5% of mothers. The majority (82.4%) of parents were married (Table 1).

Table 1. Socio-demographic Characteristics of Parents

Variable	n (%)
Maternal age (years)	
<20	37 (24.6)
20 - 29	73 (48.7)
30 - 34	26 (17.3)
>35	14 (9.3)
Educational status of mother	
None	75 (50.0)
Primary	15 (10.0)
Secondary	30 (20.0)
Tertiary	30 (20.0)
Educational status of father	

None	30 (20.0)
Primary	30 (20.0)
Secondary	30 (20.0)
Tertiary	60 (40.0)
Employment status of mother	
Unemployed	68 (45.5)
Self-employed	55 (36.4)
Public service	27 (18.1)
Employment status of father	
Unemployed	25 (16.7)
Self-employed	100 (66.7)
Public service	25 (16.6)
Marital status	
Married	124 (82.4)
Single	26 (17.7)

Characteristics of Preterm Infants

A total of 1,171 babies were admitted at the NICU of the hospital in 2019 and 352 of these were preterm babies giving preterm admission rate of 30% (Figure 1). Majority of preterm infants (54.6%) were females and 72.9% were singleton births. LBW infants constitute the majority (62.4%) followed by very LBW (30.3%) and then 5.5% were of normal birth weight. Only 1.8% were of the extremely LBW category. A higher proportion of preterm infants (68.6%) were on admission for a week, whereas 29.7% were on admission for about 2 weeks. Only 1.7% stayed on admission for more than 2 weeks. On outcome after initial hospital care, 91.8% were discharged home, 2.7% died and 5.5% referred for more advance care at a tertiary institution (Table 2).

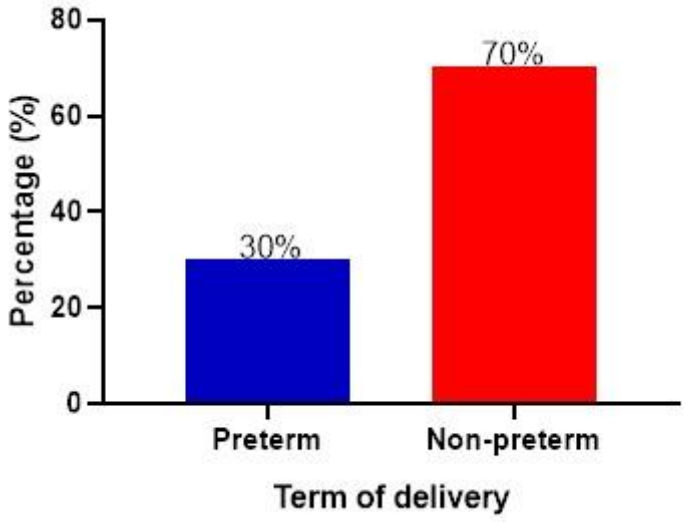

Figure 1. Preterm Babies Admission Rate in 2019

Table 2. Characteristics of Preterm Infants

Variables	n (%)
Gestational age	
extremely preterm (<28 weeks)	12 (7.8)
very preterm (28-32 weeks)	60 (40)
moderate preterm (32-33 weeks)	76 (50.4)
late preterm (34-<37 weeks)	2 (1.7)
Sex of baby	
Female	82 (54.6)
Male	68 (45.4)
Multiple birth	
No	109 (72.9)
Yes	41 (27.1)
Birth weight (gm)	
ELBW (<1000)	3 (1.8)
VLBW (1000 – 1499)	45 (30.3)
LBW (1,500 - 2,499)	94 (62.4)
NBW (≥2,500)	8 (5.5)
Length of stay on admission (days)	
0 -7	103 (68.6)
8 -14	45 (29.7)
>14	2 (1.7)
Outcome of baby	
Discharged home	138 (91.8)
Died	4 (2.7)
Referred for tertiary care	8 (5.5)
NBW: normal birth weight, LBW: low birth weight, VLBW: very low birth weight, ELBW: extremely low birth weight	

Direct Medical Costs

The cost items under direct medical costs included NICU service fees, laboratory investigations and cost of medicines. The highest cost item was intensive care service fees, followed by medicines and then laboratory services. The median cost with interquartile range for various categories of LBW were computed (Table 3). The median NICU service cost under direct medical cost by sex was higher in females than in males whereas the medicines and laboratory services costs were similar in both genders (Table 4).

Table 3. Direct NICU Medical Cost Categorized into NICU Service Cost, Laboratory Cost and Medicine Cost

Birthweight (gm)	Total Cost (GH₵)	Median Cost (GH₵)	IQR (GH₵)
NICU service cost			
ELBW (<1000)	624.50	312.50	178.50-446.00
VLBW (1000-1499)	9384.50	245.50	172.50-1168.00
LBW (1500-2499)	19832.00	233.90	132.80-887.50
NBW (≥2500)	1159.00	241.50	166.50-257.00

Sub-Total	33,785.31	246.00	0.00-1174.00
Laboratory cost			
ELBW (<1000)	24.00	12.00	7.00-17.00
VLBW (1000-1499)	384.00	7.00	7.00-97.00
LBW (1500-2499)	840.00	7.00	7.00-64.50
NBW ≥2500	97.00	9.50	7.00-32.00
Sub-Total	1,490.00	7.00	7.00-97.00
Medicine cost			
ELBW (<1000)	330.50	165.30	71.50-259.00
VLBW (1000-1499)	5394.50	134.00	65.50-1056.00
LBW (1500-2499)	12888.00	125.50	48.80-1061.50
NBW (≥2500)	462.00	33.00	125.00-54.50
Sub-Total	16,740.00	117.00	32.00-1067.00
Total	**52,015.31**		
NICU: neonatal intensive care unit, NBW: normal birth weight, LBW: low birth weight, VLBW: very low birth weight, ELBW: extremely low birth weight			

Table 4. Direct Medical Cost Stratified according to Sex of Neonate

Cost category: Median (IQR)	**Male**	**Female**
NICU service fees	185.50(100.00-600.97)	242.50(162.50-1174.00)
Laboratory cost	7.00(7.00-52.00)	7.00(7.00-97.00)
Medicine cost	117.00(32.00-1056.00)	117.00(55.50-1067.00)
NICU: neonatal intensive care unit, IQR: interquartile range		

Shared Costs

Shared cost items considered were staff salaries, equipment, and utilities. These items were specific to the newborn care unit. The total gross annual NICU staff salaries were GH₵280,761.96 and constitute the highest cost item. The total initial cost of the NICU equipment was GH₵882,000.00. We assumed the average useful life of equipment was 10 years. The total annual cost of NICU utilities was GH₵49,920. Utilities were made up of water, electricity, generator use, detergents, and accommodation (Table 6).

Table 5. Annualized Cost of NICU Equipment by Straight-Line Depreciation

Total Cost of Equipment GH₵)	**Average Useful Life of Equipment (Years)**	**Annualized Cost (GH₵)**
882,000.000	10	88,200.00

Table 6. Shared NICU Costs for the Year 2019

Cost Category	**Annual Cost (GH₵)**	**Cost Per Capita of NICU Admissions (GH₵)**	**Total Shared Cost for 150 Preterm Infants (GH₵)**
Staff salaries	280,761.96	239.76	35,964.00
Equipment (discounted)	88,200	75.32	11,298.00
Utilities	49,920	42.63	6,394.50
Total	418,881.96	357.71	53,656.50

Grand total (direct medical cost + shared cost)	418,881.96 + 52,015.31 = 470,897.27 ($78,482.88)

Total NICU admissions for 2019 =1,171

Sensitivity Analysis

The main assumption in this study was the average number of useful life of the equipment. In performing sensitivity analysis, the useful life of the equipment was varied to 5 years, 8 years, 12 years, and 15 years. The corresponding annual cost and cost per capita were in Table 8. Total cost from the median 10 years of average useful life of the equipment to 5 years vary by 12% and to 15 years by 2%. Figure 2 showed variation in total cost of initial hospital care for preterm infants as the average number of useful life of the equipment changes.

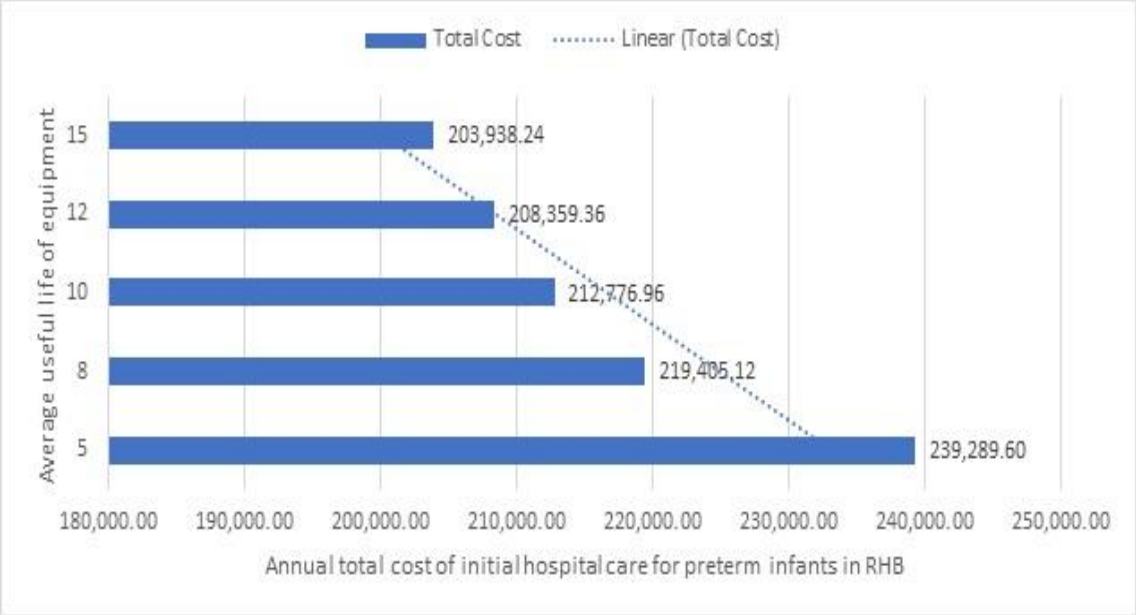

Figure 2. Sensitivity Analysis based on Useful Life of Equipment

Table 7. Summary Cost

Variable	**Direct Medical Cost (GH₵)**			**Shared Costs (GH₵)**			**Total**
Resource Item	NICU service	Laboratory	Medicine	Staff salaries	Equipment	Utilities	
Cost per capita	225.24	9.93	11.60	239.76	75.32	42.63	604.48
Total cost for 150 preterm	33,786	1,489.50	1,740	35,964	11,298	6,394.50	90,672
Total cost for all 352 preterm in 2019	79,284.48	3,495.36	4,083.20	84,395.52	26,512.64	15,005.76	212,776.96
Shared cost constituted 59.2% of total cost of initial preterm care whereas direct medical cost was 40.8%. NICU: neonatal intensive care unit							

Table 8. Annualization of Equipment Cost Per Capita

Total cost of equipment (GH₵)	882,000.000	882,000.00	882,000	882,000	882,000
Average useful life of equipment (Years)	10	5	8	12	15
Annualized cost (GH₵)	88,200.00	176,400	110,250	73,500	58,800
Annual cost per capita (Total admission =1171)	75.32	150.64	94.15	62.77	50.21

GH₵6.00 = 1USD

Table 9. Sensitivity Analysis

Average useful life of equipment (years)	**Direct medical cost per capita**	**Shared cost (Salaries and utilities only) per capita**	**Shared cost (Equipment only) per capita**	**Total cost for 150 preterm babies**	**Total cost for 352 preterm babies**
5	246.77	282.39	150.64	101,970.00	239,289.60
8	246.77	282.39	94.15	93,496.50	219,405.12
10	246.77	282.39	75.32	90,672.00	212,776.96
12	246.77	282.39	62.77	88,789.50	208,359.36
15	246.77	282.39	50.21	86,905.50	203,938.24

Discussion

The proportion of preterm infants admitted at the NICU of RHB in 2019 was 30%. This means the greater burden of care on the unit was from other patients other than preterm infants. This finding is at variance with the study in Malaysia where the majority (75%) of neonatal intensive care admissions were due to preterm babies [13]. LBW neonates (62.4%), were most of the preterm babies followed by very LBW neonates (30.3%) and extremely LBW babies which constituted only 1.8%. This finding is consistent with other studies [13, 24] which also reported the bulk of their preterm babies as being of the LBW category.

Although ELBW babies constituted only 1.8% of the admissions, they had the highest median cost of GHS165.3 ($33), for medicines. This is due to the intensity of care associated with patient management and the longer duration of stay on admission. The long duration of stay increases consumption of resources leading to high cost associated with this category of preterm babies. As expected, the lowest cost of GHS33 ($6.6) was in the management of NBW infants. The cost with respect to laboratory services was similar, the highest median cost of GHS12 ($2.4) was with ELBW babies compared to GHS7 ($1.4) for both LBW and VLBW infants. Also, on NICU service, ELBW infants had the highest median cost of management followed by VLBW infants and NBW neonates. Furthermore, LBW infants had the lowest cost of management. The higher NICU service cost in managing NBW neonates compared to LBW neonates may be due to other life-threatening neonatal complications other than birth weight.

Direct medical cost of managing neonates of female gender was higher than that of the male gender. This may be due to physiological disposition of females making them vulnerable to adverse foetal and neonatal complications. In this study, the total annual cost for the 150 preterm infants managed in 2019 was GH₵90,672.00 ($15,112) giving cost per capita of GH₵604.48 ($100.75) compared to extremely

high cost in high income countries such as United States and Canada [13, 24]. Shared cost constituted 59.2% of total cost and direct medical cost was 40.8%. The major cost items were intensive care service fees, staff salaries, equipment, and utilities. This is consistent with other studies on this subject [13, 24, 25].

Sensitivity analysis performed showed that average useful life of equipment has a marginal inverse linear effect of the total cost of initial care. As the average useful life increased from 5 years to 15 years, the total cost of care reduced with variation from 12% to 2% with respect to the median cost. This implies increasing the life span of NICU equipment through appropriate maintenance practices will culminate in reduction of the total cost of care. The bar chart peaks reduced in height from 5 years to 15 years depicting a linear inverse relationship.

Limitations of the Study

Some of the limitations of this study were poor documentation of some medical records which did not enable accurate capture of some resources. In addition, only resources directly involved in the provision of NICU services were included. The other resources involving the hospital administrative staff and non-direct supervisors of the unit were excluded in this study.

Conclusion

In conclusion, preterm birth constitutes 30% of neonatal care admissions in RHB. The bulk of this preterm babies are of LBW. Total annual cost for initial preterm care on admission at newborn care unit was GH₵604.48 ($100.75) per capita. The major component of the total cost was shared cost. The direct medical cost was 40.80%. The ELBW babies, although were of the lowest proportion, had the highest median direct medical cost for medicines and laboratory services. If preterm birth were eliminated, RHB would have saved GH₵212,776.96 ($35,462.83) for other health care services in 2019. Improving efficiency in the use of shared resources would save cost on initial hospital care for preterm babies for other needy areas of the hospital.

Declarations

Author Contribution Statement

WO conceived and designed the study. WO, BA, JA and ASS conducted the study. BA and WO analyzed and interpreted the data. WO, BA, JA and ASS contributed resources, materials, analysis tools or data. All authors read and revised the manuscript and gave final approval of the manuscript.

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Data Availability Statement

The datasets used and analyzed during the current study are available upon reasonable request.

Ethical Approval

Ethical approval was not needed for this study. However, permission was sought from the study site.

Declaration of Interest Statement

The authors declare that they have no competing interest.

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Perception of Consumers, Stakeholders, and Policy Makers on NAFDAC Anti-counterfeit Technologies and Interventions Regarding Counterfeit Drugs in Nigeria

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Abstract

Counterfeiting medicines is a global phenomenon affecting developed and less developed countries. The World Health Organization, in its report, describes counterfeit medicines as becoming "a global public health crisis. This study examines consumers, stakeholders, and policymakers' perceptions of NAFDAC anti-counterfeit technologies and interventions regarding counterfeit drugs in Nigeria. This study uses a qualitative research method to examine consumers, stakeholders, and policymakers' perceptions of NAFDAC anti-counterfeit technologies and interventions regarding counterfeit drugs in Nigeria. Participants were selected using convenience sampling, and data was collected through an online interview. Data were analysed using thematic analysis. Stakeholders emphasised the importance of NAFDAC having a comprehensive anti-counterfeiting strategy and implementing measures such as checking for NAFDAC registration numbers, inspecting packaging, and requesting seller receipts to identify genuine medicines. Policymakers at NAFDAC acknowledge the seriousness of the problem and recognise the roles of stakeholders in implementing anti-counterfeiting interventions. They emphasise the need for effective communication, engagement, and collaboration with healthcare professionals. Consumers express concerns about the accessibility to good quality medicines and the prevalence of substandard and counterfeit drugs. However, consumers also demonstrate a willingness to support NAFDAC's efforts and show a preference for quality medicines, which is a positive indicator for the Nigerian pharmaceutical industry. The findings underscore the importance of continuous efforts to raise awareness and implement effective anti-counterfeiting strategies to safeguard public health and combat the growing threat of fake drugs.

Keywords: *Falsified, Substandard, Counterfeit, Knowledge*

Introduction

Counterfeiting medicines is a global phenomenon affecting both developed and less developed or developing countries [1]. The World Health Organization, in its report, describes counterfeit medicines as becoming "a global public health crisis" [2]. The World Health Organization and International Federation of Pharmaceutical Manufacturers and Associations (WHO; IFPMA), define a counterfeit medicine as "one which is deliberately and fraudulently mislabeled with respect to identity or source. Counterfeiting can apply to both branded and generic products, and counterfeit products may include products with the correct ingredients, wrong ingredients, without active ingredients, with insufficient quantity of an active ingredient or with fake packaging" [3]. In 2011, the WHO member states included counterfeit and substandard medicines under the new term 'substandard

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/spurious /falsely labelled /falsified /counterfeit medical products' (SSFFC) [4]. Substandard medicines are genuine medicines that have failed to pass the quality measurements and standards set for them. These quality tests have been derived from the official pharmacopoeias [5]. Falsified medicines refer to medical products with deliberate or fraudulent misrepresentation of their identity [5].

The threat of counterfeiting medicines is probably growing, particularly in poorer countries with weak regulatory mechanisms and poorly monitored distribution networks. There are a great many anti-counterfeit technologies available to manufacturers and brand owners, ranging from the very simple but effective to the highly sophisticated and extremely secure ones. The majority can be implemented on one or more of the packaging components; however, some features can even be applied at the product level, either by direct marking or by using physical or chemical markers within the formulation. The purpose of an anti-counterfeit feature is primarily to enable the authentication of an item by government, industry investigators, or, ideally, by the wider public. The second function may be to deter anyone considering counterfeiting a product based on the difficulty or cost involved against the likelihood of detection and prosecution.

The efforts of manufacturers to protect and distinguish their products from fake ones fail in the long run as technologies being employed by counterfeiters surpass theirs [6]. Over the years, the Nigerian government has made efforts to introduce a good healthcare delivery system, including providing quality, productive and affordable drugs. Therefore, through the Federal ministry of Health (FMOH), the government put intervention programs and policies in place to meet these needs. That led to the establishment of the National Agency for Food and Drug Administration and Control (NAFDAC) on January 1, 1994, as a parastatal of the federal ministry of health [7], [8], [9]. In rising to the challenge of counterfeiting (including food, medicines, and other health products), NAFDAC is working hard to curb the menace of SFs in conjunction and collaboration with the health regulatory authorities of other countries [7]. Various interventions, including innovative technologies, have been used to solve problems. The previous and current Directors General of NAFDAC has introduced many strategies to fight the anti- counterfeiting war [10]. One major contributing factor to the prevalence of counterfeit medicines in Nigeria is the continued presence of the highly unregulated open drug markets across major cities of Nigeria, where medicines are sold in the open air on street corners, at kiosks, and at stalls.

Materials and Methods

Study Design

This study uses a qualitative research method to obtain in-depth information from respondents. Qualitative methods allow data to be collected using words rather than numbers. It provides a verbal description of an event or experience rather than numerical descriptions. This finding agrees with [11] who found that qualitative methods can be utilised to obtain more detailed information that is difficult to explain quantitatively. This qualitative research was used to unearth in-depth information from stakeholders, policy makers and consumers to know their perception of NAFDAC anti-counterfeit technologies and interventions regarding counterfeit drugs in Nigeria. The research was conducted in four states Lagos, Kano, Anambra and FCT Abuja. Participants were selected using a convenient sampling technique.

Study Location

The selected states for the study are Lagos, Kano, Anambra and FCT Abuja. These states have the highest number of stakeholders due to the highly unregulated open drug markets in these states and the pharmaceutical industry, while most non-governmental organisations and development agencies involved in

pharmaceutical product importation and distribution are located in Abuja.

Lagos is Africa's largest and former capital city in terms of population, with about 15.9 million people living there. It is also the 4th largest economy in Africa [12]. It is in South-Western Nigeria. It is bounded on the west by the Republic of Benin, to the North and East by Ogun state, with the Atlantic Ocean providing a coastline on the south. The state has a territorial land area of 351,861 hectares and is made of five administrative divisions: Ikeja, Badagry, Ikorodu, Lagos (Eko), and Epe. The divisions are divided into 20 local governments and 37 Local Council Development Areas, respectively. The Lagos popular open drug market is in the state's Idumota (Lagos Island) area [12].

Kano state, located in the northern region of Nigeria, was created in 1967 and is the most populous in the country according to the national census done in 2006, with an estimated 20,000,000 in the year 2020. The state's capital and largest city is Kano, Nigeria's second most populous city after Lagos. Kano state borders Katsina State to the northwest, Jigawa state to the northeast, Bauchi state to the southeast, and Kaduna state to the southwest [13]. The Hausa and Fulani make up most of the Kano state's population. The Hausa language is the dominant language in the state, as it is in most of northern Nigeria. Kano consists of forty-four Local Government Areas [14].

Anambra state is in the southeastern region of the country. It was created on August 27th,1991. It is bounded by Delta state to the west, Imo state to the south, Enugu state to the East and Kogi state to the North. There are over 9 million residents in the state, based on the 2022 census report. There are 21 local government areas, and the residents are primarily Igbo, with the Igbo language serving as the lingua franca throughout the state.

FCT, Abuja is the capital city of Nigeria, in the middle of the country. It rises behind the presidential complex, which houses the residence and offices of the Nigerian president in the three-Armed zone on the city's eastern edge. The state was created in 1976 and is located in the Northern confluence of the Niger and Benue rivers [12]. It is bordered by the states of Niger to the west and northwest, Kaduna to the northeast, Nasarawa to the east and south, and Kogi to the southwest. It has a population of about 3,464,123 according to a 2022 population estimate [15]. Abuja is known for being one of the few purpose-built capital cities in Africa.

Study Population

The study population comprised NAFDAC stakeholders who are dealers in pharmaceutical products or Marketing Authorization Holders (MAHs) of medicines and Consumers. The states are Lagos, Kano, Anambra, and Federal capital Territory (FCT), with the highest number of stakeholders.

Sampling Techniques

This Qualitative study was conducted with a convenient sampling procedure, a non-probability sampling approach to identify the relevant officers, stakeholders, and consumers with adequate knowledge of the research topic and select.

Research Instruments for Data Collection

Qualitative interview guides (unstructured questionnaires) were designed and comprised of open-ended questions. The in-depth Qualitative interview guides were used, including the types of questions to be asked, additional probes, and which personnel should be interviewed. Three Separate Interview guides were designed.

1. Policy maker or National Regulatory Authority,
2. Stakeholders and,
3. Consumers.

These guides were put on an online JotForm Application for ease of collection of responses (JotForm App was used to collect the responses online for the in-depth interview. JotForm enables one to create online forms, collect responses directly in emails and create fillable PDF forms.). The forms were distributed to the

three groups, as stated above. One group representing the Policy maker or Regulatory Authority had five respondents that participated. They were selected purposefully from (Drug Evaluation & Research, Lagos; Pharmacovigilance/Post Marketing Surveillance, Abuja; Ports Inspection, Anambra; State office Kano and Drug Registration &Regulatory, Lagos). The Second group is Stakeholders, with five participants from the various professional sectors (ACPN; NIROPHARM; PMG-MAN; AHAP & NGO). The third group represents the general consumers; five participants were drawn from the study centres, with two coming from Lagos.

Data Analysis

The collected data was analysed using thematic analysis, where patterns and themes were identified, including categories. The study findings were presented through a comprehensive report, including direct participant quotes and a discussion of the identified themes and patterns. The report also included recommendations given by respondents on ways to reduce the rate of fake and substandard drugs in Nigeria.

Ethical Consideration

To ensure the acceptability of this study, ethical approval was sought and obtained from the Federal Government Institutional Review Board and the National Health Research Ethics Committee of the National Institute of Medical Research affiliated with the Federal Ministry of Health. In addition, verbal and written consents were obtained from respondents before the commencement of administering questions and personal identifiers were removed from summary data. Also, data collected will be securely stored, and names of individuals were excluded in order not to identify the individuals as well as families or groups.

Results

This section is a qualitative analysis of stakeholders' opinions on preventing counterfeit medicines alongside the NAFDAC. The stakeholders were asked questions about anti-counterfeiting strategies and measures to fight counterfeit medicines, factors they consider before selling or recommending medicines to clients, and their opinions on stakeholders' groups that should work with NAFDAC to prevent counterfeit medicines. The responses provided were transcribed, and this report analyses and summarises the stakeholders' views.

NAFDAC's Anti-Counterfeiting Strategies

When asked if NAFDAC should have anti-counterfeiting strategies or approaches to fight counterfeit medicine, stakeholders overwhelmingly agreed that NAFDAC should have such strategies. One stakeholder said that NAFDAC should increase its staffing to cover various populists. Another stakeholder said that NAFDAC is better positioned than the general public and medical professionals to identify counterfeit medicines and end the problem. They also suggested that NAFDAC should have an anti-counterfeiting strategy to assist them in fighting falsified medicines.

Stakeholders' Groups Working to Prevent Counterfeit Medicines

When asked who they think is the stakeholders' group who should be working to prevent counterfeit medicines alongside NAFDAC, stakeholders agreed that the entire public should work with the agency to prevent counterfeit medicines. One stakeholder said, *"Everybody is a stakeholder issue, collaborates with the agency in fighting because if you do not play that role, you endanger your life or the life of your friends or lists every night. Every person should be conscious and first assist in the fighting."*

Factors Considered Before Selling or Recommending Medicines

Stakeholders considered several factors before selling or recommending medicines to their clients. Quality and socioeconomic class

were the most important factors. One stakeholder said, *"Well, we not only distribute medicines and now that number because sometimes we have a medical alternative. You don't. Some medicines don't have alternatives and are registered; you need to save the patient. So, what do you do? Of course, quality is a big issue, especially economic."*

How to Identify Good Quality Medicines

When asked how to know that a medicine is good quality, stakeholders responded differently. One stakeholder said, *"We consider whether they're registered medicines or not, whether they now have a NAFDAC number or not."* Another stakeholder suggested that buyers should send codes to verify the products they are buying, especially when in doubt.

Selling/Distributing Medicines with NAFDAC Number

Stakeholders were asked if they only sell/distribute medicines with NAFDAC numbers. Some stakeholders responded that they do not only sell/distribute medicines with NAFDAC numbers. One stakeholder said, "I think that is identifying yourselves buying from…knowledge distributors. Stuff to consider." However, some stakeholders said they only sell/distribute medicines with NAFDAC numbers because it shows that NAFDAC has approved the medicines and are of good quality.

Respondents were asked to describe the roles of the stakeholders in developing the various anti-counterfeiting strategies. They were also asked what they think of the NAFDAC initiatives against substandard and falsified drugs and to mention those initiatives. They were asked to mention what could be done to improve it and to name what should be involved in developing interventions or strategies.

This section analyses stakeholders' responses in a qualitative interview to gather insights on the roles of stakeholders in the development of various anti-counterfeiting strategies and the initiatives taken by the NAFDAC against substandard and falsified drugs in Nigeria. The interview questions focused on stakeholder roles, NAFDAC's initiatives, the effectiveness of the strategies, and ways to improve them. The following themes were developed from the responses:

Stakeholders' Roles

The stakeholders in developing anti-counterfeiting strategies were identified as professional bodies, trade groups, NGOs, universities, and everyone who could send proposals to NAFDAC. However, the primary agency for anti-counterfeiting strategies was acknowledged to be NAFDAC. The stakeholders should be involved in the conception of the strategies to give feedback and help the agency to draw up plans. One stakeholder noted that the company producing the products should be carried along in developing the strategies because they have so much to protect and can be the first to know when their products are being counterfeited or falsified.

NAFDAC's Initiatives

The stakeholders recognized the initiatives NAFDAC took in the fight against substandard and falsified drugs. The initiatives mentioned were capacity building, facility upgrades, staff training, and Mobile Authentication service or schemes (the MAS). However, they noted a need to research how effective the initiatives are, particularly in the marketplace and review the research to adjust the stages of the strategies.

Effectiveness and Ways to Improve Strategies

The effectiveness of the strategies could not be accurately measured because research has not been done on them. Stakeholders suggested that there is a need for research to be done on strategies to check their effectiveness. They also emphasised the need to examine the entire distribution chain, particularly in Nigeria, where distribution is the biggest challenge. Stakeholders suggested that plugging the

leakages in the distribution network would make the circulation of substandard and falsified drugs unattractive.

What is the general role of NAFDAC stakeholders in implementing anti-counterfeiting interventions? What are the expected challenges in the implementation? How should these roles be communicated to stakeholders? In your opinion, how could the roles be made to improve? · What are the barriers the stakeholders could face? · How do you think the agency has taken the role into account in the intervention implementation?

The stakeholders were asked about their role in implementing anti-counterfeiting interventions, the expected challenges, and how these roles could be communicated and improved upon. The responses given by the stakeholders provide insights into the expectations and challenges of their role in the fight against counterfeit drugs in Nigeria.

The stakeholders supported NAFDAC's efforts in combating counterfeit drugs in the country. They emphasized the need for documentation by all stakeholders in the supply chain, including drug disposal, purchases, and sales. This is to enable easy tracing of the movement of the product in case of detection of counterfeit drugs. The community pharmacies were specifically expected to report to NAFDAC anytime they suspected a counterfeit product, or something was wrong. However, the stakeholders noted some challenges in implementing these interventions, with the country's business environment being one of them. They observed that people are too engrossed in business to pay attention to small details, leading to missing out on counterfeit drugs. There was a call for regular stakeholder meetings to create awareness and educate stakeholders on their responsibilities in combating counterfeit drugs.

The stakeholders also suggested that advocacy and awareness creation could improve the roles of the stakeholders in the fight against counterfeit drugs. They noted that if different stakeholders are made aware of the nation's trouble with counterfeit drugs, they may become more active in reporting to NAFDAC. Social media was identified as a useful tool for communicating and reaching out to as many stakeholders as possible. They acknowledged NAFDAC's primary role in reporting cases of counterfeit drugs and emphasised the need for a flow of reports to the agency to enable effective intervention. They also recognised the challenges posed by the innovativeness of counterfeiters in changing tactics to evade detection. The stakeholders called for law enforcement agencies' support in addressing reported counterfeit drug cases.

The roles of Pharmacists and Healthcare providers in anti-counterfeiting interventions How to communicate these roles to pharmacists and healthcare providers, and how has NAFDAC considered these roles in the strategy.

The study also investigated the specific roles of pharmacists and healthcare providers in anti-counterfeiting interventions and how NAFDAC has incorporated these roles into its strategy. The responses of stakeholders were analysed to understand their perceptions of these issues. The results showed that pharmacists and healthcare providers play a critical role in stopping the circulation of counterfeit medicine and ensuring that patients have access to the right medicines.

One respondent said, *"pharmacists play more or less the role of a goalkeeper"* in stopping counterfeit medicine from getting to the patient. This role applies to other health workers who may hand the medicine to the final patient for consulting. Therefore, it is important that NAFDAC directly communicates with these stakeholders to ensure they know their roles and how to communicate them effectively. The stakeholders emphasised the importance of NAFDAC going into the space of social media and various means of communication to communicate effectively with people. They also suggested that NAFDAC needs a unit to handle this aspect of its strategy. However, one respondent expressed uncertainty about whether

NAFDAC has considered these stakeholders but mentioned constant interaction between NAFDAC and pharmacists.

The stakeholders suggested that other healthcare providers should be put under the umbrella of NAFDAC's anti-counterfeiting interventions, and workshops and symposia should be organised for pharmacists and healthcare professionals both in the community setting and hospital practice to carry them along and let them know some of these strategies and see how they can help and how they can assist.

Some notable stakeholder responses include: *"It is important that NAFDAC directly communicates with these stakeholders and ensure that they know their communication roles." "NAFDAC needs to have a unit to handle that goes into that space to communicate to people." "The pharmacist and healthcare providers should be encouraged to depart freely. Suspected. Contact." "There should be workshops and symposia organised for pharmacists and healthcare professionals both in the Community setting hospital practice to, you know, carry them along and let them know some of these strategies and see how they can help and assist."*

Do you have any comments for or against NAFDAC anti-counterfeit interventions?

This section shows the responses obtained from stakeholders at NAFDAC concerning their comments for or against NAFDAC anti-counterfeit interventions. The analysis highlights specific comments by the stakeholders and provides insights into their views on NAFDAC anti-counterfeit interventions.

Most stakeholders interviewed expressed their support for NAFDAC anti-counterfeit interventions. They noted that it is essential for NAFDAC to step up its efforts to combat counterfeit products, especially given the high danger posed by counterfeit products to public health and safety. One stakeholder remarked, *"we cannot afford to go to bed when we know that the danger of counterfeiting remains very high, especially at this time."* They further noted that the decline in the value of the Naira has led to an increase in counterfeit products' prices, making it crucial for NAFDAC to deploy full vigilance to combat the menace of counterfeit products.

However, some stakeholders raised concerns about the effectiveness of NAFDAC's anti-counterfeit interventions. One stakeholder noted that TruSscan, a tool used to detect counterfeit products, has been reduced significantly, and they hardly hear about it again. Another stakeholder also emphasised the need for vigilance to be fully deployed in combating counterfeit products, stating that *"there is room for improvement." "***I mean, we cannot afford to go to bed when we know that the danger of counterfeiting remains very high, especially at this time."**

Generally, assess the effectiveness of NAFDAC's strategies to fight fake drugs in Nigeria.

In response to the question about the effectiveness of NAFDAC's strategies to fight fake drugs in Nigeria, the stakeholders had mixed opinions. Some respondents thought that NAFDAC's efforts were commendable, given the severity of the problem in the past. One respondent stated, *"NAFDAC deserves commendation.* However, some respondents expressed their reservations about the current situation. One stakeholder said, *"My fear is just that things appear to be quiet now, and they need to step up once again."* Another respondent said, *"Good on paper, but not properly or fully implemented. That's just my assessment."*

Furthermore, some respondents believe that more needs to be done to combat the issue of fake drugs in Nigeria. One stakeholder stated, *"In the fight against counterfeits and fake, falsified products, no stone should be left unturned. All hands must be on deck. We are talking about life here."* Another stakeholder likened the issue to insurgency and said, *"The fight should be fully engaged."*

How do you think the agency can evaluate the interventions? What should be the method of evaluating them? What could the stakeholders do to help in such an evaluation?

The stakeholders were asked how they think NAFDAC can evaluate interventions and what method should be used. The stakeholders gave some insightful responses. One stakeholder suggested that research should be conducted on the effectiveness of intervention strategies. Another stakeholder agreed that the agency should approach academic colleagues to help with the research. This research would guide the agency on the interventions that have been done and their results. This shows that stakeholders recognise the importance of data in evaluating interventions.

However, another stakeholder raised concerns about the lack of data in the country. They noted that the lack of data makes it difficult to evaluate interventions. They also suggested that NAFDAC should keep records of ongoing interventions. This would enable them to refer to the records and evaluate the interventions. They emphasised the importance of keeping records as long as ongoing interventions exist. Another stakeholder suggested that every piece of information is important, whether it worked or not. They emphasised that evaluations should be done on both successful and unsuccessful interventions. This would provide valuable insights into what works and what does not work. Overall, the stakeholders agree that data is essential in evaluating interventions. They suggest that the agency conduct research and keep records of ongoing interventions. They also suggest that evaluations should be done on successful and unsuccessful interventions.

Some responses are: *"I think now that we need to research the effectiveness of intervention strategies." "As long as ongoing interventions exist, we can always refer to the records and do our process." "Every piece of information is important, but we must evaluate them."*

What would you like to add or offer towards implementing strategies to fight the counterfeiting of pharmaceuticals?

The stakeholders expressed concerns about the current state of the economy in Nigeria and how it has affected the fight against counterfeit pharmaceuticals. They emphasised the need for NAFDAC to step up its efforts in curbing the activities of counterfeiters before they cause further harm to the population. One of the stakeholders suggested that NAFDAC should consider implementing a system where individual companies must bring up their codes to be added to the NAFDAC number. This will help ease the identification of falsified products that carry fake numbers. The stakeholder noted that if a company identifies a product without that code, it is obvious that the product is fake, which will help curb the activities of counterfeiters. Moreover, the stakeholders suggested more private-sector participation in the fight against counterfeiting. This will help strengthen NAFDAC's efforts and ensure the fight against counterfeiters is sustained.

Policymaker's Qualitative Interview

What do you think of accessibility to good quality medicines in Nigeria based on your perception as a regulatory Agency? How can you describe good quality medicine? Have you heard of any of these? Counterfeit medicine/ Substandard medicine/Adulterated medicine/ degraded medicine? Can you define them from your point of view? Do you think that these are a problem in Nigeria? Do you think the problem is worse or better than in the past? …. Why has the situation changed? Have you encountered a medicine which you think is of bad quality? How did you discover this? How were the cases handled? (Prevention from going back into the distribution chain, contacting companies whose products are involved before the destruction of the medicines) …. Which group of medicines do you think are counterfeited most?

The policymakers were interviewed on their perception of the accessibility of good quality medicines in Nigeria and the NAFDAC's efforts in combating the menace of counterfeit, substandard, adulterated, and degraded medicines. The major findings from their responses are presented as follows:

Accessibility to Good Quality Medicines in Nigeria

The policymakers admitted that access to good quality medicines in Nigeria has greatly improved due to the NAFDAC's efforts in combating substandard and falsified medicines in the country. This implies that the regulatory agency has put measures in place to ensure that only good quality medicines that are fit for the intended use and safe for patients are made available to the public.

Definition of Good Quality Medicines

The policymakers defined good quality medicines as fit for the intended use and safe for patients. They emphasised the importance of patient safety in defining good quality medicines.

Counterfeit, Substandard, Adulterated, and Degraded Medicines

The policymakers admitted that they have heard of counterfeit, substandard, adulterated, and degraded medicines. They defined each of these terms from their point of view. Substandard medicines were defined as those that do not meet the required quantity to meet the specification, even though they come from a reputable manufacturer. Adulterated medicines were defined as products that do not carry the required active ingredients or are not manufactured according to good manufacturing practices. Degraded medicines are defined as medicines that lose their potency due to improper storage. Counterfeit medicines are defined as medicines that have been falsified to deceive patients and healthcare providers.

The Problem of Counterfeit, Substandard, Adulterated, and Degraded Medicines in Nigeria

The policymakers admitted that the problem of counterfeit, substandard, adulterated, and degraded medicines exist in Nigeria. However, they claimed that the agency had worked greatly to combat this menace to a greater level.

Encountering Medicines of Bad Quality and Handling of Such Cases

The policymakers admitted they had encountered medicines of bad quality. They did not provide any specific information about the medicines they encountered. However, they stated that the agency had implemented measures to prevent such medicines from returning to the distribution chain. They also stated that the agency contacts companies whose products are involved before the medicines are destroyed.

Group of Medicines Most Counterfeited

The policymakers provided no information about the medicines most counterfeited in Nigeria. Therefore, it is difficult to ascertain the extent of the problem of counterfeit medicines in Nigeria.

What are the major challenges to fighting fake medicines in Nigeria? How do you think these can be best tackled (your suggestions)

One major challenge the respondents identified was the lack of government support and willpower to combat fake medicines. According to one interviewee, *"the government will come with very strong policies...policies that will be given to agencies to enforce."* Another interviewee also stressed the need for the *"government to see the urgency in assisting and supply[ing] all the necessary tools to fight this."* These responses imply a need for more action from the government to combat the issue of fake medicines in Nigeria.

Another challenge identified was the chaotic distribution chain, making tracking products and controlling counterfeit medicines difficult. One

interviewee suggested that the national drug distribution guidelines should be fully implemented to address this challenge. On the other hand, another suggested the traceability initiative being pursued by the Ministry of Health and NAFDAC as another way of ensuring control over the drugs moving in the supply chain.

Sensitisation was also identified as a key factor in tackling the problem of fake medicines. The interviewees suggested sensitisation should be done through the media, papers, radio, and social media to spread information about the dangers of fake medicines.

Punitive measures were also necessary to deter drug peddlers from circulating substandard medicines. According to one interviewee, "*until there should be punitive measures, strong ones...a lot of these drug peddlers have taken the whole society now."* Another interviewee stressed the need for "*strong primitive punitive measures and a very strong sensitisation."*

What do you think of the NAFDAC initiatives against substandard and falsified drugs? What are those initiatives? What do you think could be done to make it better?

The policymakers identified several initiatives to tackle the menace of substandard and falsified medicines. These include using TruScan for on-the-spot checks of products, mini-labs for testing identification and labelling evaluation, using MAS for antibiotics and antimalarials, and implementing a pharmaceutical traceability strategy. The officials noted that these initiatives were laudable but suggested the need for more post-marketing surveillance activities to improve their effectiveness.

Regarding NAFDAC's initiatives against substandard and falsified drugs, the policymakers outlined several steps to prevent, detect, and respond to these products. The measures include good distribution practices, a surveillance system, sensitisation, and open destruction of substandard and falsified drugs. The officials also highlighted collaborations with other countries and agencies, such as the Nigerian customs service, police, and immigration, as key strategies to combat the problem.

What should be involved in the development of interventions?

The policymakers highlighted several important factors that should be involved in developing interventions to address the challenges of counterfeiting and substandard medicines. One of the key themes that emerged was the need for a thorough assessment of the issues that contribute to counterfeiting and substandard medicines. This would involve identifying the major challenges and outlining proposed interventions. They emphasised the importance of engaging all relevant stakeholders, including regulatory agencies, the government, the police, and the community.

Sensitisation was also highlighted as a crucial factor in the development of interventions. Policymakers emphasised the need for stakeholders to be committed to the process and to work collaboratively to close the gap between regulators and the regulated. This would involve sharing intelligence and employing the necessary interventions to solve the challenges of counterfeiting and substandard medicines.

Whistleblowers were also mentioned as a critical factor in the development of interventions. Policymakers suggested that whistleblowers should be rewarded appropriately for providing information that could help curb the production and distribution of fake drugs. Additionally, they emphasised the need for stiffening laws to discourage individuals from producing and distributing substandard and falsified medicines.

Some of the responses that stood out include: *"Interventions are necessary. The major challenges should be properly outlined, and then the proposed interventions should also be outlined."* This response highlights the need for a systematic approach to developing interventions. Another noteworthy response was, *"If everyone is involved in the process, we*

all own the drug distribution process; the challenge of fake drugs will be curtailed to a large extent." This response emphasises the importance of engaging all stakeholders to address the challenges of counterfeiting and substandard medicines.

What do you think are the roles of NAFDAC stakeholders in implementing anti-counterfeiting interventions? How should these roles be communicated to stakeholders? In your opinion, how could the roles be made to improve? How do you think the NAFDAC has taken the role into account in the implementation of interventions?

The policymakers pointed out several stakeholders in implementing anti-counterfeiting interventions, such as manufacturers, importers, retailers, and sectoral groups. They highlighted that stakeholders' primary role is ensuring compliance with regulatory requirements and supporting NAFDAC in implementing its interventions. These roles can be communicated through stakeholder engagements, NAFDAC's website, and communication with sectoral groups. The policymakers noted that NAFDAC had considered the stakeholders' roles in implementing interventions by carrying out stakeholder engagements before implementing interventions. However, they suggested that policies not favourable to pharmaceutical businesses, especially those related to the cost of pharmaceutical products, must be amended to make it easier for stakeholders to implement these interventions.

The policymakers emphasised the importance of stakeholder engagement in NAFDAC's policies and decision-making, noting that stakeholders must be sensitised, educated, and involved in the fight against counterfeiting. They stated that stakeholders' collaboration is essential in regulating and fighting counterfeiting since NAFDAC cannot do it alone. They also emphasised the need for self-regulation on the part of stakeholders, and they suggested that stakeholders should appoint qualified persons for pharmacovigilance to handle all matters related to drugs and drug distribution. They also recommended that every stakeholder have a post-marketing unit responsible for monitoring their product to avoid counterfeiting, adulteration, and other fraudulent practices.

What do you think of implementing the various anti-counterfeiting strategies by NAFDAC? What is the best way to implement anti-counterfeiting strategies? What effort is put in place to ensure the strategies are properly implemented?

The policymakers had varying opinions on the implementation of the anti-counterfeiting strategies by NAFDAC. One of the policymakers commended the agency for the difference in financing and counterfeiting strategies implemented but suggested that more hands are needed to carry out these strategies effectively. "*Many locations are known for selling counterfeited and substandard drugs. NAFDAC staff are not able to reach there because we don't have enough hands in post-marketing surveillance, so if resources are made available in terms of human and financial resources, we will be able to implement these strategies better and be able to get the benefits of it,"* the policymaker said.

Another policymaker believed that implementing the anti-counterfeiting strategies was still not strong enough as stakeholders were not cooperating with NAFDAC. *"The challenge we are having is to organise workshops and training for all these categories or drug distributors; this will go a long way. Also, having interviews should be one of the intervening methods NAFDAC adopt that will help. And then these strategies, again, as I said, still boils back to workshop sensitisation, stakeholders' engagement with all the drug distributors, a lot of them, if you look at it, we have let loose our regulatory functions to no regulators. Thus, for us to fight this battle, we cannot fight it alone. We must engage; that is very important,"* the policymaker explained.

One of the policymakers suggested that collaboration and sensitisation were key regarding the best way to implement the anti-counterfeiting strategies. *"Um, like I said, sensitisation, collaboration is key, and you know when we collaborate, and then we organise workshop training for them from time to time," the policymaker said.* Another policymaker believed that traceability features in every medicine would go a long way in helping to implement anti-counterfeiting strategies. *"With traceability features in every medicine, it will go a long way to help the various anti-counterfeiting strategies implemented by the agency,"* the policymaker said.

In terms of efforts to ensure proper implementation of the anti-counterfeiting strategies, one of the policymakers said NAFDAC had deployed cutting-edge technology such as TruScan and other scanners for surveillance. "*You know where we use TruScan; we use another scanner (RS scanner). And you know, the devices that we could use, you know, on surveillance and you can test the product there and then and products that are failing., you know you take note of them and probably place them on hold and continue and take samples to the laboratory for confirmation,"* the policymaker said. The same policymaker suggested that products found to be counterfeit should be recalled or moved out of circulation.

Do you have any comments for or against NAFDAC anti-counterfeit interventions? State them.

The policymakers were asked for their comments on the agency's anti-counterfeit interventions, and their responses highlighted some of the challenges and successes of these efforts. One of the main challenges mentioned was the lack of sustainability of these interventions, with some policies not being continued by new management or lacking funding. Additionally, the loss of experienced personnel without a succession plan was noted as a hindrance to anti-counterfeit efforts.

Despite these challenges, the policymakers did not have any negative comments on any of the specific interventions implemented by NAFDAC. They emphasised the need for various measures to address counterfeit products, including awareness creation, consumer reporting of therapeutic failures, and traceability of products along the distribution chain. The mobile authentication system and traceability efforts were highlighted as effective measures for combating counterfeit products.

Generally, assess the effectiveness of the strategies NAFDAC is using to fight fake drugs in Nigeria.

The policymakers acknowledged the effectiveness of the strategies in place but highlighted the need for better implementation and collaboration from all stakeholders to achieve better results. When asked to assess the effectiveness of the strategies used to fight fake drugs in Nigeria, the policymakers agreed that the measures put in place by NAFDAC were laudable. However, they emphasised the need for better implementation to achieve better results.

One of the policymakers said, *"we have achieved a lot but still have a lot to do."* He highlighted the need for practitioners, especially those in the pharmaceutical industry, to be more proactive in combating fake drugs by learning to say no to products that have not undergone proper checking before being displayed on shelves. He suggested that practitioners should be more involved in the fight against fake drugs by ensuring that they are sure of the products they accept and that they have a certificate of analysis.

Another policymaker noted that the GS1 track and trace or traceability program, which involves scanning products for authentication before they are put on the shelf, could save much time and effort in the fight against fake drugs. He highlighted the importance of collaboration between NAFDAC, practitioners, and consumers, noting that everyone must work together to defeat the menace of fake drugs.

The policymakers also discussed the risk categorisation of certain products, such as anti-malaria drugs, antibiotics, and infusions. They explained that the survey results on these products showed the percentage of counterfeits in circulation. The policymakers noted that the percentage of counterfeits was under 10% in the last survey, and they hoped to reduce it even further.

Overall, the policymakers agreed that the strategies being used by NAFDAC to combat fake drugs in Nigeria were effective. However, they emphasised the need for better implementation and stakeholder collaboration to achieve better results. They called for practitioners to be more proactive in checking the products they accept, for consumers to be more vigilant in purchasing drugs, and for everyone to work together to defeat the menace of fake drugs in Nigeria.

How do you think the agency can evaluate the interventions? What should be the method of evaluating them?

In this section, policymakers were asked how NAFDAC can evaluate its interventions and what method should be used. The responses provide insight into the agency's approach to evaluating interventions and highlight improvement areas.

One of the key responses was the need to survey to determine the effectiveness of the interventions. The policymakers acknowledged that NAFDAC has not been carrying out surveys to evaluate its interventions, making it difficult to determine the impact of the interventions. They suggested that surveys could generate data to help re-strategize and determine whether the interventions work. The policymakers also highlighted the importance of having key performance indicators (KPIs) to evaluate the effectiveness of the interventions. They noted that NAFDAC had outlined KPIs for itself, which can be used to determine whether the agency is achieving its objectives. They also suggested that collaborating with other organisations, such as the World Health Organization (WHO), could help to develop more effective evaluation methods.

Regarding the evaluation method, the policymakers suggested that NAFDAC should look at all the measures in place and assess how well they are being implemented. They emphasised the need to evaluate measures periodically and objectively to determine whether the agency is getting it right or needs to improve. Overall, the responses from the policymakers suggest that while NAFDAC has implemented interventions to combat counterfeit drugs, it is necessary to evaluate their effectiveness systematically. This will require the agency to carry out surveys and develop KPIs to assess the impact of the interventions. The policymakers also emphasised the need for collaboration with other organisations to develop more effective evaluation methods.

Consumers' Qualitative Interview

As a consumer, what do you think of accessibility to good quality medicines in Nigeria? How can you describe good quality medicine?

The consumers' responses in the interview indicate that the accessibility to good quality medicines in Nigeria is a major concern. They noted that they are used to purchasing drugs from local chemists, which often results in them obtaining substandard drugs. This suggests a lack of regulation and quality control in the local chemists, which risks consumers' health. The participants further stated that good quality medicine meets all the applicable quality standards of how a drug or medication should be. This response highlights the need for quality control in the production and distribution of medicines in Nigeria. Medicines must meet the required quality standards before making them available to the public.

One of the participants also expressed a fear of fake and counterfeit drugs, a common problem in Nigeria. The participant only buys drugs from pharmacies, not chemists, to address this problem. This suggests a lack of trust in the

local chemists, possibly due to the prevalence of substandard and counterfeit drugs.

Some of the quotes from the responses are: *"We are only used to the local chemists around us, and I would say we do not sometimes get substandard drugs." "I will describe good quality medicine as one that meets all the applicable quality standards of how a drug or medication should be." "And because I fear fake and counterfeit drugs, I only buy from pharmacies." "Pharmacies, not chemists. Not patents. Drop it for me."*

Have you heard of fake/Counterfeit drugs before? (a) Do you think that this is a problem in Nigeria? (b) Do you think the problem is worse or better than in the past? …. Why do you think so?

In this section, drug/medicine consumers were asked about their awareness of counterfeit drugs and their opinions on whether Nigeria's problem has worsened or improved. All participants in the study were aware of the existence of counterfeit drugs in Nigeria, with most of them considering it to be a significant problem. One participant said, *"It's a big problem in Nigeria getting counterfeit drugs,"* while another said, *"Yes, I've heard of fake drugs, and it's a problem in Nigeria because millions of people are at risk of illnesses or even death from poor quality medications."* The respondents unanimously agreed that the Nigerian government needs to take strong measures to tackle the issue.

The responses were mixed when asked whether the problem of counterfeit drugs has worsened or improved over time. One participant said the problem is getting worse every day, while another said it is slightly better in Nigeria due to the stiff scrutiny of the qualifications and conformity of dealers. One respondent mentioned that the problem is worse now because some pharmacies sell inactive drugs, especially malaria drugs. Another respondent stated that the problem is better now than before, thanks to standard practices that help curb unsafe practices.

Some of the responses quoted in the report include: *"It is a big problem in Nigeria getting counterfeit drugs." "Yes, I've heard of fake drugs, and it's a problem in Nigeria because millions of people are at risk of illnesses or even death from poor-quality medications." "The problem is getting worse every day." "The problem is slightly better in Nigeria due to the stiff scrutiny of the qualifications and conformity of dealers." "Sometimes you go to pharmacies to buy drugs, and you find them inactive, especially malaria drugs." "With standard practice, this helps Nigerians to attempt at curbing unsafe practices."*

How can you know that medicine is of good quality? ……. Before taking ……after taking it …are you concerned about the quality of your medicines?

When respondents were asked about their concerns regarding the quality of medicines they take and how they ensure they are good quality, the responses revealed several ways to determine the quality of their medicines. The first way is by inspecting the medicine before taking it. This involves checking if the seal is broken or tampered with. One interviewee mentioned that they do a visual inspection of the medicine. They also check the medicine's price, with some noting that more expensive medicines are usually of better quality.

The respondents also mentioned that they check the authenticity of the medicine by scratching off a code on the pack and sending it by SMS. This helps to confirm that the medicine is not counterfeit. One interviewee noted that Nigeria is *a "huge crime scene,"* It is challenging to know if the medicine is of good quality, even with the scratch code.

After taking medicine, the interviewees mentioned checking for unexpected side effects. They also look out for the effectiveness of the medicine and if it yields the expected results. One interviewee mentioned that they prefer to buy medicines made in Nigeria, believing they are good quality.

Some responses include: "*Most drug-producing companies these days do put some tags at the back...that makes us know every drug is substandard if it's counterfeit or original." "I try to check if the seal is broken or has been tampered with." "I usually scratch off a code or a number on the pack; I scratch it off and then send the code by SMS." "There is no way to know that one is taking good quality drugs except...drugs that you import yourself or that you maybe you travelled and come back with it?" "I also prefer to buy made-in-Nigeria drugs...believe those people."*

Do you try to know if your medicines are fake or original? (If so, what do you do?)

In this question, the participants were asked if they made any effort to know if their medicines were fake or original. Most participants answered in the affirmative, indicating that they try to ensure the authenticity of their medicines. One participant said they check the drug's manufacturer to ensure it is from the right source. Another participant mentioned that they checked for the expiry date of the drugs before consuming them. This is a common practice amongst drug consumers, as expired drugs can harm health.

Some participants also mentioned checking for unusual things, such as broken seals, which could indicate tampering. One participant mentioned using a scratch card to verify the drug's authenticity. Interestingly, one participant stated that they prefer to buy drugs made in Nigeria, as they believe those produced in the country maintain standards like electrical cables. This shows that the perception of the quality of locally made drugs is increasing, and consumers are willing to trust products made in Nigeria.

Some responses include: *"To check if it is from the right drug manufacturer." "I usually check for expiry dates." "I also check for unusual things, like maybe if the seal has been broken." "I prefer to buy drugs that are made in Nigeria." "Nigeria has the best quality cables for electrical application."*

What determines the brand/type of medicine that you purchase? …on prescription …Recommendation (who) …Cost …Brand/generic. country of manufacture (any preference of where your medicines should come from?) …others

This section presents a thematic analysis of the responses on the factors determining the brand/type of medicine consumers purchase.

When asked what determines the brand/type of medicine they purchase, the participants mentioned several factors. Most participants stated that they relied on recommendations from either the doctor who prescribed the medicine or the pharmacist at the point of purchase. One participant said, *"Mainly, it's recommendations. I maybe ask the doctor Who prescribed the better medicine. Alternatively, I can ask the pharmacist to recommend a better brand when I get to the pharmacy. So mainly based on recommendations for me."* This suggests that the opinion of medical professionals is crucial in determining the brand/type of medicine the participants purchase.

Another factor mentioned by the participants was the country of manufacture. One participant said, *"One of them is where it is manufactured. If it is made in Nigeria, I will go for it."* This suggests that some participants preferred medicines manufactured in their home country, possibly due to a perception of better quality or patriotism. Additionally, one participant said they avoided medicines manufactured in certain countries, saying, *"It is not India, China, I mean."* This suggests that some participants had reservations about the quality of medicines from certain countries. The cost was another factor mentioned by the participants. One participant said that cost is also a factor. I might go for a cheaper alternative if it is too expensive." This suggests that the medicine's price influences some participants' purchasing decisions.

Finally, some participants mentioned the brand/generic of the medicine as a determining factor. One participant said, "Like some brands? I believe that cannot easily be fixed, so the

country of origin is also important." This suggests that some participants preferred certain brands of medicine.

Are you aware of any initiative by NAFDAC against fake medicines?

The responses from the participants revealed that there is a low level of awareness of any initiatives by NAFDAC against fake medicines. Some participants stated they were unaware of any initiatives, while others mentioned that they had seen or heard something about NAFDAC's efforts to track down warehouses where fake drugs are kept. However, they were not sure of the effectiveness of these initiatives.

One participant said NAFDAC is not doing much publicity to enlighten consumers about their efforts to combat fake drugs. The lack of awareness of these initiatives may be attributed to NAFDAC's inadequate dissemination of information. Participants who were aware of NAFDAC's efforts expressed uncertainty about the effectiveness of these initiatives in curbing the menace of fake drugs in the country.

Some of the responses from the participants are presented here: *"Not really. They are not doing much in publicity to enlighten consumers." "I'm not aware of any." "But I think I have seen something like that on TV." "Well, I don't know if they have a new initiative against fake drugs, unlike what we know that they check drugs and food and whatever."*

Among all these initiatives, which ones do you know? List some. ...would you be prepared to pay more for your medicines if their cost increases as a result? … Overall, how satisfied are you with the service by NAFDAC? (For only those you have used).

This section analyses the responses obtained from the participants and provides insights into their knowledge of NAFDAC's initiatives and their perception of the agency's service delivery.

Knowledge of NAFDAC's Initiatives

The respondents' knowledge of NAFDAC's initiatives was limited, with only one participant mentioning the tracking initiative. Another respondent referenced a mapping initiative that ensured the quality of medicines in the country. However, this response was not clear, and it is unclear whether this initiative is directly linked to NAFDAC. Overall, the participants had limited knowledge of NAFDAC's initiatives, suggesting the agency needed to engage in more public education and awareness campaigns to inform the public of its various initiatives.

Willingness to Pay More for Medicines

Most participants expressed a willingness to pay more for their medicines if the costs increased due to NAFDAC's efforts to safeguard the drug industry. One participant stated, *"I would love to pay more," while another said, "if we are sure that the drugs are effective, it does not matter the cost for me."* These responses indicate that consumers are willing to pay a premium for quality medicines and support NAFDAC's efforts to ensure that only safe and effective drugs are available.

Satisfaction with NAFDAC's Service Delivery

The researcher also asked the participants to rate their satisfaction with the service provided by NAFDAC. However, the responses obtained were limited to only those who had used the agency's services, making it difficult to draw general conclusions about the overall satisfaction level of the public with NAFDAC's service delivery. One participant mentioned that NAFDAC raids shops and publishes information about suicidal drugs, indicating that some public members will receive the agency's efforts to safeguard the drug industry.

What are the Major Challenges to Fighting Fake Medicines in Nigeria?

The responses from the drug/medicine consumers shed light on the challenges facing the fight against fake medicines in Nigeria. One major challenge the respondents highlighted is the lack of community sensitisation. They noted a need to sensitise the local communities to the dangers of fake medicines. One respondent said,

"Community sensitising you to sensitise them in their local community." Another challenge identified is local sellers' prevalence of bad or counterfeit drugs. The respondents noted that the risk of getting such drugs is high, posing a significant challenge to fighting fake medicines in Nigeria. One respondent said, *"The operational risk of getting bad drugs. Or counterfeit drugs from the local sellers."*

Corruption was also a significant challenge to fighting fake medicines in Nigeria. The respondents noted that many people are corrupt, greedy, and want to line their pockets. They believe corruption is the major issue in the fight against fake drugs. One respondent said, *"So basically, corruption is the major challenge in fighting this drug issue. Many people are corrupt, want to line their pockets, and are greedy. So, I think that is our major issue with this fight against fake drugs."*

The respondents also noted that the people fighting fake medicines are compromised. They explained that some people collect money and close their eyes to the issue. This poses a significant challenge to the fight against fake medicines. One respondent said, *"Most people are compromised. Most have that. They will collect money and close their eyes. That is the truth."* Lastly, one of the respondents expressed uncertainty about the effectiveness of the fight against fake medicines in Nigeria. They noted that the fight was effective in the past, but they are unsure about the current situation. One respondent said, *"Overall, not before; this time, it was effective. I don't know about now."*

How do you Think this can be Tackled (Your Suggestions)

From the responses, it is clear that the participants have different ideas on tackling the issue of fake, adulterated, and counterfeit medicine in circulation. One participant suggested organising health talks in the community to educate people about the negative effects of taking bad drugs. This can be an effective way to raise awareness about the dangers of using counterfeit medicines and could potentially discourage people from buying them. Another participant recommended implementing strict policies and monitoring to curb the menace. This would involve having trustworthy people in the right offices to ensure everything is done correctly.

However, a third participant highlighted that people often do not do what is expected of them, especially staff who work in drug inspection and checking. They suggested that there should be stricter inspections and checks on the staff to ensure that they are doing their jobs properly. They also mentioned that some staff members are only interested in the money that comes into their pockets and may look the other way when fake drugs are sold.

It is clear from the responses that the issue of fake drugs in circulation is complex and requires a multifaceted approach. Education campaigns can help raise awareness among the general public about the dangers of using counterfeit medicines. However, strict policies and monitoring are also necessary to ensure that fake drugs are not being produced and sold. Additionally, there needs to be greater accountability among drug inspection and checking staff to ensure that they are doing their jobs properly and not contributing to the problem.

One participant said, "*Most people are after money, and for that reason, we have a lot of fake, adulterated and counterfeit medicine in circulation."* This highlights that profit motives often drive the issue of fake drugs and that addressing this problem will require a fundamental shift in how drugs are produced, distributed, and regulated.

Discussion

Stakeholders' Perception of NAFDAC Interventions, Challenges, Roles, and Anti-Counterfeit Technologies

Based on this study's findings, stakeholders believe NAFDAC should have anti-counterfeiting strategies and approaches to fight

counterfeit medicine. The entire public should work with the agency to prevent counterfeit medicines. They consider quality and socioeconomic class before selling or recommending medicines to clients. Although some stakeholders do not only sell/distribute medicines with NAFDAC numbers, but others do also so because it indicates that the medicines are of good quality. To identify good quality medicines, stakeholders suggested that buyers verify their products, especially when in doubt. The stakeholders' opinions gathered through the qualitative analysis highlight the importance of anti-counterfeiting strategies, a collaboration between NAFDAC and the public, consideration of quality and socioeconomic factors when selling or recommending medicines, and the use of NAFDAC numbers as an indicator of good quality [16], [17], [18]. The stakeholders' perspectives provide valuable insights for NAFDAC in formulating effective measures to prevent counterfeit medicines in Nigeria.

This study's findings reveal that stakeholders acknowledged stakeholders' roles in developing anti-counterfeiting strategies and recognised NAFDAC's initiatives against substandard and falsified drugs. They suggested that the effectiveness of the strategies needs to be measured through research, and the entire distribution network needs to be checked to plug the leakages. Finally, stakeholders suggested that companies producing the products should be carried along in developing strategies to protect their products. The stakeholders' insights provide valuable perspectives on the roles of stakeholders, NAFDAC's initiatives, and the need for research to evaluate the effectiveness of anti-counterfeiting strategies. These findings demonstrate the stakeholders' commitment to combatting counterfeit medicines and their recognition of the multi-faceted nature of the issue. By considering stakeholders' suggestions, NAFDAC can strengthen its efforts to protect public health and safety, enhance the effectiveness of anti-counterfeiting strategies, and foster collaboration among all relevant stakeholders.

This study's findings show that stakeholders support NAFDAC's efforts and recognise the importance of their active involvement in combatting the use of fake drugs. One of the key expectations expressed by the stakeholders is the need for proper documentation throughout the supply chain, including drug disposal, purchases, and sales. This documentation is crucial for effective traceability of products, especially in the event of counterfeit drug detection. The stakeholders specifically highlighted the responsibility of community pharmacies to report any suspicions or issues related to counterfeit drugs to NAFDAC. This highlights the importance of their vigilance and contribution to the fight against counterfeit medicines [16].

However, the stakeholders also acknowledged several challenges in implementing these interventions. The business environment in the country was identified as a hindrance, with stakeholders often being too focused on their business operations to pay attention to small details that could help identify counterfeit drugs. Regular stakeholder meetings were suggested as a means to create awareness, educate stakeholders, and reinforce their responsibilities in combating counterfeit drugs. This highlights the need for ongoing communication and collaboration among stakeholders to address the challenges effectively. Advocacy and awareness creation was essential strategies to improve stakeholders' roles in fighting counterfeit drugs. By raising awareness about the prevalence and dangers of counterfeit drugs, stakeholders may become more proactive in reporting suspicious activities to NAFDAC. Social media was mentioned as a useful tool for reaching a wider audience and disseminating information effectively. The stakeholders recognised NAFDAC's primary role in receiving reports of counterfeit drugs and emphasised the need for a steady flow of information to the agency. They also

acknowledged the challenges posed by the innovative tactics of counterfeiters, who continually adapt to evade detection. In light of this, the stakeholders called for support from law enforcement agencies to address reported cases of counterfeit drugs, emphasising the collaborative effort required to combat the problem effectively.

Furthermore, the stakeholders' responses in this interview highlighted the importance of collaboration and communication among stakeholders in the fight against counterfeit drugs. There is a need for regular stakeholder meetings and advocacy to create awareness and educate stakeholders on their responsibilities in the fight against counterfeit drugs [6]. The challenges of counterfeit drug intervention require constant vigilance and innovation in tackling the problem. By addressing the challenges identified and implementing the suggested strategies, stakeholders can enhance their roles and contribute to more robust anti-counterfeiting interventions.

This study highlights pharmacists and healthcare providers' important roles in anti-counterfeiting interventions. The stakeholders emphasised the need for effective communication strategies and interventions to ensure that the right medicines are dispensed and that patients can access the right medicines that are not counterfeit or falsified. They suggested that NAFDAC needs to do more to involve other healthcare providers in their strategy and organise workshops and symposia to educate and engage pharmacists and healthcare professionals. By fostering effective communication, providing necessary training and support, and involving these stakeholders in workshops and symposia, NAFDAC can enhance their roles and leverage their expertise to combat the circulation of counterfeit medicines more effectively [18, 19].

In response to the effectiveness of NAFDAC's strategies to combat fake drugs in Nigeria, stakeholders expressed appreciation for NAFDAC's efforts, acknowledging the severity of the problem in the past; others had reservations about the current state of affairs. The mixed opinions expressed by the stakeholders reflect the problem's complexity and the challenges NAFDAC faces in combating fake drugs. While some stakeholders acknowledged the agency's efforts, others called for more proactive measures and greater engagement. The stakeholders' perspectives underscore the importance of continuous evaluation, improvement, and increased collaboration among stakeholders to address the issue effectively [6]. Also, the stakeholders' suggestions that all hands must be on deck and that the fight against fake drugs should be fully engaged are particularly noteworthy. NAFDAC should take note of these suggestions and continue to work towards eradicating the problem of fake drugs in Nigeria.

In responses regarding how NAFDAC can evaluate interventions and what methods should be used, highlight the importance of data and research in assessing the effectiveness of strategies. The stakeholders provided valuable insights into the evaluation process. The stakeholders unanimously agree on the importance of data and evaluation in assessing intervention strategies. They suggest conducting research, keeping records of ongoing interventions, and evaluating both successful and unsuccessful interventions. These recommendations underscore the stakeholders' recognition of the significance of evidence-based evaluation in refining and improving NAFDAC's efforts to combat counterfeit drugs in Nigeria [7]. These insights will also help NAFDAC to evaluate its interventions and improve its strategies.

Based on the findings from this study, the stakeholders expressed concerns about the current state of the economy in Nigeria and how it has affected the fight against counterfeit pharmaceuticals. The stakeholders from NAFDAC emphasised the need for increased vigilance and stepped-up efforts to curb the activities of counterfeiters. These suggestions

are similar to the recommendations made by [6] on the factors associated with drug counterfeiting in Nigeria. They suggested implementing a system where individual companies must bring up their codes to be added to the NAFDAC number and called for more private sector participation in the fight against counterfeiting. The stakeholders' suggestions highlight the need for innovative approaches and partnerships to address the challenges posed by counterfeit pharmaceuticals in Nigeria. Implementing a system that includes individual company codes and fosters greater private-sector participation can contribute to more effective and sustained efforts to combat counterfeit drugs. Combining these strategies with NAFDAC's existing initiatives can strengthen the fight against counterfeiting and protect the population from the risks associated with fake pharmaceutical products.

Policy maker's Perception of NAFDAC Interventions, Challenges, Roles, and Anti-Counterfeit Technologies

The responses from policymakers in this study shed light on their perception of the accessibility of good quality medicines in Nigeria and NAFDAC's efforts in combating counterfeit, substandard, adulterated, and degraded medicines. The policymakers of NAFDAC believe that accessibility to good quality medicines in Nigeria has greatly improved due to the agency's efforts in combating substandard and falsified medicines in the country. They defined good quality medicines as fit for the intended use and safe for patients. They admitted that counterfeit, substandard, adulterated, and degraded medicines exist in Nigeria and that the agency has worked greatly to combat this menace to a greater level. While progress has been made, there are still challenges to overcome. Policymakers recognise the importance of ensuring patient safety and the need for continued efforts to address the issues associated with poor-quality medicines. Further research and collaboration with relevant stakeholders will be crucial in developing effective strategies to combat the menace of counterfeit medicines in Nigeria. This aligns with the World Health Organization's definition of quality medicines that meet established quality, safety, and efficacy standards [20].

The challenges to fighting fake medicines in Nigeria, as identified by the respondents, revolve around the lack of government support, the chaotic distribution chain, the need for sensitisation, and the necessity of implementing punitive measures. These challenges were also evidenced in a study by Ojonugwa et al. [21] on the role and challenges of the national agency for food and drug administration and regulation of alternative medicine in Nigeria. The suggestions provided by the interviewees on how to tackle these challenges include the implementation of guidelines, sensitisation, and punitive measures. It is recommended that policymakers consider these suggestions in the fight against fake medicines in Nigeria. By addressing these challenges and implementing the suggested strategies, Nigeria can significantly progress in fighting fake medicines. However, it is important to continuously evaluate and adapt these strategies to stay ahead of evolving counterfeit tactics and emerging challenges in the pharmaceutical landscape. A comprehensive and multi-faceted approach involving government commitment, regulatory enforcement, public awareness, and international cooperation is necessary to safeguard the health and well-being of the Nigerian population.

As identified by the policymakers, the NAFDAC initiatives against substandard and falsified drugs demonstrate a multi-faceted approach to preventing, detecting, and responding to these dangerous products. The use of technologies such as TruScan, mini-labs, and MAS for on-the-spot checks, testing, and identification of medicines is a commendable step towards ensuring product quality and authenticity [16]. Additionally, implementing a

pharmaceutical traceability strategy can help track and monitor the movement of medicines throughout the supply chain, making it easier to identify and address potential issues [16]. To further enhance the effectiveness of these initiatives and make them even better, the policymakers recognised the seriousness of the substandard and falsified drug problem. They also emphasised the need for more post-marketing surveillance activities and stronger punitive measures on defaulters. By incorporating these suggestions, NAFDAC can strengthen its initiatives against substandard and falsified drugs, ensuring the protection of public health and the integrity of the pharmaceutical supply chain in Nigeria.

Furthermore, based on this study's findings, the policymakers highlighted several important factors that should be involved in developing interventions to address the challenges of counterfeiting and substandard medicines. These include a thorough assessment of the challenges, engagement of all relevant stakeholders, sensitisation, rewards for whistleblowers, and stiffening of laws. These factors were similar to the recommendations provided by Ubajaka et al. and Okereke et al. [6, 18]. All stakeholders can help curb the production and distribution of fake drugs, ensuring that safe and effective medicines are available to all. By adopting these strategies, policymakers can create a more robust and collaborative framework that addresses the challenges at various levels, leading to improved public health and the protection of consumers from the dangers of fake drugs.

The policymakers with NAFDAC in this study identified the roles of stakeholders in implementing anti-counterfeiting interventions and suggested ways to improve stakeholders' participation. They emphasised the importance of stakeholder engagement, sensitisation, education, and collaboration in NAFDAC's policies and decision-making. They also recommended that stakeholders appoint qualified persons for pharmacovigilance and have post-marketing units responsible for monitoring their products. These recommendations can help NAFDAC fight against counterfeiting, ensuring the safety and efficacy of drugs in Nigeria. By involving stakeholders, providing them with the necessary support and information, and fostering a sense of shared responsibility, NAFDAC can enhance its effectiveness in regulating and fighting counterfeit drugs in collaboration with the various stakeholders involved in the pharmaceutical industry.

The policymakers in this study expressed diverse perspectives on implementing NAFDAC's anti-counterfeiting strategies, the best way to implement these strategies, and the efforts to ensure proper implementation. However, they all agreed that more human and financial resources were needed to implement the strategies effectively. They also emphasised the importance of collaboration, sensitisation, and the adoption of advanced technologies to implement anti-counterfeiting strategies successfully. By addressing these key areas, NAFDAC can strengthen its approach and enhance its effectiveness in combating the issue of counterfeit and substandard drugs.

According to this study's findings, the policymakers at NAFDAC recognise the importance of implementing various measures to address the issue of counterfeit products and acknowledge the successes and challenges of current interventions. The need for sustainability and succession planning for experienced personnel was emphasised as an area for improvement. While acknowledging the successes of NAFDAC's interventions, addressing sustainability and personnel turnover challenges will be crucial for the agency to continue progressing in the fight against counterfeit medicines in Nigeria.

The policymakers from NAFDAC acknowledged the effectiveness of the strategies used to fight fake drugs in Nigeria. They called for better implementation and stakeholder collaboration to achieve even better results. The policymakers highlighted the importance of

practitioners being more proactive in checking the products they accept, consumers being more vigilant in purchasing drugs, and everyone working together to defeat the menace of fake drugs in Nigeria. NAFDAC must continue to work rigorously to reduce the percentage of counterfeits in circulation and ensure that only quality medicines are found in the country. Addressing these recommendations will contribute to more effective anti-counterfeit efforts and protect the population from the risks associated with counterfeit drugs.

The policymakers' responses regarding the evaluation of interventions implemented by NAFDAC shed light on the agency's current approach to evaluation and highlight areas for improvement. The policymakers' responses indicate the need for NAFDAC to evaluate its interventions systematically. Conducting surveys, establishing KPIs, and collaborating with external organisations were highlighted as key components of an effective evaluation process. By incorporating these suggestions, NAFDAC can gain valuable insights into the impact and success of its interventions, allowing for continuous improvement and the development of more targeted and efficient strategies to combat counterfeit drugs.

Consumers' Perception of NAFDAC Interventions, Challenges, Roles, and Anti-Counterfeit Technologies

The consumers' perspectives on the accessibility to good quality medicines in Nigeria shed light on their challenges and expectations for medication quality. The consumer's responses in the qualitative interview highlight the need for increased regulation and quality control in the production and distribution of medicines in Nigeria. The participants' concerns about the accessibility to good quality medicines and the prevalence of substandard and counterfeit drugs should be taken seriously by the relevant authorities. To ensure the safety and well-being of the consumers, measures must be implemented to ensure that all medicines meet the required quality standards. Building consumer trust through reliable sources, such as reputable pharmacies, is crucial in combating the issue of substandard and counterfeit drugs. Additionally, raising awareness among consumers about the importance of purchasing medicines from trusted sources and the potential risks associated with substandard drugs can empower them to make informed decisions about their health [22, 23]. Addressing the accessibility and quality of medicines in Nigeria requires a collaborative effort involving regulatory agencies, healthcare providers, pharmacists, and consumers themselves. Implementing stricter regulations, enhancing quality control measures, and promoting consumer education can improve the accessibility and availability of good quality medicines, ultimately safeguarding public health.

Also, responses from this study revealed that counterfeit drugs are a significant problem in Nigeria, and most drug consumers know their existence. The Nigerian government needs to take strong measures to curb the availability of counterfeit drugs to protect the health of its citizens. Additionally, standard practices and strict scrutiny of drug dealers can play a crucial role in reducing the availability of fake drugs in the Nigerian market. The study recommends further research to identify the root causes of counterfeit drug production and distribution in Nigeria and effective design interventions to address the issue.

In response to the quality of medicines they take and how they ensure they are good quality; the responses revealed several ways to determine the quality of the medicines they take. Consumers stated that they inspect the medicine before taking it, check the authenticity of the medicine, and check for side effects and effectiveness after taking it. The findings suggest that there is a need for stringent measures to ensure that all medicines in the market are of good quality, especially in countries where counterfeit medicines are

rampant. Further research is necessary to explore more ways of determining the quality of medicines and how consumers can be better informed about the quality of their medicines.

In response to policymakers' efforts to know if their medicines were fake or original, most of the consumers stated that they try to ensure the authenticity of their medicines. The responses from the participants indicate that drug consumers are aware of the dangers of consuming fake drugs and are taking measures to ensure that the drugs they consume are authentic. Their efforts, such as checking the manufacturer, expiry date, packaging integrity, and even utilising specific verification methods, reflect a desire for safe and genuine medications. Enhancing consumer awareness and education about identifying counterfeit drugs, verifying authenticity, and understanding quality indicators can empower individuals to make informed decisions and protect their health when purchasing medicines. Regulatory bodies must continue educating the public on the dangers of fake drugs and enforce laws that penalise those producing and distributing counterfeit drugs. The perception of the quality of locally made drugs is also increasing, which is a positive development for the Nigerian pharmaceutical industry.

The result from this study also reveals the factors determining the brand/type of medicine consumers purchase, which are multifaceted. Recommendations from medical professionals, the country of manufacture, cost, and brand/generic were identified as the main factors. The findings of this study could be useful for pharmaceutical companies in developing their marketing strategies and for policymakers in ensuring the quality of medicines manufactured and sold in their respective countries.

Understanding these factors can help healthcare providers, pharmaceutical companies, and policymakers better address consumer preferences and concerns regarding medication choices. By considering these factors and providing accurate information, healthcare professionals can guide patients towards suitable treatment options, and pharmaceutical companies can align their marketing strategies and quality control measures to meet consumer expectations.

This study's findings suggest low awareness among drug/medicine consumers about initiatives by NAFDAC against fake medicines. This may be attributed to the inadequate dissemination of information by NAFDAC. It is recommended that NAFDAC intensifies its efforts to create awareness among consumers about its initiatives to combat fake drugs in the country. This can be achieved through effective communication such as mass media campaigns and public enlightenment programs. NAFDAC can also collaborate with healthcare professionals and pharmaceutical companies to disseminate information about the dangers of fake drugs and the agency's efforts to combat them.

Also, the responses obtained from the participants suggest a need for NAFDAC to engage in more public education and awareness campaigns to inform the public about NAFDAC's various initiatives. The finding behaviour highlights the willingness of consumers to pay more for quality medicines and support the efforts of NAFDAC to ensure that only safe and effective drugs are available in the market. Overall, the responses obtained from the participants provide valuable insights into the public's perception of NAFDAC's service delivery and their willingness to support the agency's efforts to safeguard the drug industry.

The findings from this study highlight several key challenges facing the fight against fake medicines in Nigeria. These challenges include a lack of community sensitisation, the prevalence of bad or counterfeit drugs sold by local sellers, corruption, compromised individuals involved in inquiry issues regarding fake medicines, and uncertainty about the current effectiveness of the fight. The project's objectives regarding drug/medicine consumers

reflect states: multifaceted nature of the fight against fake medicines in Nigeria. Addressing these challenges requires comprehensive strategies, including community sensitisation, improved regulation and quality control, anti-corruption measures, strengthening of regulatory bodies, and regular evaluation of interventions. By addressing these challenges, Nigeria can make significant progress in safeguarding public health and ensuring access to genuine and safe medicines for its population.

The findings from this study reflect a diversity of ideas on addressing the issue of fake, adulterated, and counterfeit medicines in circulation. The participants' responses suggest that tackling fake drugs in circulation will require a coordinated effort involving education, strict policies and monitoring, and greater accountability among drug inspection and checking staff.

Additionally, addressing profit motives and fostering a culture of integrity and ethical conduct within the pharmaceutical industry is crucial for achieving long-term solutions to combat the circulation of counterfeit medicines. This is a complex and challenging problem, but with the right approach, it is possible to reduce the circulation of counterfeit medicines and protect public health.

Conclusion

The findings from this study highlight the importance of NAFDAC having a comprehensive anti-counterfeiting strategy and implementing measures. This study's findings show that collaboration and communication among stakeholders are crucial in the fight against counterfeit drugs. This study's outcome suggests the need for implementing anti-counterfeiting interventions to cut down on fake drugs in Nigeria. This study also highlights the importance of post-marketing surveillance, stronger punitive measures on defaulters, and the involvement of the private sector in the fight against counterfeiting. Additionally, this study emphasises the need for increased regulation, quality control, and public education. The findings underscore the importance of continuous efforts to raise awareness and implement effective anti-counterfeiting strategies to safeguard public health and combat the growing threat of fake drugs.

Conflict of Interest

The author declares no conflict of interest.

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Integration of ICT in the Teaching and Learning Process at Christ the King Catholic Senior High School in the Obuasi Municipality

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Abstract

This study sought to investigate the extent to which teachers were using ICT in the teaching and learning process at Christ the King Catholic Senior High School in the Obuasi Municipality. The study also sought to find out which ICT resources were available for the teaching and learning process. Sixty teachers of different subject's background were sampled through simple random sampling technique. Questionnaire titled 'teachers in the Christ the King Catholic SHS background knowledge in the information and communication technology competency test' was used to collect data. Mean served as the statistical tool for data analysis for research questions II, III and IV, while question I and V were analyzed with percentages. Findings depict that teachers were aware of ICT resources but do not utilize them while teaching. Many constraints were identified including lack of computer literacy on the part of some teachers, lack of ICT facilities, lack of funds, poor power supply, and no adequate knowledge of the use of internet among others. It was recommended that for quality assurance and for effective ICT integration in curriculum, teachers should be encouraged through workshops, seminars and conferences to be ICT literate; stake holders in education should join hands together in making ICT pedagogical and methodological issues fully integrated in the teaching and learning process in secondary education for quality assurance.

Keywords: *Integration, ICT, Teaching and Learning.*

Introduction

The Ministry of Education policy on ICT is to integrate ICT into education and training institutions to prepare the learners for the future technological knowledge-based economy. Although the Government, Private sectors, Non-Governmental Organizations, and individuals have donated ICT facilities to schools and opened training opportunities for teachers in the use of ICT facilities in order to improve on education delivery. The use of ICT in the teaching and learning at Christ the King SHS in Obuasi municipality still lags. Students often refuse to do assignments requiring the use of internet. So, the researcher decided to investigate the extent to which ICT is incorporated in the teaching learning in the school. This study therefore tries to find out the available ICT resources in the school, the extent to which teachers utilize these resources, the challenges they face in using these resources and possibly make some recommendations for proper integration and the alternative to the use of ICT.

The concept Information Communication Technology (ICT) comprises any product that can store, retrieve, manipulate, transmit or receive information electronically in a digital form.

They include digital television, computers email, modems and internet and it mostly deals with how these different resources can combine and work with each other. In this study, ICT in education is taken to mean the use of digital ICT resources in all aspects of teaching and learning process. Knowledge in Information

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Communication Technology (ICT) is a prerequisite in this modern society where every sphere of our lives is controlled by technology. Information Communication Technology must be integrated in the curriculum and in the methods used to teach it to produce students who are ICT literate who can function in this twenty-first century where technology permeates every sphere of life. The view that using ICT resources especially computers, the internet and other related technologies in the classroom better prepares the learners for studies in the workplace where this equipment is used [1].

Students who can use ICT effectively have a better chance of being absorbed in the current globalized job market. Several scholars argue that using ICT in teaching gives the learners a chance to learn how to function better in this digital era. The use of old methods of teaching does not prepare the learners for the job market where knowledge of technology is required.

Therefore, for institutions to claim to be preparing their learners for life in the present century, they must use new technologies in their teaching [2]. Her arguments are in line with [3], who posits that when learners are taught ICT skills in primary schools, they are in a better position to face new developments with better understanding. There are several roles which ICT can play in the educational process. First, ICT has the potential to enhance learners' achievement [4].

Secondly, several theorists and scholars agree that using ICT in the teaching process makes the learners knowledgeable, reduces face to face instruction and provides a learning environment where teachers can assist learners with special needs. In addition, use of ICT will motivate the learners and help them develop a favorable attitude towards learning against this background, concerted effort is being put in place to embrace the use of ICT in education in several countries to reap the benefits of ICT integration.

A review conducted by [5] in ninety countries, classified countries regarding different levels of ICT development. These classifications include countries with integrated ICT in education system, countries with national policies and master plans formulated and various ICT being applied and tested, and countries where efforts towards ICT integration and formulation of national policies have just begun. Again, this does not reflect the specific achievements of ICT integration in education and these general classifications may leave out concerns of ICT integration. Teachers are thus unprepared for any changes that may be brought about by technology at schools.

The purpose of this study was to ascertain the extent to which ICT tools are used in the teaching and learning process at Christ the King Catholic Senior High School in the Obuasi Municipality.

This study will enlighten the teachers on the importance of integration of ICT in their instruction. It will also provide information about the resources available in the schools. The study will help improve students' achievement in their studies through showing high motivation and better attendance. It will also help Teachers see the need to use ICT in teaching and learning process. It will be useful to the educational training institutions on the need to train teachers who will be able to use ICT in the teaching and learning.

Research Questions

1. What are the available ICT resources used in teaching and learning at Christ the King Catholic SHS?
2. To what extent do teachers use ICT resources in the teaching and learning process?
3. To what extent do teachers involve students in the use of ICT resources in the teaching and learning process?
4. What are the challenges encountered by teachers in the school in the integration of ICT in the teaching and learning process?
5. What alternative resources do teachers use

in the absence of required ICT resources?

Delimitations of the Study

This study only investigated the extent to which teachers were using ICT in the teaching and learning process and ascertained the ICT tools available at Christ the King Catholic Senior High School in the Obuasi Municipality.

Limitations of the Study

This study was limited to only Christ the King Catholic senior high school in the Obuasi Municipality. The other senior high schools in the municipality were not included in this study due the limited time available to the researcher to complete the work.

Literature Review

The study was guided by the Constructivism Theory [6]. According to the constructivists, people create their own understanding of the world through undergoing experiences and internalizing these experiences, learning requires that the learners be encouraged to use active methods which include experiments and inquiry using authentic data. Constructivism changes the way the teacher instructs the learners. The teachers' main role is to direct learners so that they construct ideas and not reproduce mere facts. According to constructivism the teacher should provide situations where learners are confronted with problems so that they can formulate answers thereby testing their knowledge, drawing conclusions and getting answers and in the process creating an environment for collaborate learning [7].

The teacher should guide the learners to realize the activities they are undertaking by helping them arrive at a better understanding of their problems. By looking at the tasks given critically and using their chosen strategies, students become expert learners as they learn how to learn on their own. Constructivism theory ties with this study as it shows that the use of ICT in teaching and learning helps learning become learner centered. The learners look for information on their own and practice what they have learnt using ICT resources. The learners can manipulate the ICT resources and in doing this practically they do not easily forget what they learn. A theory of teaching should look at: the learners' views towards learning, how the materials to be learnt are structured to allow the learners grasp them easily, and the teacher can find the process of teaching easier if the teacher has the knowledge of ICT. [8] The use of ICT resources in teaching make the learners become motivated, they go out and look for more information which they can easily access through ICT resources [9].

The constructivists are of the view that for education to take place there must be action. Knowledge and ideas will only be attained when learners get experiences that are meaningful to them. These experiences do not occur in isolation but when learners work together as in a classroom manipulating resources thereby building their knowledge together and building team spirit. For learning to occur, the learner must be an active participant, for knowledge must be sought and not just accepted. The learner must engage in activities so that this knowledge can be realized [10]. By using ICT, the learner becomes involved in the learning process by manipulating the ICT resources as guided by the teachers.

Information Communication Technology can help students learn by allowing them construct knowledge. Constructivist proponents emphasize learner-centered activities which allow the learner to arrive at answers. Computer based applications support these approaches to learning. Learners can simulate various situations and in thus doing become creative. Problems that are posed as the learners read through materials on the internet help in deep inquiry and problem solving [10]. Information Communication Technology enriches classroom change classroom dynamics, the class becomes more active, and there is

increased classroom interaction. Students learn to cooperate and work as a team thus building team spirit which encourages peer- support learning which is encouraged for better learning.

When computer aided instructions designed for individual learning at different levels of education are used, learners are in a position to work at their own pace and get feedback without being coerced and hence evaluate their own performance [12].

Integrating ICT into teaching and learning is described as the process of determining which products and processes of ICT should be appropriate for a given classroom situation and problems. Referring to the instructional uses of ICT, the teacher is expected to acquire competencies and expertise in the utilization of ICT to be able to use it properly for lesson delivery.

In the teaching and learning process the learner, the curricular contents, the specified objectives, the materials/methods, and the teacher interact in the instructional system to achieve the expected result. Integrating ICT into the curriculum demands the availability of ICT friendly teachers and these ICT friendly teachers are trained teachers with proficiency in computer operation, programmed production and developing suitable software. Most of the developing countries of the world have fallen behind in science education delivery due to their inability to utilize ICT resources [13].

The conventional and traditional teaching approach still takes the lead in our secondary schools. The uses of ICT in education to include ICT as objects, as an assisting tool, as a medium of teaching and learning, as a tool for organization and management in schools. In the instructional uses of computer, some classified computer as a teacher and as a tool, appropriately computer in instructional delivery should be classified as a teaching device because computer cannot substitute a teacher rather it can serve as a device through which the teacher prepared lessons are delivered. Also, it should not be seen as a tool for learning rather it can be better classified as a learning machine [14].

Computer as a teaching device is used to assist instruction in the form of drills and practice, tutorials and dialogue, simulation, and games and as subject of instruction while as a learning resource, it could be used in information processing, data collection and analysis, data retrieval resources and computer mediated communication.

Materials and Methods

Research Design

The design adopted in this study was descriptive research. The descriptive research design was appropriate for this study since it was a fact finding with an intention of arriving at the truth. The use of this design enables one to describe events as they are at that time [15].

The purpose of this study is to identify teachers' level of computer skills and knowledge, level of ICT integration in teaching and learning process in classroom. Besides, this study also investigates the relationship between teachers' computer skills and knowledge and the ICT integration in their daily teaching and learning process in classroom.

The populations which were surveyed consist of all the teaching staff at Christ the King Catholic Senior high school in the Obuasi Municipality.

Participants

The target population for the study comprised 60 teachers who teach different subjects in the school.

60 teachers of different subjects' background were selected for the study. This sample size was manageable and feasible for the study. In determine sample size, it must be kept manageable [16]. This would allow the researcher to get detailed data at a cost which is manageable in terms of finance, time, and human resources.

Instruments

Data was obtained using a questionnaire and observation. There was a set of questionnaires which were completed by the teachers. The researcher carried out observations in the school to ascertain the use of ICT resources during the instruction process.

A set of questionnaires titled "Christ the King SHS teacher's information and communication technology competence test" was used as the instrument to collect data. 60 respondents returned their questionnaire appropriately completed. The use of questionnaires gives the respondents ample time to think out the answers to give and it is also effective when using a large sample [17].

The researcher also observed the ICT resources available in the school. The information collected through the observation was used to confirm the data obtained through questionnaires. Areas that were examined included physical facilities such as the library and IT rooms.

There were also four observations of lessons in progress in the school in order to identify the use of ICT resources employed by teachers during instruction. There were two observation guides, one to check on physical resources and the other to confirm the usage of these resources in the teaching and learning of process. The merit of this method is that if observation is carried out effectively there is no fear of the research being biased, there is no subjectivity [18].

Procedure

The researcher self-administered the questionnaires to the respondents. The researcher gave ample time to the respondents and agreed on the day and time for completion of questionnaire by the teachers. The respondents were informed about the intention of the research, its potential for the wider society and of their right to choose to participate or not. After completion of filling in the questionnaires, the observation was done by the researcher. He sat in the class and observed the lessons in progress. The IT room and the library were visited to see which ICT resources were available.

Results

This chapter presents the results, analysis, interpretation, and discussion of the research findings. The study had five objectives which were to:

1. To find out the available ICT resources used in teaching and learning at Christ the King Catholic SHS.
2. To ascertain extent to which teachers use ICT resources in teaching and learning.
3. To examine the extent to which teachers involve students in the use of ICT resources in the teaching and learning process.
4. To find out the challenges encountered by teachers in the school in the integration of ICT in the teaching and learning process.
5. To find out the alternative resource's teachers use in the absence of required ICT resource.

Table 1. The Study Response Rate

Respondents	Targeted	Obtained	Response rate %
Teachers	**60**	**60**	**100**

As presented in Table 1, the study targeted teachers from the Christ the King SHS and managed to get the views of all of them and this was a response rate of 100%.

Research Question 1. What are the available ICT resources used in teaching and learning at Christ the King Catholic SHS?

Table 2. Response of Teachers Indicating the Available ICT Resources for Use in the Schools

S/N	Item	Available	%	Not available	%
1	Smart board	0	0	60	100
2	Computer	21	35	39	65
3	Projectors	1	1.6	59	98.3
4	Televisions	10	16.6	50	83.3
5	Video discs	20	33.3	40	66.6

From Table 2 above, 100% of the respondents agreed that there is no smart board in the classroom also, this confirm the observation the researcher made that there is no smart board in the school. Only 35% of the respondent agreed that there were computers in the school, and this also confirms to the observation made that there were few computers in the school and out of these some are in bad state and need to be repaired**.**

Research Question 2: To what extent do teachers use ICT resources in the teaching and learning process?

Table 3. Mean Response of Teachers' Use of ICT Resources in Teaching and Learning

S/N	Item	Mean
1	Smartboard	0.0
2	Computers	2.0
3	Projectors	2.0
4	Television	1.1
5	Video disc	0.4

From table 3 the mean of all the listed ICT resources was less than 2.5 showing that none of the ICT resources were used by the teachers at Christ the King Catholic SHS not even the computer considered available.

Research question 3. To what extent do teachers involve students in the use of ICT resources in the teaching and learning process?

Table 4. Mean Response of Teachers' Involvement of Students in the use of ICT Resources in Teaching and Learning

S/n	Item	Mean
1	Giving assignment to be done using internet	2.0
2	Using virtual library	1.4
3	Video tape lesson	1.1
4	Using projectors in lesson	0.5

The mean score of all the listed items in table 4 were below 2.5 showing that the teachers' involvement of the students in the use of ICT resources is very low.

Research Question 4. What are the challenges encountered by teachers in the school in the integration of ICT in the teaching and learning process?

Table 5. Mean Response of Constraints to Effective Integrative Use of ICT Resources in Teaching and Learning Process

S/n	Item	Mean
1	Lack of funds	3.5
2	Inadequate skills in using internet	2.9
3	Lack of funds	3.7
4	Poor power supply	2.6
5	Lack of qualified personnel	3.7
6	Unable to identify required resource	1.7
7	Lack of time	1.9
8	Lack of ICT facility	3.7
9	Lack of computer literacy on teachers	3.8

Data presented in Table 5 shows that the most inhibiting factor to the integrative use of ICT resources was lack of computer literacy on the part of some teachers (mean=3.8) followed by non-availability of ICT facilities in schools (mean=3.7). Lack of funds (Mean=3.7) and lack of qualified technical personnel among others were indicated as being very problematic.

Research question 5: What alternative resources do teachers use in the absence of required ICT resources?

Table 6. Response of Teachers Indicating Alternative Resources Used in Absence of the Required ICT Resources?

S/N	Item	Frequency used	%	Frequency not used	%
1	Posters	31	51	29	48
2	Textbook	60	100	0	0
3	Chart	43	72	17	28
4	Maps	55	92	5	8
5	Newspaper	46	77	14	23
6	Bulletin board	55	92	5	8
7	Realia	58	97	2	3

From the displayed in Table 6, all the listed items (instructional media) recorded percentages above 50% indicating that they are used.

Discussion of Findings

The purpose of this study was to determine the extent teachers utilize ICT resources in teaching and learning process at Christ the King SHS. The study revealed that out of seven (7) listed ICT resources, only few of these items was available. Others like interactive whiteboards, video discs, multimedia projectors etc were not available as they were below 50%. This finding confirms the recommendation made by the previous study that adequate learning environment in form of infrastructural facilities and technological equipment with internet connectivity should be provided for successful implementation of ICT in the classroom**.** [19] The result also showed that teachers in the Christ the King Catholic SHS were not utilizing ICT resources in teaching and learning. This implies that they are yet to embrace ICT resources in an ICT era or ICT world base. The non-utilization of ICT resources may not be unconnected with the non-inclusion of ICT in teacher education curriculum where these teachers were trained. These finding lays credence to the findings of that a growing number of teachers in most schools lack the required knowledge, technique,

and professional capabilities to harness computer technologies into teaching and learning [20].

The study further revealed that teachers' involvement of students in the use of ICT resources is very low. This finding confirms the teacher's low-level perception and low ICT literacy level which has been identified as a common problem which needs to be addressed adequately and urgently too. A successful use of ICT is dependent on learners' acceptance which has been found to be affected largely by teachers' literacy level and attitude [22]. Some constraints and challenges to effective integration of ICT resources into teaching and learning were also highlighted. They include the following: lack of computer literacy on the part of some teachers, non- availability of ICT facilities, lack of funds, lack of qualified technical personnel, erratic power supply, lack of Internet services and others. This implies that for effective integrative use of ICT resources in the teaching and learning process, these constraints must be given urgent attention by the appropriate authorities.

Conclusions

This study has revealed that teachers in the Christ the King Catholic SHS are aware of ICT facilities in the school but were not yet utilizing them in teaching and learning process. The involvement of students in the use of ICT resources is very low because of their low literacy level and poor attitude towards the use of ICT resources in instructional process. The older technologies are very much in use in the secondary schools, and this is a pointer to the fact that teachers in the Christ the King Catholic senior high school are yet to embrace ICT resources in teaching and learning process. It is easily understandable that ICT is a part of technical and specialized knowledge and skills whose acquisition is much important in staying at par with the constantly dynamic global market. It should be integrated in the education system to build globally competitive graduates from all levels of education. This study therefore recommends the following:

The government through the Ghana Education Service should organize continuous and periodic training and retraining of teachers through capacity building workshops, seminars, and conferences to boost their ICT literacy level to enable them utilize ICT resources while teaching their students.

There is an urgent need for government to provide ICT facilities at all levels of education. There should be training in ICT experts specifically for instructional design who will work with the teachers and the students in the schools. The problem of erratic power supply should be addressed while schools should on their own procure stand-by generators that can supplement the Power supply in the school.

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Conflicts of Interest Statement

The author whose name is listed immediately below certify that they have No affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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An Assessment of Multidimensional Poverty Trends in Ghana

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Abstract

This study aims at establishing the trends in multidimensional poverty in Ghana from 2011 to 2020 using intertemporal and counting approach. Alkire and Foster methodology was applied to identify and analyse the data. The study adopted the global multidimensional poverty indicators made up of three dimensions – health, education, and standard of living – and the ten indicators of which equal weights are attached to each dimension, and the same weights for the indicators within each dimension. It was found that Ghana did very well in reducing multidimensional poverty in all the six indicators within the standard of living dimension both in absolute and relative terms. However, the nation increased its multidimensional poverty in education and health dimensions. The Northern region continues to be the poorest region with the lowest reduction in multidimensional poverty in absolute and relative terms. Overall, multidimensional poverty reduced significantly both in absolute and relative terms at the national and regional levels. As compared with Sub-Saharan Africa, Ghana performed better in decreasing multidimensional poverty than the mean of the sub-region in almost all the dimensions and indicators, both in absolute and relative terms. Government should sustain this feat and improve upon it to eliminate poverty in all its forms by 2030 as envisaged by Sustainable Development Goal 1. Government must invest heavily in education and health as well as agriculture and rural development to reduce poverty. Strategy that targets the poorest regions should be implemented to reduce poverty.

Keywords*: Multidimensional poverty, Headcount poverty, Monetary poverty, Trends, Ghana.*

Introduction

The multidimensional nature of poverty makes it complicated subject both conceptually and in approach in a dynamic society. How we appreciate poverty is largely determined by how we measure it, and the way we analyze it influences the policies developed to address it [1]. In this respect, the methodology used to measure poverty is of great importance to enable us to grasp the essential characteristics and type of poverty encountered. Some researchers and policy makers have defined poverty using income or consumption levels [2-4] has expressed the inadequacy of income measurement of poverty because not all human needs can be provided in the market or done so efficiently. The different capability of households to translate income into "functioning" makes monetary measurement a weaker indicator for measuring poverty on a fairgrounds. The income measurement was assumed to adequately capture whether someone can fulfill their basic physiological needs [3, 5]. The poor, however, moves a step higher than income to express how they feel about poverty which incorporates education, health, shelter, security, jobs and many more. Moreover, the various challenges confronting the poor cannot be expressed in a single indicator.

The scale and trends of income poverty may not correspond with trends in other important variables such as child mortality, education, shelter, malnourishment, and good drinking water, which are necessities for life [6]. Someone can therefore be income poor but not multidimensionally poor, likewise be income

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non-poor but multidimensionally poor. Available data indicate that 45.6% and 23.4% of Ghanaians are multidimensionally and consumption expenditure poor respectively, showing a difference of 22.2 percentage points [7-8]. 19.3 percent of Ghanaians are simultaneously consumption and multidimensionally poor, while 4.1 percent experience consumption poverty but not multidimensional poverty and 26.3 percent are multidimensionally poor but do not experience consumption expenditure poverty [7-8]. Poverty can also be measured using subjective approach or objective approach [9-11]. Subjective poverty is where one assesses his/her situation and considers himself/herself poor in relation to a reference group or unable to make a decent living based on his/her minimal income [10-11]. The objective measurement uses either absolute approach or relative approach.

Various theories such as monetary [2], the basic needs [12-13], the primary goods [14], and capacity [15], have been used to explain the concept of poverty. Poverty and income disparity can be viewed from different angles [16] as being monetary and non-monetary. Measurement using money is based on income or expenditure, but other development indicators are used for non-monetary measurement. The most appropriate determinants of multidimensional poverty have been the asset indices adapted from the Demographic Health Surveys (DHS) [17-19]. This study aims at analyzing the relative changes and directions of multidimensional poverty in Ghana since 2011 by looking at data from UNDP Global Multidimensional Poverty Indices and Ghana Multidimensional Poverty indicators using intertemporal trend estimations.

The money measurement poverty can be assessed using relative or absolute measurements. The absolute measurement uses a poverty parameter which indicates the needed amount of resource to acquire a given quantity of necessities for survival or to meet one's food intake sufficient to satisfy the international benchmark of 2100 calories per day [20, 9, 21]. Relative poverty measurement identifies the lowest (e.g 20% or 40%) quintiles of the population using a relative poverty parameter or an arbitrary line of a proportion of the average or median income of each person [10].

According to [22], less developed economies globally have experienced a meaningful reduction in poverty in its various forms recently. Globally a considerable advancement in child mortality [23-24], availability of potable water and hygiene [25-26], ability to attain basic education [27-29] and income poverty [30-31] has been achieved. Significant improvement has been achieved in multidimensional poverty reduction in Ghana as well. The multidimensional poverty incidence in Ghana fell by 9 percent from 55 percent in 2011 to 46 percent in 2017. The severity of poverty also dropped (from 54.2% in 2011 to 51.7% in 2017) indicating that the gain is 'pro-poor' [7]. The MPI dropped by 0.062 from 0.298 in 2011 to 0.236 in 2017.

The global MPI indicates the general assessment of poverty globally in all its dimensions and follows up on performances towards Sustainable Development Goals (SDG) 1, which deals with removing poverty in all its forms [26]. The objective of SDG is to "carry along everyone" while alleviating poverty [26, 28, 32-33]. The Alkire and Foster methodology was used to derive the global multidimensional poverty [3, 5, 29, 34]. Data for computing global MPI are derived from over a hundred countries which are sourced from the Demographic Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS) [34] and country specific surveys such as Ghana Living Standards Survey [35]. Three dimensions and ten indicators constitute global MPI, however, the Multidimensional Poverty measurement in Ghana (2017/2018) classified MPI into twelve indicators and three dimensions [35]. This study adopts the global MPI as it compares the performance of Ghana against that of sub-Saharan Africa region. Equal weights are placed

on each dimension and for each indicator within each dimension. [36] expresses that the weighting mechanism selected is influenced by theoretical concepts rather than data induced methodology. In effect, people are identified as impoverish if they do not satisfy the deprivation criteria in any of the indicators. The nature of deprivation a person experiences is used to determine the MPI [34, 37].

This paper examines the nature and direction in MPI for Ghana between 2011 and 2020 using a harmonized global MPI which makes comparison of MPI dimensions and indicators over time possible. The purpose of SDG 1 is to eliminate poverty in all its dimensions across the globe [28] and Target 1.2 requires each nation to reduce at least by half poverty in all its dimensions by 2030 for all its people based on the country's definition of poverty [28, 31, 32]. Tracking this changes requires comparisons over time the movements in the MPI indicators as presented in this paper.

The study therefore seeks to examine how multidimensional poverty in Ghana has changed between 2011 and 2020, the magnitude of change, contribution of each indicator to MPI reduction, and Ghana's comparative performance within the sub-region in absolute and relative terms.

The methodology adopted to achieve the objectives of the study is [5] because it is clear and simple in relation to other methods of estimating MPI [38]. While we have extensive writings on monetary poverty on Ghana, not much has been written about non-monetary poverty. This study attempts to throw more light on the little known concept of multidimensional poverty in Ghana from 2011 which coincides with the period Ghana started measuring multidimensional poverty. The study further adopts decomposition analysis to illustrate the variations in multidimensional poverty by comparing the movements across components of poverty which are headcount and intensity and among the three dimensions.

The paper presents two distinct contributions to literature. In the first place, earlier studies on MPI in Ghana deal with only one dimension or the other and how they affect a section of the population [39-43]. This study, however, holistically looks at the trends in MPI from all the dimensions and indicators and their impacts on the entire population. By so doing, it is possible to track successes being chalked and identifies impediments in the country's forward march at eliminating multidimensional poverty in line with SDG 1 [26, 32]. Secondly the study, in the knowledge of the researcher, is the first time the performance of multidimensional poverty components have been measured in relative terms rather than absolute terms in Ghana. This allows for assessing the elasticity of poverty reduction measures to ensure effective allocation of scarce resources to tackling poverty.

The remainder of the study is arranged as follows: the literature review and empirical studies about the subject matter are presented in section 2, section 3 explains the methods and data, the empirical results are analyzed in section 4, and section 5 concludes and suggests policy implications.

Literature Review

The multidimensional nature of poverty makes it complicated subject both conceptually and in approach in a dynamic society. Various theories such as monetary [2] the basic needs [12-13], the primary goods [14], and capability [15], have been used to explain the concept of poverty. The most appropriate concept relating to the multidimensional poverty is Sen's capability approach [15]. The capability concept advocates for dramatic departure from concentrating on the physiological needs to real freedoms enjoyed by the poor [15] which are various combinations of "functioning's" an individual can obtain. The capability concept stresses on the diversity at which individuals based on their personal characteristics such as age, gender, physical conditions, social factors

such as institutions, cultural and social norms, and environmental and other factors, convert "commodities" into "functionings" and "capabilities". It is therefore possible for two individuals with the same level of "means" but have different levels of welfare. The key issue is the "functionings" which is made up of the things one cherishes or "being" [44]. A person's capabilities are assumed, as they are not directly observable [4]. The "functionings" attained are used as a proxy for measuring poverty [44-46].

There have been numerous studies on how multidimensional poverty has transformed over the years. [47] indicates that to assess whether nations are reducing their poverty levels in line with the SDGs, one must compare the MPI levels across time and identify which dimensions have experienced a significant reduction and which have not. [48] did a research on multidimensional poverty trends and levels in Africa south of Sahara and observed a statistically significant drop in multidimensional poverty in the sub-region. [47] used Multidimensional Poverty Index (MPI) data from 34 developing economies and conclude that multidimensional poverty has been decreasing. [37] country analysis on multidimensional poverty confirms that India and Cambodia experienced the rapid drop in MPI values. [49] examined data from 1999 to 2006 to establish trends of multidimensional poverty in India and concluded that an impressive drop in national poverty as well as all the dimensions have been realized. [50] identified transitory poverty in rural Ethiopia. [51] analyzed multidimensional poverty trends in Chad from 2003 to 2011 and came to the realization that multidimensional poverty has risen marginally. [52] applied harmonized intertemporal trends for data from 80 nations and observed that meaningful drop in multidimensional poverty in the form of dispossessing in health, education, and living standards has been obtained. Again, [53, 54], and [27] identified meaningful improvement in the multidimensional poverty indicators, as well as continuing drop in multidimensional poverty. Some studies have been conducted in Ghana on multidimensional poverty. Interestingly the researchers looked at only an aspect or a dimension of multidimensional poverty without comprehensively analyzing multidimensional poverty in all its elements. For instance, data from 2014 Ghana Demographic Health Survey was adopted by [39] to assess the levels of poverty among children and investigated the various groups which existed within the larger group of child poverty. [40] used global MPI to examine changes in impoverishment level for minors from 2010 to 2012, and the influence transfer of cash has on multidimensional poverty among children in Ghana. [41] examined whether rural farmers in Ghana should diversify their means of farming and income sources as a way of solving challenges to their economic circumstances and lessening their exposure to multidimensional poverty.

The effect of multidimensional energy poverty on mental health in Ghana was analyzed by [55] by adopting a two-wave socioeconomic survey. [42] assessed the connection between energy poverty and poverty and to establish whether households who are energy-poor are also income-poor, and the other way round by adopting multidimensional poverty measures. [56] examined the influence of energy poverty on human welfare of Ghanaians. [57] assessed how financial inclusion impacts poverty and those most likely to be exposed to poverty in Ghana, while [58] analyzed the impacts of welfare packages on financial inclusion and how it influences poverty in Ghana. The well-being of migrant and non-migrant workers in cocoa farms in Ghana was analyzed by [43] using multidimensional poverty index. The disaggregated values of global MPI was adopted by [59] to measure multidimensional poverty across ethnic groups in selected regions of developing countries.

Ghana, with the support from IMF has undergone through different programmes in the last forty years to eliminate poverty. Some of

these programmes are Structural Adjustment Programme (SAP) in 1983, Ghana Poverty Reduction Strategy, 2002-2004 (GPRS I), Growth and Poverty Reduction Strategy, 2005-2009 (GPRS II) and the Ghana Shared Growth and Development Agenda, 2009-2013 (GSGDA). The focus of all these is to quicken economic growth with the overall aim of alleviating poverty [60]. The Livelihood Empowerment Against Poverty (LEAP), Capitation Grant, School Feeding Programme, and the Free Senior High School Programme, are some of the social interventions instituted with the objective of lessening poverty faced by the disadvantaged population [35]. One District One Factory, Planting for Food and Jobs, the Nation Builders Corp, the Infrastructure for Poverty Eradication Programme (IPEP), among others are other poverty reduction intervention policies implemented by government ([8].

There are several dimensions to poverty which are depicted by low income, poor nutrition, poor health, no education, insecurity and so on. These different factors may combine in several forms to hold households or entire community in extreme poverty [35]. Following [5] and [61], this paper presents multidimensional poverty trends for Ghana by adopting Akire and Foster methodology which in essence is embedded in Sen's capability concept. The incidence and intensity of poverty as well as the driving forces behind these deprivations will be derived from this methodology. The government and all stakeholders will be informed about the appropriate support needed to bring the poor out of poverty.

Methodology

Conceptual Approaches for Determining Multidimensional Poverty

Multidimensional poverty can be determined using two main methods: marginal method and common or counting method [5]. The marginal method does not apply data found in the joint distribution achievements and therefore every data on links across dimensions are overlooked. [5] indicate that a marginal approach allocates equal degree of poverty to two matrices that provide equal marginal distributions. The marginal approach adopts a deprivation cutoffs procedure which finds persons deprived in a certain dimension. The information about the population is summed to derive a deprivation measure for all the dimensions. The problem about marginal approach is that it does not tell whether individuals are poor or not on a multidimensional level and as such does not align with Sen's identification criteria [4].

The counting method uses Alkire and Foster method [5] by applying a specific deprivation threshold to dimensions upon which individuals below are considered deprived. The counting method demands a specific deprivation cut-off for each indicator, indicating the lowest threshold necessary to be identified as not deprived [62, 63]. Two basic steps are involved; first define the dimensions and the deprivation cut-off, and secondly the poverty cut-off to determine who is multidimensionally poor. The key issue for calculating multidimensional poverty is to trace and analyze variations of MPI variables for a period.

The MPI index is obtained by a two-stage 'double cut-off' procedure [5]. Some minimum satisfaction level is associated with each indicator which is regarded as the deprivation threshold value, indicated as (zi). An individual (i) is considered deprived if his/her performance in an indicator (xi), is lower than the threshold value, thus, if $xi < zi$, the dummy variable *(Ii)* is 1; and if $xi \geq zi$, *Ii* is zero. Then, select the weights (w) for the 'indicators' which sum up to 1, i.e ($\sum_{i=1}^{m} w = 1$). Every dimension has equal weight of one-third and same weights apply to the indicators in each dimension. The computation of deprivation score *(ci)* is $\sum_{i=1}^{m} wiIi$, which falls between zero (0) and one (1).

The next step is to determine a definite cut-off, (k), which stands for the portion of weighted deprivations an individual must suffer before

regarded multidimensionally poor. An individual is classified as poor if $ci \geq k$, where k = 33.33 percent, indicating that an individual's deprivation should not be more than one-third of the weighted indicators before he/she is described as MPI poor. Again, ci(k), which represents the reviewed deprivation mark, is obtained as: if $ci \geq k, ci(k) = ci;$ if $ci < k, ci(k) = 0$ [62].

This study adopted Alkire and Foster method (AFM) which compares favourably as against marginal method. The AFM has the benefit of finding people who are multidimensionally poor by using their common deprivations. The AFM is clear and simple to understand and allows for easy comparison over time across countries and regions as compared with other multidimensional poverty measurement indices [38, 5]. This paper follows the footsteps of [46-49, 64] by adopting AFM in analyzing trends of multidimensional poverty in Ghana. The paper involves comparing the intertemporal trends of MPI and its components over a ten-year period using a time series data.

The absolute rate of change of poverty over a given time dimension is essential for comparison. Poverty change over two measurement periods could be because of changes in incidence of poverty (headcount) or intensity of poverty (mean deprivations) or a combined effect of the two [5]. This variation is measured using absolute change over the two periods or the percentage (relative) change over the periods [5]. The simple variation between two period's poverty is the absolute poverty [65]. In this study the four time periods for which data were gathered for analysis are denoted by t_1, t_2, t_3 and t_4 respectively. The same set of parameters are used to compute the trends for each dimension over the periods. The difference in MPI components for two subsequent periods is absolute rate of change and is calculated as:

$$\Delta MPI = MPI(X_{ij}t_2 - X_{ij}t_1) \quad (1)$$

Also, for incidence (H) and intensity (A): $\Delta H = H(X_{ij}t_2) - \mathrm{H}(X_{ij}t_1)$ and $\Delta A = A(X_{ij}t_2) - \mathrm{A}(X_{ij}t_1)$, where X_{ij} are achievement matrices and t_s are time periods [65].

The initial level is not relevant for measuring absolute change. For instance, a 5 percent drop in H values could imply a drop in H from 80% to 75% or from 25% to 20%.

Any variation in the components of MPI across subsequent time dimensions is assessed using relative rates. The relative rate of change on the other hand is the gap in poverty levels between two time periods expressed as a percentage of the former. This shows the proportion of poverty reduction achieved over the period [65]. Combining absolute and relative changes gives a better understanding of interpretation and analysis of the variations in various multidimensional poverty components at different time periods. The relative rate of change (δ) is calculated for the MPI components as well as for H and A as:

$$\delta\mathrm{MPI} = \frac{MPI(X_{ij}t_2) - MPI(X_{ij}t_1)}{MPI(X_{ij}t_1} \times 100 \quad (2)$$

Data

This section underscores the significant elements of the multidimensional poverty index and the datasets from which the trends in MPI components are estimated. Secondary data, mainly from UNDP databases ([28, 24, 26] as well as 2016/17 Ghana Living Standard Surveys (GLSS), 2011 and 2017/18 Multiple Indicators Cluster Surveys (MICS), and 2014 Demographic Health Surveys (DHS) conducted over the ten-year period (2011 – 2020) were gathered for the study. The UNDP and Oxford Poverty and Human Development Initiative (OPHI) have since 2010, produced an internationally comparable global MPI, which are used to measure multidimensional poverty [24, 34].

To ensure data reliability and comparability the time frame for the study was chosen to reflect the periods whereby large scale data was collected on human and social development through multiple indicator cluster surveys in 2011. The study focuses on the period starting around 2011 until the 2017/18 where the most

recent data was taken. These data points transcend period of MDGs into SDGs which all have poverty reduction as the core objective. The agenda for MDG 1 was universally agreed in 2001, the reference period however, dates to 1990. Measuring poverty trends using MDGs' adopting period is appropriate as the whole world measures poverty using the same standard. Again, data availability informed the choice of the time frame as it enables the utilization of all the data at the disposal of the researcher, whereas data on previous periods are either non-existent or limited.

The deprivation scores using global MPI are aggregated from the ten deprivation indicators to generate MPI [66] and adjusted headcount ratio *(M_0)* [5]. The deprivation score is used to find the poor, and the population estimates of the poor are obtained from sampled household surveys [66]. Where a person is deprived in at least one-third of the MPI indicators, he/she is classified as multidimensionally poor [24, 35, 65]. That is, where the weighted deprivation index mark of someone is 33.33% or more, that individual is counted as MPI poor, if 50% or more the individual is in severe poverty, and if the index falls between 20% and 33.33%, the person is vulnerable to poverty [7, 27, 34, 35, 37, 65].

The deprivation, made up of ten indicators are placed under three dimensions: health, education and living standards. The Millennium Development Goals (MDG) served as an inspiration for developing the deprivation dimensions and indicators [66], of which five indicators have been fine-tuned to meet the desires of Sustainable Development Goals (SDGs) [53, 65]. The indicators are expressed in binary terms taking the values of one (1) if the critical conditions are satisfied, and zero (0) if not satisfied [67]. For example, in terms of education, if no person in a household has finished a minimum of six years in school, that household is considered deprived and scores zero for years in schooling. Likewise, if a household has experienced death of a child under 18, five years before the survey, they score zero for child mortality, if not they score one. A household which shares or does not have a sanitation facility is said to be deprived in terms of sanitation and scores zero under that indicator. The other indicators are nutrition, school attendance, cooking fuel, drinking water, electricity, housing, and assets. The dimensions are given equal weights likewise the indicators within each dimension, signifying that equal importance is attached to every component of the multidimensional poverty.

Analysis of Data

Table 1 and Figure 1 present the deprivations of individuals in each of the indicators and the progress made over the study period. Overall, the MPI value dropped marginally by 0.04, from 0.153 in 2011 to 0.111 in 2020. In relative terms the drop is significant at 27.5%. This means that there is an overall fall in both the headcount and intensity of poverty in all the indicators over the period. Specifically, the contributions of the indicators to poverty reduction have been mixed. Nutrition, child mortality, years in schooling and school attendance are variables which contributed to poverty. Nutrition increased significantly with 3.7% in absolute terms from 2011 to 2020, but in relative terms the increase is 25%. Child mortality contributed marginally by 0.1% in absolute terms and 2.04% in relative terms over the ten-year period. Number of years in school and school attendance appear to contribute greatly to poverty. School attendance and years of schooling contributed 3.10% and 1.80% respectively to poverty. In relative terms school attendance and years in schooling contributed 35.6% and 10.6% respectively to poverty.

The other variables, cooking fuel, sanitation, housing, electricity, drinking water and assets contributed significantly to reducing poverty over the study period. In absolute terms, cooking fuel contributed 19.3%, sanitation 19%, housing 14.1%, electricity 18.2%, drinking water 12.9% and asset 9% reductions in multidimensional poverty over the ten-year period. The relative

drops have been phenomenal over 60% for each of the dimensions. Cooking fuel dropped 61.3%, housing 67.5%, sanitation 62.5%, electricity 77.1%, drinking water 67.5% and assets 69.2%. The significant reductions in these indicators resulted in significant drop in poverty headcount by 5.7% and poverty intensity by 2.8% at the same period.

The overall poverty headcount decreased from 31.8% in 2011 to 26.1% in 2020 and that of intensity of deprivation from 47.9% to 45.1% over the ten-year period. The trend analysis indicates that 2018 – 2020 performances followed the same pattern as that of the overall performance (2011 – 2020) with four indicators (nutrition, child mortality, years of schooling, school attendance) all experienced a rise in deprivations averaging about 47%, whereas (cooking fuel, sanitation, housing, drinking water, electricity and assets) experienced significant reduction in deprivations in these indicators averaging about 50%. In absolute terms, the headcount poverty rather increased by 1.40%, but the intensity of deprivation dropped marginally by 0.1%. From 2014 – 2018 all the indicators projected a drop except child mortality which increased marginally by 0.30% in absolute terms.

The average drop in deprivations was about 3% in absolute terms. In relative terms, electricity enjoyed the highest drop of 29.7% followed by school attendance 20.6%, asset 19.2%, housing 17.9%, years of schooling 16.1%, sanitation 15.6% and drinking water 14.6% in that order. Nutrition contributed the least of 1.6% drop in poverty. The MPI for the period also dropped by 13.85% in relative terms with a relative drop in headcount poverty by 13%. 2011 – 2014 saw a drop in deprivations in all the indicators except school attendance which saw a rise of 1.5% in absolute terms. Electricity experienced the highest drop in deprivation by 8.1% and child mortality experienced the least of 1.8%. In relative terms, the highest drop of 36.7% was experienced for child mortality and the lowest by 11.1% for cooking fuel. The MPI value, headcount poverty, and intensity of deprivation relatively decreased by 15%. 10.6%, and 4.6% respectively.

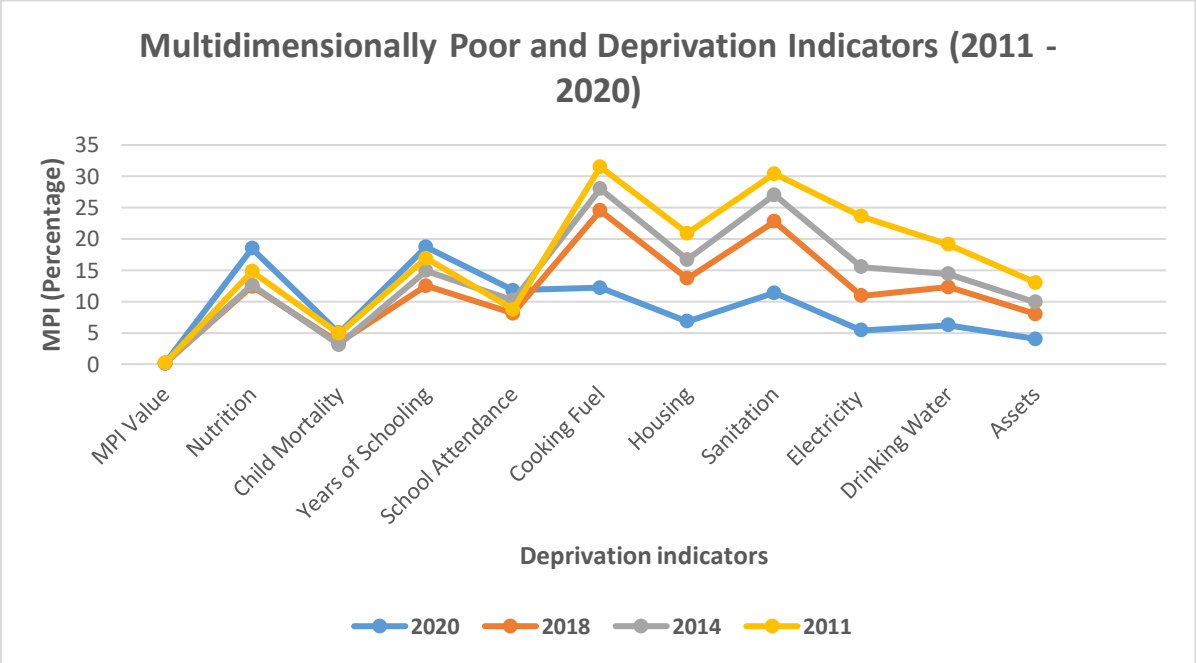

Figure 1. Multidimensional Poverty and Deprivation by Each Indicator

Source: Authors construct

Table 1. Multidimensional Poverty and Deprivation in Each Indicator

Multidimensional Poverty and Deprivation in Each Indicator												
	2020	**2018**	**2014**	**2011**	**abs. chg**	**rel. chg**	**abs. chg**	**rel. chg**	**abs. chg**	**rel.chg**	**abs.chg**	**rel. chg**
					2020 - 2018	**2020 - 2018**	**2018 - 2014**	**2018 - 2014**	**2014 - 2011**	**2014 -2011**	**2020 - 2011**	**2020 - 2011**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
MPI Value	0.111	0.112	0.130	0.153	0.00	-0.89	-0.02	-13.85	-0.02	-15.03	-0.04	-27.45
Nutrition	18.5	12.4	12.6	14.8	6.10	49.19	-0.20	-1.59	-2.20	-14.86	3.70	25.00
Child Mortality	5.0	3.4	3.1	4.9	1.60	47.06	0.30	9.68	-1.80	-36.73	0.10	2.04
Years of Schooling	18.7	12.5	14.9	16.9	6.20	49.60	-2.40	-16.11	-2.00	-11.83	1.80	10.65
School Attendance	11.8	8.1	10.2	8.7	3.70	45.68	-2.10	-20.59	1.50	17.24	3.10	35.63
Cooking Fuel	12.2	24.5	28.0	31.5	-12.30	-50.20	-3.50	-12.50	-3.50	-11.11	-19.30	-61.27
Housing	6.8	13.7	16.7	20.9	-6.90	-50.36	-3.00	-17.96	-3.40	-16.27	-14.10	-67.46
Sanitation	11.4	22.8	27.0	30.4	-11.40	-50.00	-4.20	-15.56	-3.40	-11.18	-19.00	-62.50
Electricity	5.4	10.9	15.5	23.6	-5.50	-50.46	-4.60	-29.68	-8.10	-34.32	-18.20	-77.12
Drinking Water	6.2	12.3	14.4	19.1	-6.10	-49.59	-2.10	-14.58	-4.70	-24.61	-12.90	-67.54
Assets	4.0	8.0	9.9	13.0	-4.00	-50.00	-1.90	-19.19	-3.10	-23.85	-9.00	-69.23
Poverty Headcount (H)	26.1	24.7	28.4	31.8	1.40	5.67	-3.70	-13.03	-3.40	-10.69	-5.70	-17.92
Intensity of Poverty (A)	45.1	45.2	45.7	47.9	-0.10	-0.22	-0.50	-0.22	-2.20	-4.59	-2.80	-5.85

Source: Author's construct

Table 2 and Figure 2 illustrate comparative analysis of performance of Ghana as against Sub-Saharan Africa (SSA) in terms of achievements in multidimensional poverty indicators. The overall MPI value dropped by 0.03% for Ghana in absolute terms and 19.6% in relative terms. For SSA the decrease was 0.01% in absolute terms and 4.4% in relative terms. Ghana performed better both in absolute and relative terms in reducing multidimensional poverty. The number of people in multidimensional poverty represented by headcount ratio dropped by 5.5% in absolute terms and 18.3% in relative terms for Ghana and 1.6% and 2.9% in absolute and relative terms respectively for SSA. Ghana therefore was able to reduce the headcount ratio by 3.9% and 15.4% in absolute and relative terms respectively over SSA. Ghana reduced its intensity of deprivation by 0.7% and SSA by 0.8% in relative terms. Ghana performed worse by 0.1% than the SSA region in absolute terms but better by 0.6% in relative terms. The SSA did not experience any change in inequality among the poor, but Ghana reduced the inequality in relative terms by 12.5%. Ghana and SSA reduced the number of people in severe multidimensional poverty by the same margin (2%) but in relative terms Ghana did better by reducing severe poverty by 13.2% than SSA region.

The population vulnerable in multidimensional poverty dropped 1.9% in absolute terms and 8.6% in relative terms for Ghana, whereas for SSA the drop was 0.8% in absolute terms and 4.5% in relative terms. Ghana performed better by 2.7% in absolute terms and 13.1% in relative terms.

Ghana rather increased the multidimensional poverty in health and education in absolute terms by 1.3% for health and 0.1% in education and 5.8% for health and 0.3% for education in relative terms. The SSA however decreased multidimensional poverty in health by 0.5% in absolute terms but increased the multidimensional poverty in education by 0.2% in absolute terms. Relatively multidimensional poverty in health dropped by 2.2% and increased in education by 0.7% for SSA. Ghana performed poorly in health but better in education than SSA region in both absolute and relative terms. The standard of living for Ghana improved by 1.3% in absolute terms and 2.7% in relative terms. The standard of living for SSA region rather worsened by 0.2% in absolute terms and 0.4% in relative terms.

The study further considered the proportion of the population living under the national poverty line and international poverty line of $1.90 per day. The findings were that Ghana did not experience any change in national poverty line but rather reduced the proportion of the poor under the international poverty line of $1.90 per day by 0.6%. The SSA rather reduced the proportion of the poor under national poverty line by 2.3% in absolute terms and 5.3% in relative terms. For international poverty line ($1.90) SSA dropped by 4.6% in absolute terms and 10.1% in relative terms. Ghana therefore performed badly in both national and international poverty lines as against SSA in both absolute and relative terms.

Table 2. Comparative Performance of Ghana and SSA in MPI Indicators

Multidimensional Poverty Index										
Data source (UNDP database)	**Ghana-2019**	**Ghana-2020**	**SSA - 2019**	**SSA - 2022**	**abs. chg**	**rel.chg**	**abs. chg -SSA**	**rel. chg-SSA**	**abs. chg (GH-SSA)**	**rel. chg (GH-SSA)**
	%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
MPI Value	0.138	0.111	0.299	0.286	-0.03	-19.57	-0.01	-4.35	-0.01	-15.22
Headcount (%)	30.1	24.6	55.0	53.4	-5.50	-18.27	-1.60	-2.91	-3.90	-15.36
intensity of deprivation	45.8	45.1	54.3	53.5	-0.70	-1.53	-0.80	-1.47	0.10	-0.06
inequality among the poor	0.016	0.014	0.022	0.022	0.00	-12.50	0.00	0.00	0.00	-12.50
Popu. In severity of MDP	10.4	8.4	32.9	30.9	-2.00	-19.23	-2.00	-6.08	0.00	-13.15
Popu. Vulnerable to MDP	22.0	20.1	17.9	18.7	-1.90	-8.64	0.80	4.47	-2.70	-13.11
Health	22.3	23.6	22.4	21.9	1.30	5.83	-0.50	-2.23	1.80	8.06
Education	30.4	30.5	29.3	29.5	0.10	0.33	0.20	0.68	-0.10	-0.35
Standard of living	47.2	45.9	48.4	48.6	-1.30	-2.75	0.20	0.41	-1.50	-3.17
National Poverty line	23.4	23.4	43.4	41.1	0.00	0.00	-2.30	-5.30	2.30	5.30
International poverty line ($1.90)	13.3	12.7	45.7	41.1	-0.60	-4.51	-4.60	-10.07	4.00	5.55

Source: Author's construct

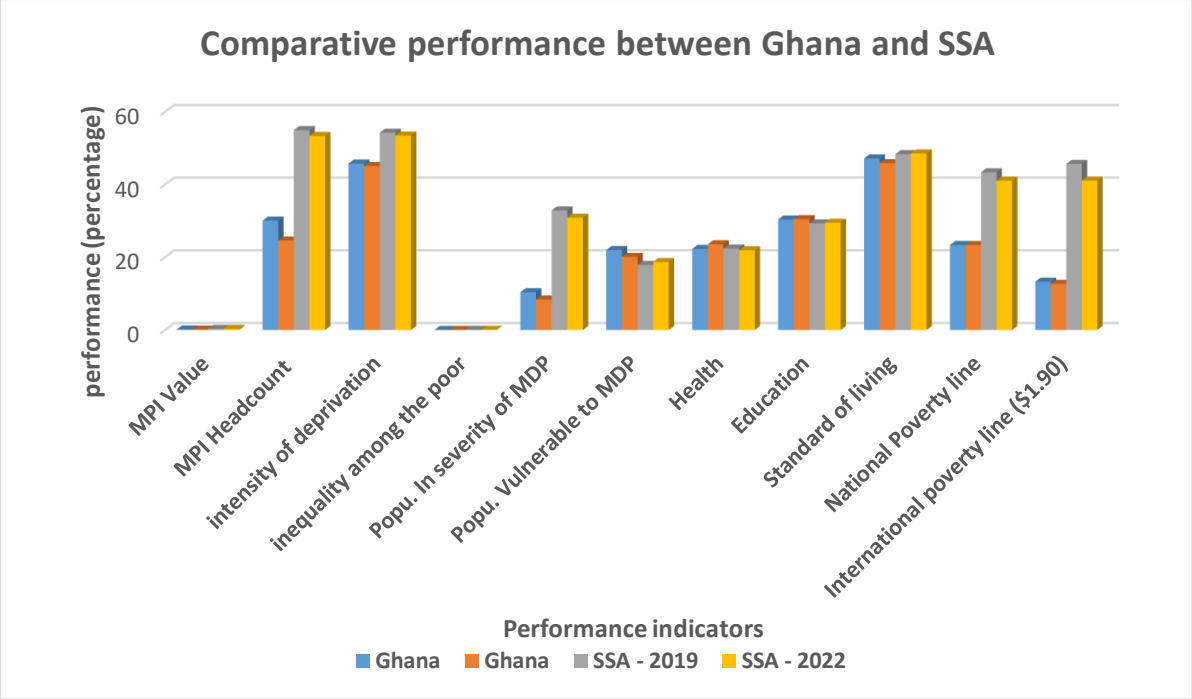

Figure 2. Comparative MPI Performance between Ghana and SSA

Source: Author's construct

Table 3 and Figure 3 on Regional MPI indicate that Ghana experienced a significant reduction of multidimensional poverty in all the administrative regions between 2011 and 2017 in both absolute and relative terms. This is consistent with [7, 24, 28, 26, 35]. The largest reduction of 19.3% in absolute terms was observed in Upper East region, followed by Ashanti (14.5%), Upper West (13.9%), Western (11.2%), Brong Ahafo (11.2%), Central (9.3%), Volta (6.8), Eastern (5.3%), Greater-Accra (4.7) and Northern (2.7%) in that order. Ashanti Region experienced the highest relative reduction of 31.8% followed by Upper East (22. 08%), Western (19.05%), Brong Ahafo (18.48%), Upper West (17.51%), Greater Accra (17.28%), Central (16.34%), Eastern (10.75%), Volta (10.46%), and Northern (3.23%) in that order. Northern Region, being one of the poorest region [35] and [7], has been the worst performer in both relative and absolute terms. This observation agrees with [50] who identify between 1999 and 2006 in India that, greater number of the poorest regions are sluggish in multidimensional poverty reduction. The government of Ghana should therefore strategize and target the poorest regions in the implementation of poverty reduction measures. Five regions (Greater Accra, Volta, Eastern, Northern and Western) performed poorly below the national average of 9.40% in absolute terms. In relative terms four regions (Volta, Eastern, Northern, and Central) performed below the national average of 17.09%.

Table 3. Regional Analysis of MPI

Regional Analysis of MPI %	**2011 (%)**	**2017 (%)**	**Absolute Change (%)**	**Relative Change**
Greater Accra	27.2	22.5	-4.70	-17.28
Volta	65.0	58.2	-6.80	-10.46
Eastern	49.3	44.0	-5.30	-10.75
Ashanti	45.6	31.1	-14.50	-31.80

BAR	60.6	49.4	-11.20	-18.48
Northern	83.5	80.8	-2.70	-3.23
Upper East	87.4	68.1	-19.30	-22.08
Upper West	79.4	65.5	-13.90	-17.51
Central	56.9	47.6	-9.30	-16.34
Western	58.8	47.6	-11.20	-19.05
National	55.0	45.6	-9.40	-17.09

Source: Author's construct

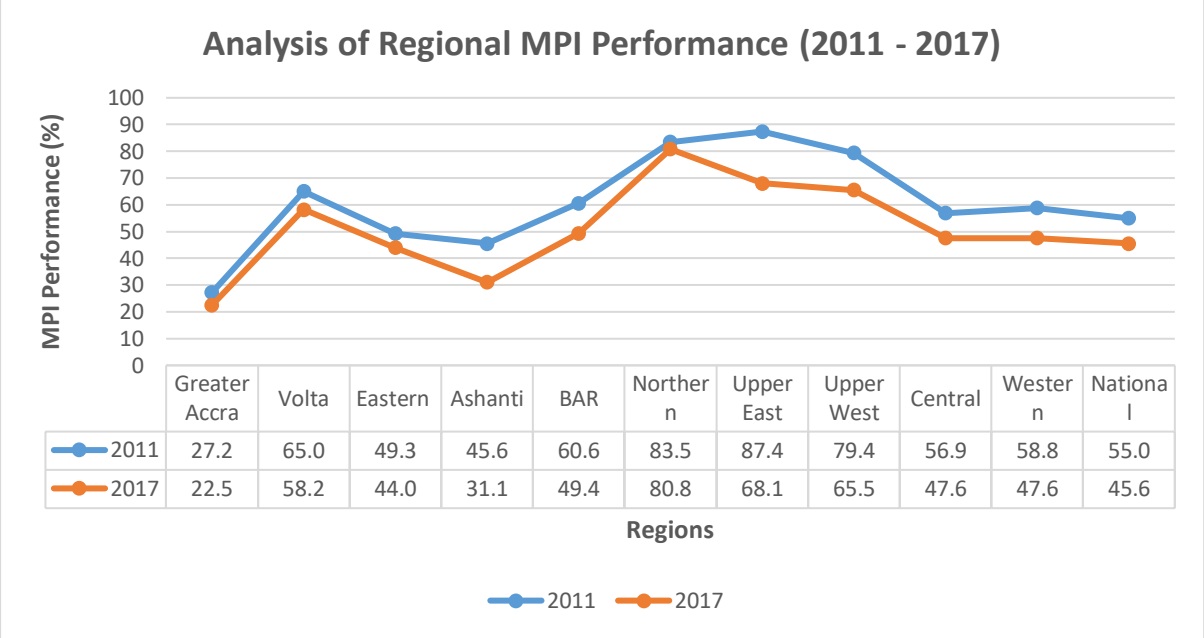

Figure 3. Analysis of Regional MPI Performance (2011–2017)

Source: Author's construct

Table 4 represents poverty cut-offs and their impacts on MPI. The poverty cut-offs of k = 33.33% indicates proportion of the population which are deprived in at least one-third of the indicators. The MPI is measured by poverty headcount (H) and intensity of deprivation (A). Poverty headcount (H) at k = 33.33% dropped by 5.5% in absolute terms and 18.3% in relative terms for Ghana, whereas for SSA poverty headcount decreased by 1.6% in absolute terms and 2.9% in relative terms. Ghana therefore reduced its headcount poverty by 3.9% and 15.36% in absolute and relative terms respectively as compared to achievements for SSA. The intensity of poverty (A) decreased by 0.7% in absolute terms and 1.53% in relative terms for Ghana and 0.8% in absolute terms and 1.47% in relative terms for SSA.

This implies Ghana did poorly in terms of absolute reduction in intensity of deprivation by 0.1% than the SSA but did better in relative terms by 0.06%. The population vulnerable to multidimensional poverty represented by cut-off value of k = (20% - 33.33%) dropped by 1.9% and 8.64% respectively for absolute and relative terms for Ghana and 0.8% and 4.47% in absolute and relative terms respectively for SSA. The achievement for Ghana was better than SSA by 2.7% in absolute terms and 13.11% in relative terms. Population in severe multidimensional poverty represented by cut-off value of k = / > 50% reduced by 2% just the same as that for SSA in absolute terms. In terms of relativity Ghana dropped by 19.3% whereas SSA dropped by 6.08% indicating a favorable variance of 13.15% for Ghana.

Table 4. Poverty Cut-offs and Impact on MP1

Incidence, Intensity, Vulnerability and Multidimensional Poverty Index (MPI)											
Data Source		**Ghana 2014 -DHS**	**Ghana 2017/18 - MICS**	**SSA**	**SSA**	**Abs.chg**	**Rel. chg**	**Abs. chg SSA**	**Rel. change SSA**	**Abs. change GHA-SSA**	**Rel. change GH-SSA**
	Index	**Value**	**Value**	**Value**	**Value**						
Poverty cut-off (k)	MPI	0.138	0.111	0.315	0.286	-0.03	-19.57	-0.03	-9.21	0.00	-10.36
	Headcount (%) (H)	30.10	24.60	55.00	53.40	-5.50	-18.27	-1.60	-2.91	-3.90	-15.36
k-value = 33.33%	intensity of deprivation (A)	45.80	45.10	54.30	53.50	-0.70	-1.53	-0.80	-1.47	0.10	-0.06
k-value = 20% - 33.33%	Population vulnerable to multidimensional poverty	22.00	20.10	17.90	18.70	-1.90	-8.64	0.80	4.47	-2.70	-13.11
k-value = /> 50%	Population in severe multidimensional poverty	10.40	8.40	32.90	30.90	-2.00	-19.23	-2.00	-6.08	0.00	-13.15

Source: Author's construct

Conclusion and Policy Implications

The overall aim of the study is to ascertain trends in reduction of multidimensional poverty in Ghana from 2011 to 2020 adopting Alkire and Foster method. The period of analysis was chosen because it falls within the period a comprehensive cross-sectional data on multidimensional data was first collected via a multiple indicator cluster survey in 2011. The study observed a general fall in multidimensional poverty over the period at both national and regional levels. This is consistent with the findings of [1, 7, 24, 26, 28, 30, 31, 33, 34, 35, 37, 50, 68, 69, 70] that developing countries have experienced downward trends in multidimensional poverty over the years. As a lower-middle income country, Ghana must put in much effort to alleviate poverty further irrespective of its nature across all the population groups by 2030 in line with Sustainable Development Goal 1 [26, 28, 32]. The decrease in poverty has not been even both in absolute and relative terms. The worst performance was experienced in the Northern Region which is the poorest of all the regions. Deliberate and conscious effort in investments targeting at poverty reduction should be instituted to reduce poverty in these areas [49].

Investments in agriculture and rural infrastructure and social services such as education and health are key in reducing multidimensional poverty as more than 80% of the people in the savannah regions engage in agriculture [7, 35]. Ghana performed massively well in the indicators within the standard of living dimension namely, cooking fuel, electricity, housing, drinking water, sanitation, and assets, perhaps because of general improvement of the per capita income of the people and fall in income poverty over the years. However, Ghana failed to reduce multidimensional poverty in education and health indicators.

There is the need to consciously invest heavily in education and health in order to cause a decline in multidimensional poverty. Investments in primary health care, health insurance, access to health facilities, expansion of school feeding programme, free senior high school, opening of more schools will improve access to education and health which will subsequently improve the well-being of the people, and hence their capacity to lift themselves out of poverty. Government must concentrate more on rural development as majority of the poor reside in rural areas and are employed in the agriculture sector [7, 26, 30, 31, 33, 35, 71] Comparison with the performance of the SSA region shows that Ghana outperformed the average performance of the sub-region in almost all the indicators and decreased its multidimensional poverty more than its counterparts in the sub-region. Government should sustain this feat and improve upon it to eliminate poverty in all its forms by 2030.

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Conflict of Interest

I Ofori Frimpong Henneh, the researcher do hereby declare that I do not have any interest whatsoever in relation to the publication of this research work.

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Anxiety and Depressive Disorder Admissions to the Georgetown Public Hospital Corporation's Psychiatric Outpatient Clinic - A Descriptive Study

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Abstract

The objective of this study was to determine the incidence of anxiety and depressive disorders at the GPHC POC 2019 -2021; and the percentage of these patients who were healthcare workers. This is a cross sectional study involving 3170 charts, 68 charts were identified for analysis. Variables were collected and the incidence of disorders calculated. Data was analyzed using Microsoft excel. The incidence of each disorder was as follows (the percentage of patients who were healthcare workers are listed in brackets): anxiety disorder - 2019 8% (32%), 2020 9% (15%), 2021 11% (18%); depressive disorders - 2019 13% (45%), 2020 17% (38%), 2021 16% (18%). Data for the health care group: 15% depressive illness and 9% anxiety illness. By sex: 2019 64% females, 36% males, 2020 46% females and 54% males, 2021 58% females and 42% males. By age group: 16-25 24%, 25-35 21%, 36-45 14%, 46-55 16%, >55 24%. Relationship status: 2019 68% single, 2020 69% single, 2021 55% single. Most affected: nurses 2019 31%, doctors 2020 38%, nurses 2021 36%. The incidence of anxiety disorders increased progressively during the years of the pandemic. The incidence of depressive disorders increased significantly in 2020 and then had a small decrease in 2021. In 2020, more doctors and males sought help than nurses and females. Nurses and females sought more help in 2021. Healthcare workers who were single, young, and completed tertiary level of education were most affected.

Keywords*: Anxiety disorders, Depressive disorders, Incidence, Healthcare workers, Pandemic.*

Introduction

The WHO in its constitution defines health as" a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" [1]. They also define mental health as "a state of well-being in which an individual realizes his or her own abilities, and copes with normal stresses of life, can work productively, and is able to make a contribution to his or her community" [2]. The implication being that mental health is more than simply the absence of mental disabilities. The mental aspect of heath is an often-overlooked feature of heath that is overshadowed by physical afflictions. Healthcare workers, especially, have been shown to pay little interest in their own mental health. Healthcare workers include physicians, nurses, dental professionals, medical and nursing students, laboratory technicians, emergency medical personnel, pharmacists, hospital volunteers, and administrative staff [3, 4]. Additionally, a healthcare worker may be anyone who delivers care and services, whether it be directly or indirectly, and may include medical waste handlers as well [5].

Sadness that is strong or persistent enough to impede functioning and, frequently, a loss of interest or enjoyment in activities is characteristic of depressive disorders [6]. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), classifies depressive disorders as: major depressive disorder, persistent depressive disorder

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(dysthymia), premenstrual dysphoric disorder, depressive disorder due to another medical condition, substance or medication induced depressive disorder, disruptive mood dysregulation disorder, unspecified depressive disorder, and otherwise specified depressive disorder. The DSM is a reference text used by psychiatrists for the diagnosis of mental disorders. A variety of environmental adversities such as job loss, marital difficulties, major health problems, and loss of close personal relationships are associated with a substantial increase in risk for the onset of depressive disorders [7].

Major depressive disorder (MDD) is a disease that is characterized by depressed mood, diminished interests, impaired cognitive function, and vegetative symptoms, such as disturbed sleep or loss of appetite [8]. It can also be described as a medical condition that includes abnormalities of affect and mood, neurovegetative functions, cognition, and psychomotor activity [9].

Dysthymia (also called persistent depressive disorder (PDD)) is defined by a chronic course (depressed most of the day, more days than not, for at least 2 years) and persistent symptoms (no symptom-free periods of longer than 2 months). PDD presents with the full gamut of depressive symptoms, although cognitive symptoms, affective symptoms, and social-motivational symptoms are usually more common than vegetative symptoms [10].

Premenstrual symptoms are a collection of psychological, behavioral, and physical symptoms that appear in women of reproductive age prior to menstruation and subsequently subside after the menstrual period. Most women only experience mild discomfort, and symptoms rarely affect their personal, social, or professional lives, however, 5 to 8% of women suffer moderate-to-severe symptoms that can result in major distress and functional impairment [11].

PMDD is characterized by depressed mood, anxiety, irritability, anger, and other symptoms occurring exclusively during the 2 weeks preceding menses. Other symptoms may include decreased interest in usual activities, difficulty concentrating, lethargy, fatiguability, or marked lack of energy, change in appetite, overeating, or specific food cravings, hypersomnia, or insomnia. It may also include other physical symptoms, such as breast tenderness or swelling, headaches, joint or muscle pain, a sensation of bloating, or weight gain.

The DSM-5 lists several types of anxiety disorders, and each are defined individually. These disorders include separation anxiety disorder, selective mutism, specific phobia, social anxiety disorder, panic disorder, agoraphobia, generalized anxiety disorder, substance/medication-induced anxiety disorder, and anxiety disorder due to other medical conditions [12].

Anxiety is marked by worry and symptoms that result from activation of the sympathetic nervous system. Common symptoms include trembling, nervousness, paresthesia, psychomotor agitation, increased heart rate, sweating, increased respirations and dizziness. Ruminations and preoccupations also occur.

Healthcare workers are chief among those most likely to experience mental health struggles. One important reason is related to poor working conditions and the Covid-19 pandemic, both causing work related stress, as well as inherent stigma towards mental health [3, 4]. Three out of four healthcare workers caring for Covid-19 patients had a depressive disorder, with two-thirds of those having severe symptoms. Predictors of depression include young age, female gender, decreased sleep hours, history of psychiatric illness, fear of infection or death due to Covid-19. These are also predictors of severity [13]. Protective and risk factors can be summarized as being intrapersonal, interpersonal, organizational. Commonly identified intrapersonal factors include age, sex, and sleep quality. The most common interpersonal factor was marital status, with prevalence being higher in the married

population. Key organizational factors predisposing to depression were the profession and specialty, long hours of work, including being on call, level of training, and levels of work experience.

Published literature has established that healthcare workers are increasingly susceptible to alarming levels of psychological distress, that may present as anxiety, emotional exhaustion, burnout, or depression. Documented prevalence of depressive and anxiety disorders among healthcare workers ranges from 21.53% to 32.77% in high income nations, much higher than those of the general population which was noted to be approximately 4.40% in 2015. One country reported a prevalence of depression among healthcare workers ranging from 22.00% to 45.30%, with males (76.10%) being affected more than females (70.10%) [14].

Work related stress mostly affects mental health, causing anxiety, burnout, depression, suicide attempts, and sleep disorders are becoming increasingly common among healthcare workers [15]. This is mediated to a great extends by the biopsychological vulnerabilities of the individuals and socio-environmental factors such as risk of exposure or being infected with Covid or other diseases, possibility of exposing family members to said illnesses, as well as being afflicted with different ailments [16]. Healthcare workers are faced with multiple sources of stress, including work intensity, workplace challenges relative to daily work, as well as family responsibilities, which may all affect mental health. Moreover, personal coping style and the presence of job-related burnout may also have an impact on levels of depression and anxiety among healthcare workers [17]. Poor mental health and wellbeing among healthcare staff has organizational implications for patient safety, experience, and satisfaction, in addition to financial costs, impact on productivity, and the direct effects on the individual [18]. High pressured working environments, heavy workload, long hours, limited resources, organizational restructuring, and a culture of blame and fear have all been implicated as contributory factors; all factors that have become increasingly salient within the context of the current global crisis [19]. With a grave impact on work productivity, patient care, staff attrition and turnover rates, a better understanding of existing relationships between work related stress, burnout, job satisfaction and general health of healthcare workers is required [20].

There are very few well conducted studies on the psychological distress faced by medical practitioners that it is difficult to formulate clear set recommendations on how to deal with them [21]. One study advocated for peer support networks and support groups, organizations to offer training modules about stress management, work-life balance, and early recognition of burnout [22]. Other studies recommend effective communication, tangible support from administrators, mental health screening with interventional facilities, curtailing misinformation and strict legal measures against violence or ill treatment of healthcare workers [16]. This study aims to add information to the existing literature. This study aims to identify the incidence of depressive disorders and anxiety disorders among admissions at Georgetown Public Hospital Corporation Psychiatric Outpatient Clinic (GPHC POC) during the period 2019 to 2021; and to determine what percentage of these cases are healthcare workers. A secondary objective is to examine the socio demographics of healthcare workers with a diagnosis of an anxiety or depressive disorder admitted to GPHCs POC during the period 2019 to 2021.

Methodology

Study Design and Population

This was a cross-sectional, descriptive type of study. Data was collected directly from the charts.

To this study, all categories of healthcare workers were included, with no exclusions or bias. The charts of all new patients admitted to

the clinic during 2019-2021 were analyzed and comprised the population. These numbers were used as the denominator in the formula that was used to calculate the incidence of depressive disorders and anxiety disorders during the period identified. Similarly, all new admissions with a diagnosis of a depressive or anxiety disorder were tallied, and these numbers used as the numerator in the formula.

After permission was sought and granted by GPHC and Ethics Review Board, this data was collected, tallied, and represented in a table as shown in the appendix. Deductive data analysis was then used to analyze the data by using Microsoft Excel, and the data represented graphically.

The formula used to calculate the incidence of depressive disorders and anxiety disorders amongst admissions at the GPHC psychiatric outpatient clinic per year is as follows:

(Total number of patients with a depressive or anxiety disorder in a given year/ the total number of admissions that year) x 100.

Variables: Registration Number, Age, Sex, Ethnicity, Religion, Education status, Migration status, Marital Status, Occupation, Category of Healthcare worker.

Inclusion criteria: All patients admitted between January 2019 to December 2021 at the GPHC Psychiatric clinic with completed charts.

Exclusion criteria: 1. All medical records that fall outside the January 2019 to December 2021 admission time frame. Incomplete records.

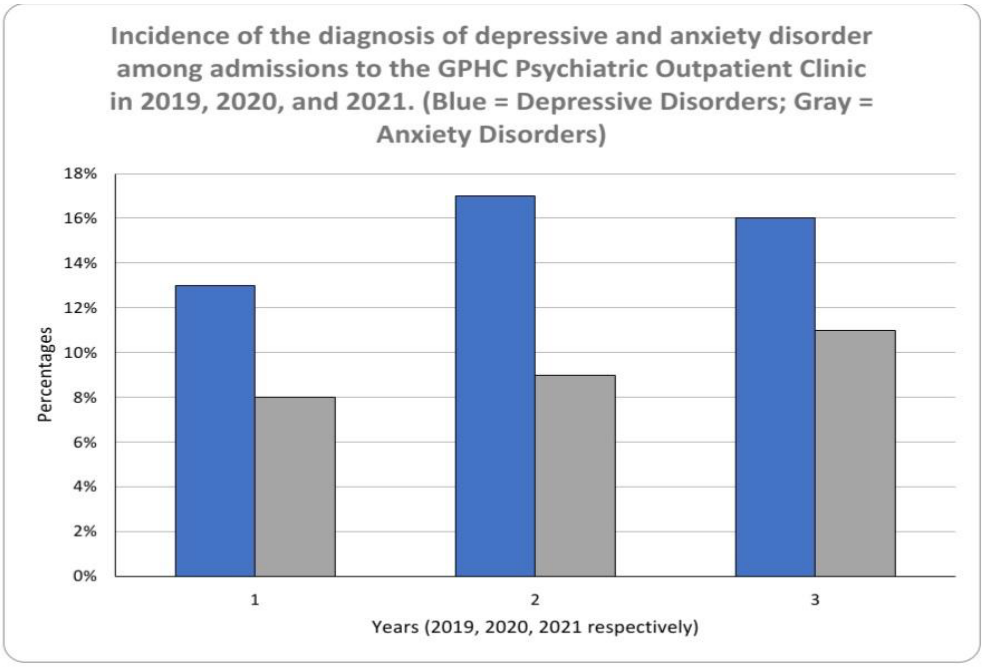

Figure 1. The Incidence of the Diagnosis of Depressive and Anxiety Disorder among Admissions to the GPHC's POC in 2019, 2020 and 2021

Results

Table 1. The Incidence of the Diagnosis of Anxiety and Depressive Disorders among Admissions to the Georgetown Public Hospital's (GPHC's) Psychiatric Outpatient Clinic (POC), and the Number of those that were Healthcare Workers

Year	Total number of admissions	#/% of Males	#/% of Females	# Of admissions with a diagnosis of depressive/incidence	# Of admissions with a diagnosis of anxiety disorder/incidence	Total # of healthcare workers	#/% of healthcare workers with anxiety disorder	#/% of healthcare workers with depressive disorder
2019	1163	563\48%	600\52%	156/13%	98\8%	22/2%	7/32%	10/45%
2020	918	437/48%	481/52%	152/17%	81/9%	13/1%	2/15%	5/38%
2021	1089	505/46%	584/54%	174/16%	114/11%	33/3%	6/18%	6/18%
Total	3170	1505/47%	1665/53%	482/15%	287/9%	68/2%	15/22%	21/30.8%

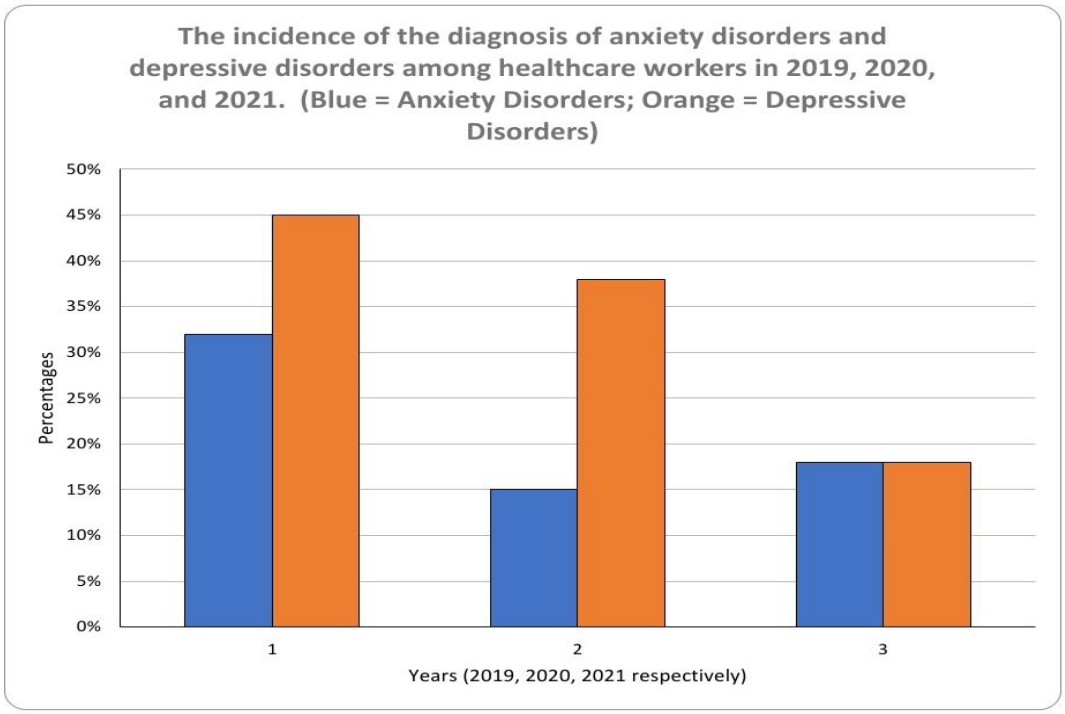

Figure 2. The Incidence of the Diagnosis of Anxiety Disorders and Depressive Disorders among Healthcare Workers Admitted to GPHC's POC in 2019, 2020 and 2021

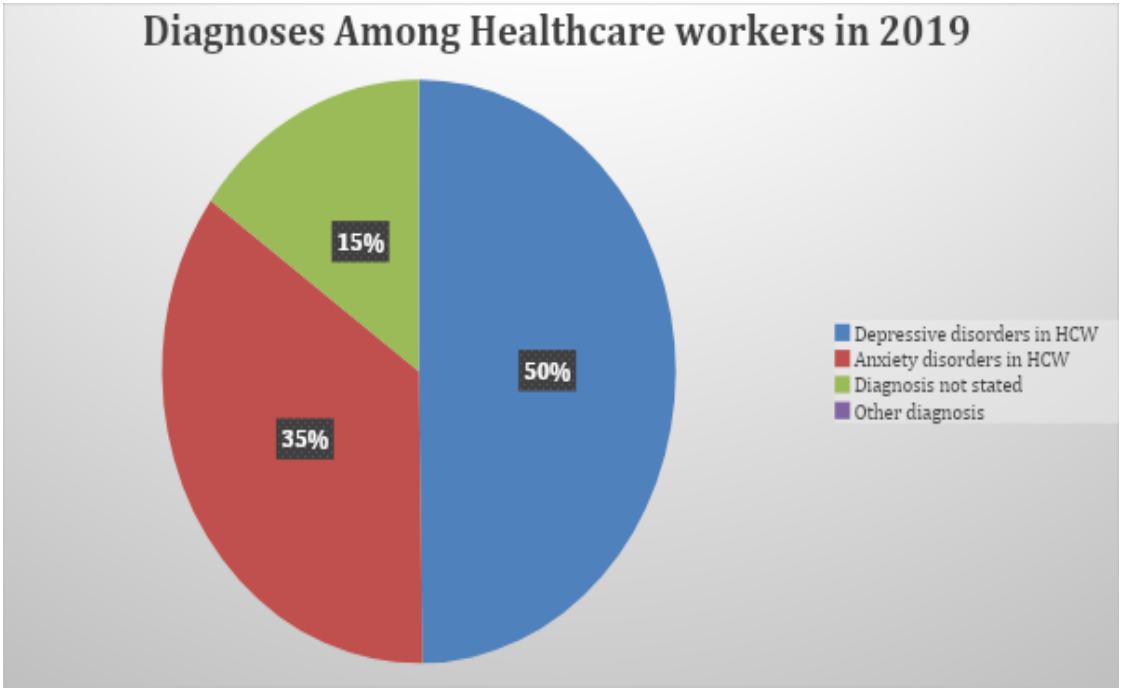

Figure 3. Distribution of Diagnoses among Healthcare Workers Admitted to GPHCs POC in 2019

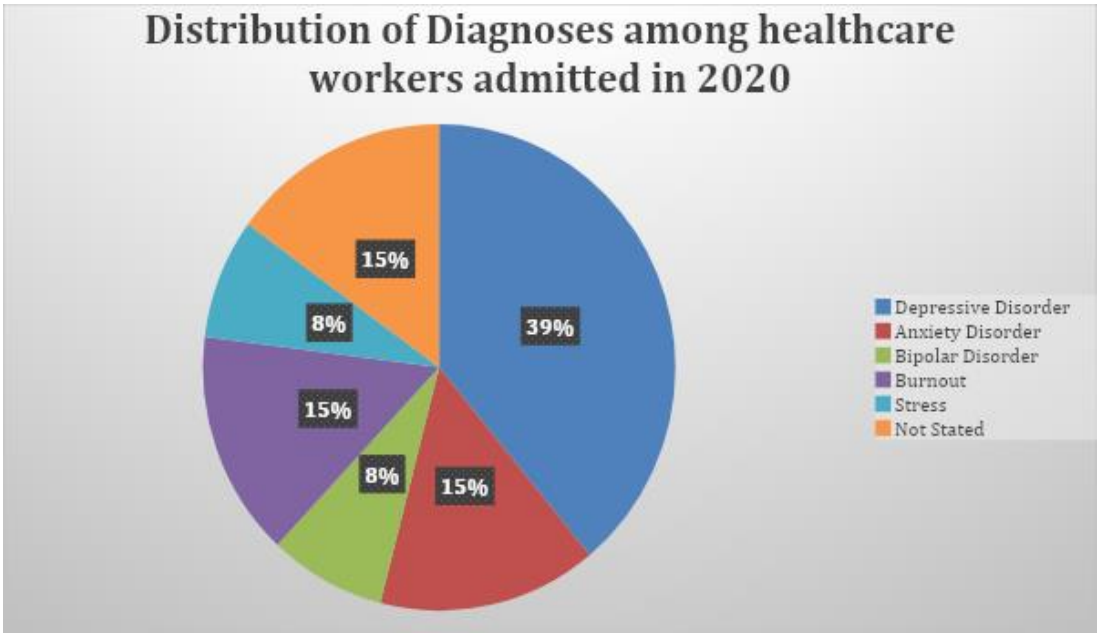

Figure 4. Distribution of Diagnoses amongst Healthcare Workers Admitted to GPHCs POC in 2020

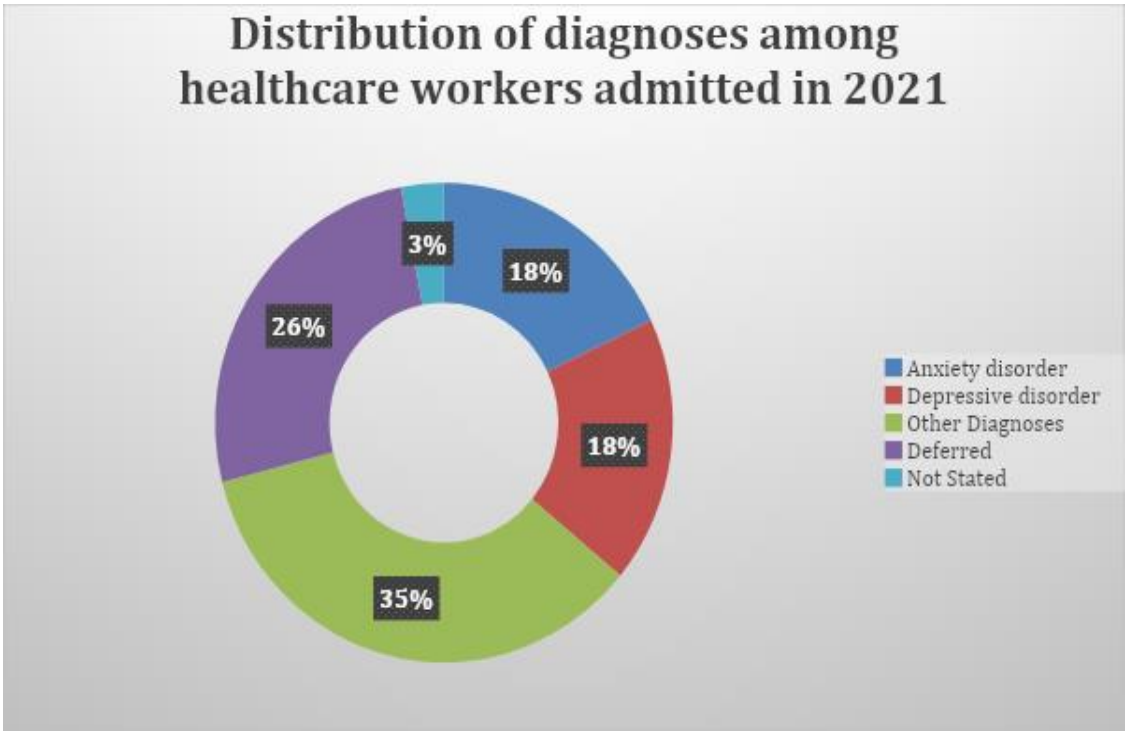

Figure 5. Distribution of Diagnoses amongst Healthcare Workers Admitted to GPHCs POC in 2021

Table 2. The Socio-demographics of the Different Classes of Healthcare Professionals Admitted to GPHC's POC in 2019

Year Total	Socio- demographics		Doctors	Nurses	Medical Students	Nursing Students	Opto-metrists	Medical Technologists	EMT	Dental Assistants	Dispensary technicians	Nursing Assistant	Medical Intern	Total
			4/18%	7/31%	2/9%	1 /5%	1 /5%	2/9%	1/9%	1 /5%	1 /5%	1 /5%	1 /5%	22
2019	**Age**	16-25	0	2/29%	1/50%	1/100%	1/100%	0	1/100%	1/100%	0	1/100%	0	8/36%
		26-35	2/50%	3/43%	1/50%	0	0	2/100%	0	0	1/100%	0	1/100%	10/45%
		36-45	1/25%	1/14%	0	0	0	0	0	0	0	0	0	2/9%
		46-55	1/25%	0	0	0	0	0	0	0	0	0	0	1 /5%
		>55	0	1/14%	0	0	0	0	0	0	0	0	0	1 /5%
	Sex	Males	2/50%	2/29%	0	1/100%	0	1/50%	0	1/100%	0	0	1/100%	8/36%
		Females	2/50%	5/71%	2/100%	0	1/100%	1/50%	1/100%	0	1/100%	1/100%	0	14/64%
	Ethnicities	African	1/25%	1/14%	0	1/100%	1/100%	1/50%	1/100%	1/100%	1/100%	0	0	8/36%
		East Indian	1/25%	1/14%	2/100%	0	0	0	0	0	0	0	0	4/18%
		Not Stated	0	2/29%	0	0	0	1/50%	0	0	0	0	1/100%	4/18%
		Mixed	2/50%	3/43%	0	0	0	0	0	0	0	1/100%	0	6/28%
	Marital Status	Single	2/50%	2/29%	2/100%	1/100%	0	2/100%	1/100%	1/100%	1/100%	1/100%	0	13/59%
		Married	1/25%	2/29%	0	0	0	0	0	0	0	0	0	3/14%
		Common law	1/25%	1\13%	0	0	0	0	0	0	0	0	0	2/9%
		Not Stated	0	2/28%	0	0	1/100%	0	0	0	0	0	1/100%	4/18%

Table 3. The Socio-demographics of the Different Classes of Healthcare Professionals Admitted to GPHC's POC in 2020

Year	Socio- demographics		Doctors	Nurses	Medical Students	Nursing Students	Optometrists	Medical Technologists	Nursing Assistant	Total
Total			5/38%	3/22%	1 /8%	1 /8%	1 /8%	1 /8%	1 /8%	13
2020	**Age**	16-25	1/20%	1/33%	0	1/100%	1/100%	0	1/100%	5/39%
		26-35	3/60%	0	1/100%	0	0	1/100%	0	5/39%
		36-45	1/20%	1/33%	0	0	0	0	0	2/15%
		46-55	0	0	0	0	0	0	0	0
		>55	0	1/33%	0	0	0	0	0	1 /8%
	Sex	Males	3/60%	0	0	1/100%	1/100%	1/100%	1/100%	7/54%
		Females	2/40%	3/100%	1/100%	0	0	0	0	6/46%
	Ethnicities	African	2/40%	1/33%	0	1/100%	0	0	0	5/38%
		East Indian	2/40%	0	0	0	1/100%	1/100%	0	4/31%
		Not Stated	1/20%	0	1/100%	0	0	0	1/100%	3/23%
		Mixed	0	2/67%	0	0	0	0	0	2/8%
	Marital Status	Single	3/60%	2/67%	1/100%	1/100%	0	0	1/100%	8/61%
		Married	1/20%	1/33%	0	0	1/100%	1/100%	0	4/31%
		Not Stated	1/20%	0	0	0	0	0	0	1 /8%

Table 4. The Socio-demographics of the Different Classes of Healthcare Professionals Admitted to GPHC's POC in 2021

Year	Socio- demographics		Doctors	Nurses	Medical Students	Nursing Students	Opto-metrists	Medical Technologists	EMT	Dental Assistants	Dispensary Technicians	Nursing Assistant	Medical Intern	Total
Total			7/21%	12/36%	2/6%	1 /5%	1 /5%	3/9%	2/6%	2/6%	1 /5%	1 /5%	1 /5%	33
2021	**Age**	16-25	1/14%	6/50%	1/50%	1/100%	1/100%	1/33%	1/50	1/50%	0	1/100%	1/100%	15/46%
		26-35	4/58%	3/25%	1/50%	0	0	2/67%	1/50%	0	1/100%	0	0	13/36%
		36-45	1/14%	1 /8%	0	0	0	0	0	0	0	0	0	2/6%
		46-55	1/14%	0	0	0	0	0	0	1/50%	0	0	0	2/6%
		>55	0	2/17%	0	0	0	0	0	0	0	0	0	2/6%
	Sex	Males	5/71%	3/25%	1/50%	0	0	1/33%	1/50%	2/100%	0	0	1/100%	14/42%
		Females	2/29%	9/75%	1/50%	1/100%	1/100%	2/67%	1/50%	0	1/100%	1/100%	0	19/58%
	Ethnicities	African	2/29%	4/33	0	0	0	2/67%	1/50%	2/100%	1/100%	0	0	12/37%
		East Indian	2/29%	3/25%	1/50%	1/100%	1/100%	0	0	0	0	0	0	48/24%
		Not Stated	2/29%	1 /9%	1/50%	0	0	1/33%	0	0	0	0	1/100%	6/18%
		Mixed	1/13%	4/33%	0	0	0	0	1/50%	0	0	1/100%	0	7/21%
	Marital Status	Single	3/42%	5/41%	2/100%	1/100%	0	1/33%	0	1/50%	1/100%	1/100%	0	15/46%
		Married	2/29%	3/25%	0	0	0	2/67%	0	0	0	0	0	7/21%
		Common law	2/29%	2/17%	0	0	0	0	0	0	0	0	0	4/12%
		Not Stated	0	2/17%	0	0	1/100%	0	2/100 %	1/50%	0	0	1/100%	7/21%

Discussion

The incidence of the diagnosis of anxiety disorders among admissions to the clinic were 8% in 2019, 9% in 2020 and 11% in 2021. For the incidence of the diagnosis of depressive disorders; these percentages were 13% in 2019, 17% in 2020 and 16% in 2021. Healthcare workers made up 2% of the population in 2019, 1% in 2020 and 3% in 2021.

This data illustrates that there was an increase in the number of patients seeking help for the first time for both anxiety and depressive disorder. This increase was more marked for depressive disorders. The number of patients newly diagnosed with an anxiety disorder increased continually through the pandemic. On the other hand, we had less patients newly diagnosed with a depressive disorder from 2020 to 2021.

Healthcare workers such as doctors, nurses, medical and nursing students, optometrists, medical technologists, dental assistants, and EMTs were admitted to Georgetown Public Hospital Corporation's Psychiatric Outpatient Clinic within the study period.

For healthcare workers visiting the clinic for the first time in the year 2019, 45% of them were diagnosed with a depressive disorder while 32% of them were diagnosed with an anxiety disorder. In the year 2020, 38% of the healthcare workers visiting the clinic for the first time were diagnosed with a depressive disorder while 15% of these patients were diagnosed with an anxiety disorder. In 2021, 18% of health care workers visiting the clinic for a first time was diagnosed with a depressive disorder and an equal percentage was diagnosed with an anxiety disorder.

Healthcare workers visited the clinic less in 2020, they accounted for only 1% of new admissions as opposed to 2019 and 2021 where they made up 2% and 3% of the admissions respectively.

For healthcare workers that did attend the clinic for the first time during the study period, the percentage of these patients diagnosed with an anxiety disorder dipped in 2020 to 15% and increased in 2021. When we look at those newly diagnosed with depression within this group this number steadily declined from 2019 to 2021.

The dip in numbers that occurred is 2020 may have been because of person's fear of the virus within Guyana and resultant social isolation. Health care workers would not have wanted to visit the psychiatric clinic. Initially there were a lot of patients who contracted Covid and died. Many of the staff were scared. Persons knew very little about the corona virus. This made people avoid hospitals for fear of contact with infected persons. Lots of departments operated with reduced staffing and staff remained in their assigned areas. The staff especially experienced this fear of the virus, and they were particularly afraid of infecting not only themselves but also their relatives. Staff would only seek help if it were absolutely necessary, as they would count this as an exposure. Psychiatry was a particular area of avoidance for staff because lots of psychiatric patients did not follow Covid protocols. The percentage of health care workers diagnosed with a depressive disorder was higher in 2019 and 2020 than those diagnosed with anxiety disorders. In the year 2021 the percentage was equal for both groups of disorders. This may be because depression may have caused more subjective distress and social occupational dysfunction than the anxiety disorders and so regardless of stigma or any other reason, depression would have been a major push factor to seek help.

Nurses accounted for most of the healthcare workers who visited the clinic for the first time during 2019 and 2021, whilst doctors were the most frequent in 2020. 2019 was a pre pandemic year. The number may have been increased for nurses in 2019 because they may have visited the clinic more than doctors during this period. The stigma attached to mental illness affects many doctors. Many doctors are financially able and prefer to seek help outside of the hospital, within a more private setting.

During the year 2020 patients infected by the corona virus were detected in Guyana for the first time. After the first case, many other cases appeared. Many doctors were transferred from their place of normal employment to areas designated only for Covid patients. Doctors were also required to work longer hours and be stationed at diagnostic centers. This would have had a negative effect on them. This might explain why doctors were most frequently affected in 2020. After 2020, the nurses would have been more involved in testing and management of infected patients. This added to their regular duties of patient care - cleaning, administration of medications, performing procedures; all of which increase exposure to body fluids and aerosols. This may have affected them negatively.

The incidence of these disorders among medical technologists remained quite stable. They handled samples of infected patients daily even before the pandemic. They were not involved in direct patient care as sample collection was done by doctors and nurses.

Within the group of health care workers, in 2019 and 2021 more females sought help than males. In 2020, more male healthcare workers sought help. This is significant as within each year the number of females seeking help for the first time was greater than the number of men for each year. So even though there were less men seeking help in 2020, there were still more male healthcare workers than female healthcare workers seeking help.

One contributing factor to the development of anxiety and depressive disorders identified by published literature was age. Though no particular age or range was identified in reviewed studies as being more common, data collected showed the younger demographic of healthcare workers (16 - 35 years of age) being affected most commonly as compared to the older population in the rest of the population. Reasons for this may include that younger healthcare professionals were less established in their fields of work, as such they were more readily reassigned during the early phases of the pandemic. Of note, some young doctors working in departments with low exposure risks were reassigned to Covid swabbing sites or to the ICU/transition/isolation wards.

A study of the marital status over the 3-year period showed in all years, a glaring majority of the admissions to the clinic being single. This contrasts with reviewed literature, which acknowledged marital status as a contributor, with chiefly the married population being affected. The years of the pandemic, 2020 and 2021 were a time of isolation. Humans were long referred to as social beings. With the closure of restaurants, theatres, malls, schools/universities, and some working environments came the challenge of home isolation. In those times of isolation, the single population would have been especially affected negatively as they would have been locked away by themselves in a time of uncertainty.

Conclusion

The incidence of anxiety disorders increased progressively during the years of the pandemic. The incidence of depressive disorders increased significantly in 2020 and then had a small decrease in 2021. Healthcare workers were more often diagnosed with depressive disorders. In 2020, more doctors and males sought help than nurses and females. Nurses and females sought more help in 2021. Healthcare workers who were single, young, and completed tertiary level of education were most affected.

Limitations

1. Incomplete records: since all required information may not have been recorded in the charts, the information gathered from the data may have been skewed.
2. Written records: quality of handwriting and the ability to decipher what is written left certain bits of information up to the readers' interpretation.
3. The medical fraternity is a close knit one. As such, medical practitioners may approach

their colleagues in the psychiatry department for assistance, with the insistence of being off the record. This also may have skewed the result.

Recommendations

1. The hospital should develop protocols, agreed upon by all departments, to govern the functioning of the hospital during a pandemic.
2. It should be agreed upon priori, the compensation that will be given to staff who sacrifice time and other aspects of their lives to assist during an emergency. This might entice persons to volunteer. If a person volunteers and is made to feel like they have more control over themselves in these situations, their level of distress will be less.
3. Team building exercises and safe spaces should be provided for staff to share experiences and provide emotional support to build better working relationships.

Conflict of Interest

The authors declare that there was no conflict of interest whilst conducting this study.

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Insertion of One-third Tubular Plate for Hemiepiphysiodesis in Children: Surgical Technique

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Abstract

Limb length discrepancy and angular deformities are among the main issues in paediatric patients. There are various ways to manage these two problems which includes growth modulation with eight-Plate. For certain reasons, the use of the eight-Plate is limited, thus conventional plates have been selected for the guided growth, for example two-hole one-third tubular plate or reconstruction plate. Literatures reported good results on its use but none of them explained the surgical technique in details. Therefore, we proposed the surgical technique of inserting the two-hole one-third tubular plate in hemiepiphysiodesis in children, which includes pre-skin incision preparation, placement of one-third tubular plate and screw insertion. The three steps are surgeon-friendly and less demanding, being suitable to apply to paediatric patients that require growth modulation.

Keywords*: Angular deformity, Hemiepiphysiodesis, One-third tubular plate, Limb length discrepancy.*

Introduction

Limb length discrepancy and angular deformity are common in children. In cases when the physis is still open with the remaining growth of more than two years, the treatment of these two conditions with growth modulation is famous among paediatric surgeons [1-20]. Less invasive, immediate weight-bearing, avoiding or delaying more invasive surgeries, early rehabilitation and minor and fewer reported morbidities are the advantages of the guided growth compared to bone lengthening or corrective osteotomy for limb length discrepancy and angular deformity, respectively [1-10, 12-15, 18].

Historically, the epiphysiodesis has been introduced to the medical field as early as 1933 by Phemister albiet with its own disadvantages [1, 6, 14, 19]. Since then, many others have refined it such as the first reversible technique using staples by Blount and Clarke, eight-Plate by Stevens and drilling using a low-speed high torque drill by Bowen [1, 6, 8-11, 13, 14, 18]. The reversible technique is widely accepted as it does not destroy the physis of the bones but rather just halts its progression [1]. The use of guided growth has evolved from the treatment of angular deformity to treatment of limb length discrepancy, coronal deformity and join dislocation [1, 4-5, 6, 8-10, 12, 15, 19].

The use of eight-Plate was popular among surgeons for growth modulation in children [1, 7, 18]. The implant design makes its surgery less demanding. In view of cost and availability issues, some authors alternatively used two-hole reconstruction plate or one-third tubular plate for the hemi epiphysiodesis [16]. As the latter plates have a different design from the original eight-Plate, therefore the surgical technique in putting the plate would also be different. To date, there have been no reports on this technique in detail. Therefore, we would like to propose the surgical technique in

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inserting one-third tubular plate for hemiepiphysiodesis of distal femur or proximal tibia in paediatric patients.

Methods

Patient was positioned in supine under general or spinal anaesthesia. A thigh tourniquet applied and inflated. The three main steps are:

Pre-skin Incision Preparation

Distal femur physis or proximal tibia physis were marked in both views (anteroposterior and lateral) with surgical marker under image intensifier (II) guidance. Another imaginary longitudinal line drawn on the skin that follows centre of the femoral or tibial shafts (midsagittal or lateral view), and intersected the distal femur or proximal tibia physis, respectively.

Placement of One-third Tubular Plate

A 3 cm skin incision made centred at the intersection point between the physeal line and the imaginary longitudinal line. Soft tissue dissection made until periosteum visualized. A small Kirshner wire (guide wire) was inserted into the physis (under II guidance) in midsagittal plane or slightly posterior to this plane to prevent recurvatum. After the guide wire confirmed in place, preliminary Kirshner wire inserted about 1cm proximal and distal to the guide wire correspond to the plate hole (Figure. 1a, 1b). Then, the guide wire was removed, and a 2-hole one-third tubular plate was slided in as deep as possible through the two preliminary wires until the periosteum (Figure. 1c, 1d). An additional Kirshner wire was inserted posterior to the plate to further stabilize and prevent it from migrating posteriorly while putting the screws (Figure 1e).

Screw Insertion

The epiphyseal screw was inserted first followed by the metaphyseal screw. A 2.5 mm drill used to create the entry point for the screw at the near cortex. A 4.0 mm cancellous screw was then inserted (without tapping step) into the two holes before sequentially tightened until the plate well hold on the bone surface. Once satisfactory placement of the plate and screws were achieved, the posterior wire was removed, and the surgical wound washed and closed in layers.

The placement of the 2 screws should be parallel to each either (Figure. 2a, 2b). The divergent of both screws always been expected as in the eight-Plate (Figure. 2c, 2d). Once the screws diverged maximally at about 30 degrees, the screw repositioned to be parallel if the effect of growth modulation still needed (Figure 3). The same surgical technique described above was used to do this revision surgery.

Results

The authors have used this technique for eleven sites of two-hole one-third tubular plate insertion involving three limbs with limb length discrepancy and three limbs with angular deformity. The inclusion criteria for this technique similar to those that require eight-Plate for growth modulation. Any two-hole non-specialized plate can use these three steps in putting the plate for hemiepiphysiodesis. There have been no wound complications apart from one screw loosening in three sites before the maximum divergent of screw. All patients were able to weight-bear after surgery and continue routine activities about 2 weeks after operation.

Discussion

The principle of eight-Plate in growth modulation is by applying the tension band plate principle [1, 6, 8, 16, 19]. Unlike staples that use physeal compression principle, the eight-Plate with non-rigid screw fixation would avoid this compression to the growth plate as the screws could angulate progressively while correcting the deformity [6, 9, 10, 20]. The use of these plates is safe as the risk of physeal arrest is low [6, 20].

The design of implant between eight-Plate and one-third tubular plate would be the main reason for difference in their surgical technique. The eight-Plate has feature of contoured waist and a centre hole for a temporary guide wire during plate insertion. The guide wire will be at the level of physis and putting this wire is very essential to ensure accurate placement of the eight-Plate. As for one-third tubular plate, it is a non-specialised plate with no hole at the centre. Its two-hole plate may mimic the eight-Plate and could be used for hemiepiphysiodesis in children as reported by Stephanie et. Al [8]. However, as there is no centre hole, the surgical step would be different from the usual eight-Plate insertion.

We proposed three surgical steps in putting one-third tubular plate for hemiepiphysiodesis (as described above). The pre-skin incision preparation is similar to the eight-Plate as well as for the screw insertion. After inserting the guide wire at the level of physis, this tubular plate could not slide on the wire as there is no centre hole unlike in eight-Plate. Therefore, another preliminary wire should be placed above and below to the guide wire (about 1cm distance) where the hole of the one-third tubular plate can slide and subsequently advanced to the bone surface [Figure. 1a]. The preliminary wires should be at the correct mid-sagittal plane as well as coronal plane in order to ensure the screws are at the appropriate level [Figure.1b]. After advancing the tubular plate on the bone, another temporary wire is necessary to stabilize the plate posteriorly before putting the first screw (epiphyseal screw) at the epiphyseal hole. This temporary wire should only be removed after the second screw (metaphyseal screw) have been inserted [Figure. 1c,1d and 1e].

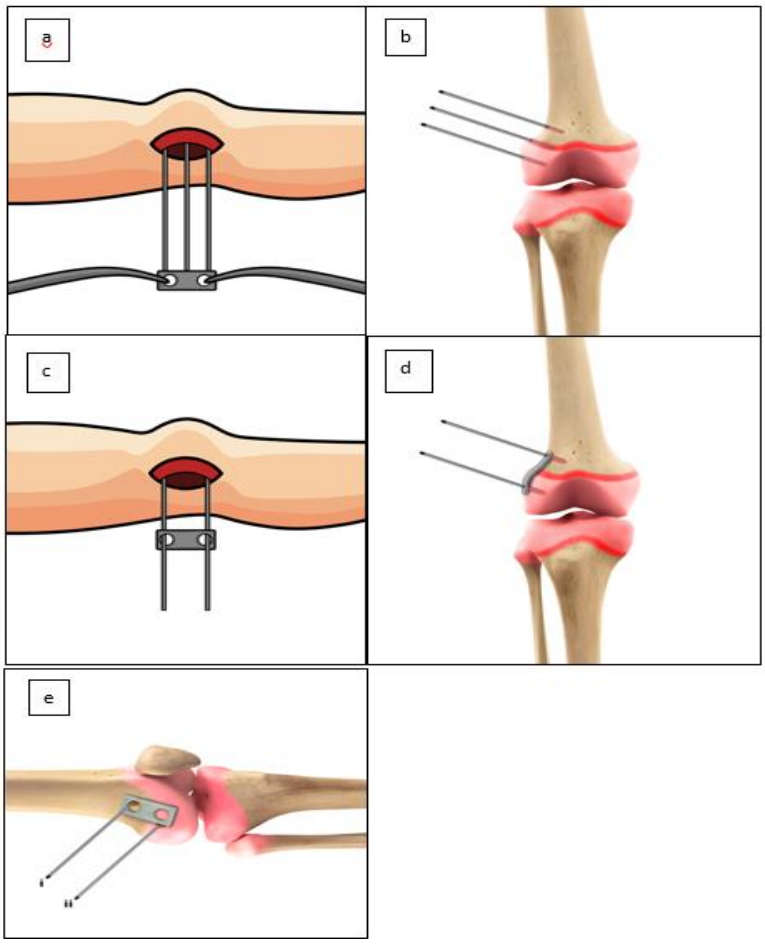

Figure 1. Steps of one-Third Tubular Plate Insertion Starting from K-Wire Positioning until Plate Placement

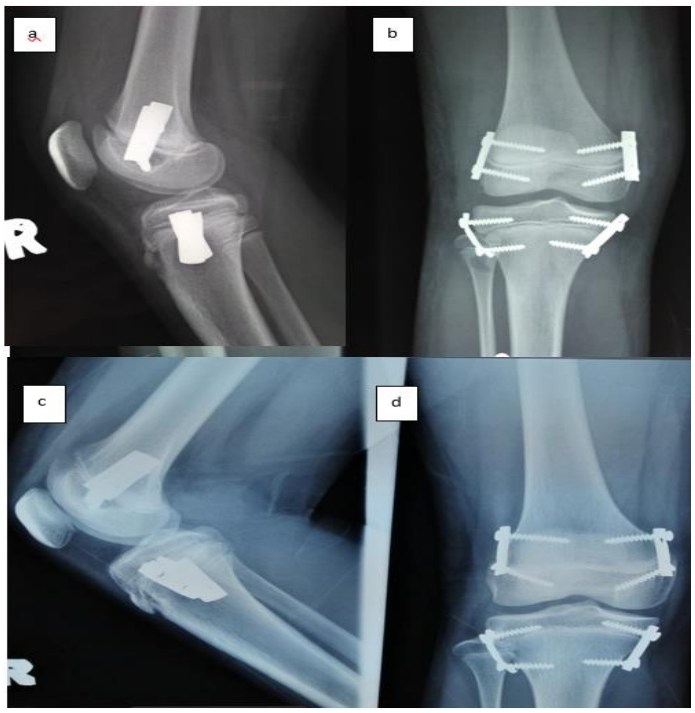

Figure 2. Day-1 Post-operative Radiograph and Post-operative Radiograph after One Year

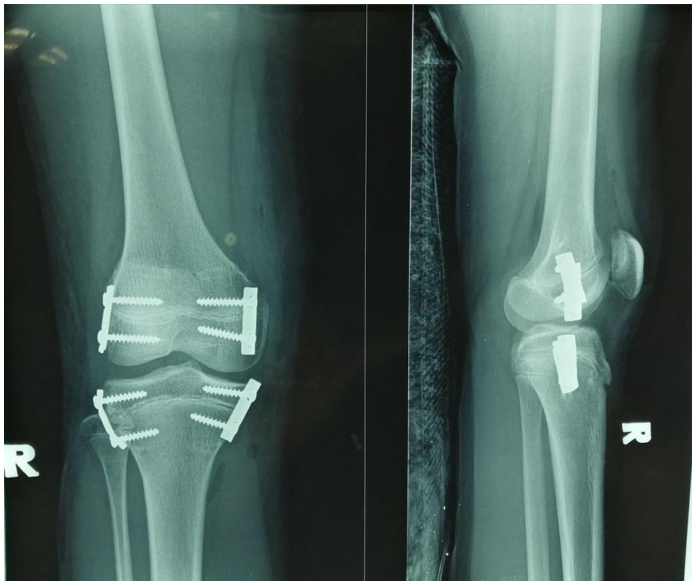

Figure 3. Radiograph Shows Parallel Screws after Readjustment

Conclusion

The specialized eight-Plate is relatively a straight forward surgery. The non-specialized plate (e.g one-third tubular plate & reconstruction plate) needs additional surgical steps before the plate can be nicely put on the bone surface. We believe the above proposed surgical technique is surgeon-friendly and less demanding, therefore we would like to recommend this technique to those who are planning to use non-specialized plate (e.g one-third tubular plate & reconstruction plate) for hemiepiphysiodesis in paediatric patients. It is not only for patients with limb length discrepancy but could also be used for those with angular deformity of limbs.

Conflict of Interest

The authors declare there is no conflict of interest.

Acknowledgements

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The Impact of Covid-19 on the Social and Emotional Wellbeing among School-Aged Children in Minnesota, USA

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Abstract

This research study investigated the impact of Covid-19 on the social and emotional wellbeing of school aged children in Minnesota, USA. The study adopted a descriptive survey research design in which school-aged children completed a questionnaire enquiring about the impact of the Covid-19 pandemic on their social and emotional wellbeing during the period. A sample of 400 school-aged children were randomized from a population of 955,000 school-aged children in the Minnesota metropolis. The first stage involved the population being stratified into male and female, public and private schools before a sample of 400 school aged children were randomly selected. Two instruments were utilized: The Social Well-Being Scale (SWBS) and The Emotional Well-Being Scale (EWBS). The result revealed a significant difference ($\beta = .223$, $t = 3.667$, $p < .05$) leading to the conclusion that there was a significant impact of Covid-19 on emotional wellbeing among school-aged children in Minnesota, USA. Also, there is a significant impact of Covid-19 on social wellbeing among school-aged children in Minnesota, USA ($\beta = .607$, $t = 12.301$, $p < .05$). Lastly, there was a significant positive relationships between Covid-19 and social wellbeing ($r = .607$, $p < .05$), Covid-19 and emotional wellbeing ($r = .223$, $p < .05$), and social wellbeing and emotional wellbeing ($r = .230$, $p < .05$). The following recommendation was made. School authorities and stakeholders should develop targeted interventions on promoting social connections, providing mental health support, and fostering resilience among children. Governments should implement preventive measures to ensure access to remote learning resources, promote health education and prioritize mental health and wellbeing as integral components of the education system.

Keywords: *Covid-19- Pandemic, Social Wellbeing, Emotional Wellbeing, School-Aged Children.*

Introduction

The current global health emergency due to Covid-19, has caused the world's population including children and adolescents, to change their lifestyles and behaviors, despite the initial conflict in understanding and adapting to the changes brought about by the emergency. Likewise, the entities in charge of health care, such as hospitals, clinics, non-governmental, and governmental organizations have had to carry out sanitary measures conditioned to the implications of the disease. For example, psychological care has been adapted to take into consideration the increase in mental health problems and thus the necessity for mental health care since the start of the pandemic.

According to [1], the Covid-19 is the disease caused by the novel coronavirus, also known as SARS-CoV-2, affecting mainly the respiratory system to produce respiratory insufficiency, in addition to acute respiratory distress syndrome, septicemia and septic shock, pulmonary thromboembolism and multiorgan failure. Other organs can be affected in addition to the lungs, which can cause heart, liver and kidney damage. The lethality of the disease is 2% compared to other diseases. Approximately 80% of people infected by it recovers, 15% deteriorate to a more

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serious condition, and 5% enter a critical state. Thus, the extent of the disease infection itself generates alarm and concern in the population [1].

Covid-19 is transmitted directly through contact with an infected person, specifically when a person hosts the virus at the moment of coughing, sneezing or speaking. Droplets that are released from the nose or mouth of a person with Covid-19 into the mucous membranes of another person can cause the other person to become infected. If an infected person touches a surface that has been contaminated with these droplets and makes direct contact with their eyes, nose or mouth, they can become infected [2]. This is why one of the first considerations has been the use of the mask as a medium of protection, in addition to maintaining a minimum distance of one meter between individuals. Recent studies indicate that the burden of the virus is improved when a distance of four meters is maintained [3], and constant washing or disinfection of hands is practiced [4, 5]. Children, adolescents, and adults are required to follow the same guidelines (quarantine and isolation) if there is a risk they have been exposed to the virus or have presenting symptoms [2].

Children and adolescents have specific physical and emotional care needs especially in adolescence when they are in a process of identity consolidation, search for independence and autonomy. At this life stage, the family plays a fundamental role for adequate development with fewer psychosocial risks [6]. In a UN policy report [7] on the repercussions of Covid-19 on the mental health of children, it highlighted how severe Covid-19 has affected the emotional state and behavior of children. In the case of children, the current crisis has directly affected their perspective of life and how they view the future. For example, a study in the United Kingdom reports that 32% of adolescents identified that the pandemic worsened their mental health [7]. The psychological response to Covid-19 depends on the age of the minor, and reaction to traumatic events or events that threaten his/her life or that of his/her family, making care necessary during and after confinement [8].

Covid-19 has a multifactorial impact on children and adolescents, triggered by stressors (which produce neuroinflammation and behavioral alterations), making these individuals more susceptible to developing a psychiatric disorder in the future [8]. Likewise, stress due to social isolation can induce greater food intake, and thus weight gain. As social beings, people need to create and maintain social ties. Unfortunately, the state of confinement does not allow attending schools, holding family or friendly meetings in a face to face format, but virtual connections.

Regarding the impact of epidemics on the health of parents, children and adolescents, it is of vital importance for governments to formulate policies that help develop strategies to face adversity [9]. A study conducted by [10] through an online questionnaire, determined that emotional reactions in school aged children are most prevalent during confinement (69.6%) and problems of sleep (31.3%), with behavioral reactions at 24.1%. The impact of Covid-19 on the routine and lifestyle of school aged children are enormous.

Likewise, [11] mentioned that this quarantine has mainly affected children and adolescents who have already suffered from a severe mental health condition, due to the special attention needed and the limitation of care services. [12] Concluded that the Covid-19 outbreak had a significant psychosocial impact in children and adolescents, emphasizing the need to address mainly the emotional distress and the presence of symptoms of anxiety and depression, with the possibility of developing other psychiatric disorders in adulthood. [13], through a systematic review determined that the most common diagnostic presentation during the Covid-19 pandemic is acute stress disorder, adjustment disorder, grief and post-traumatic stress disorder, which appears in the form of restlessness, irritability, anxiety, attachment and

inattention. In a study focused on children (5 to 11 years) and adolescents (12 to 17 years) residing in Canada, 1472 participants completed an online survey that evaluated the immediate changes in physical activity and gambling behavior during confinement by Covid-19. It was reported that there was a decrease in physical activity and sleep disorders during the outbreak [14]. This can be contrasted with a review in which it is mentioned that the impact of the outbreak should not only be addressed in terms of it being an infectious disease, but also the psychophysical impact due to the lack of physical activity and maintaining a balanced diet [15].

The Covid-19 pandemic has been a tragedy due to its health and economic consequences, and due to its strong impact on the mood and mental health of the population [16]. It is important to focus on a specific aspect of the impact of the pandemic on the population; its impact on the feelings, senses, and emotions experienced by people; that is, its subjective impact. Getting into the study of the impact of a socio-sanitary catastrophe such as the Covid-19 pandemic through the study of the emotions that it has generated in people, could seem an option too focused on the individual whereas it is a phenomenon whose main long-term consequences seem to be predominantly social. The emotions that human beings experience play a fundamental role in all social phenomena [17]. Sociologists of emotions have helped us, first, to understand what an emotion is, the countless number of existing feelings, and the great complexity of emotional processes. Secondly, they have revealed the social nature of human emotions, and the emotional nature of social phenomena. Thirdly, they have developed several theoretical approaches to studying emotions. And, lastly, they have carried out sociological analyses of many specific emotions; fear, trust, shame, and emotional analyses in many areas of sociology; gender, work, organizations, social movements [18]. In addition, integrating emotions into explanatory models of various types of collective behavior has been extremely productive, for example, to understand people's political behavior in its institutional participation dimension [19], as well as in their participation in protests or social movements [20]. Therefore, this research study sought to describe the impact of Covid-19 on the social and emotional wellbeing of school aged children in Minnesota metropolis. Considering the sanitary measures established for Covid-19 and the implication of said measures in the lifestyle of the population, the following hypotheses were tested:

1. There is no significant difference in the impact of Covid- 19 on the social wellbeing of school-aged children in Minnesota, USA.
2. There is no significant difference in the impact of Covid- 19 on the emotional wellbeing of school-aged children in Minnesota, USA.

Methodology

The research methodology utilized to investigate the effects of Covid-19 on the social and emotional wellbeing of school-aged children in Minnesota-USA was adopted from existing literary evidence and scientific research. The research methodology addressed the methods and procedures used in the study. These include research design, population, sample and sample technique, instrumentation, data collection and data analysis.

Research Design

The study adopted a descriptive survey research design in which school-aged children in Minnesota-USA will be asked to complete a questionnaire enquiring about the impact of the Covid-19 pandemic on their social and emotional wellbeing during the period.

Sampling Technique

The research utilized stratified random sampling. A sample of 400 school-aged children were randomized from a population of 955,000 school-aged children in the Minnesota metropolis. The first stage involved the

population being stratified into male and female, as well as public and private schools before a sample of 400 school aged children were randomly selected. This technique captured key population characteristics that were proportional to the overall population and was helpful in gaining detailed knowledge of the effects of Covid-19 on the social and emotional wellbeing of school-aged children in Minnesota-USA. The technique provided a clear criterion and rational for participant inclusion.

Data Collection Tools

Two instruments were utilized namely, The Social Well-Being Scale (SWBS) and The Emotional Well-Being Scale (EWBS). The Social Well-Being Scale (SWBS) was adapted from the Social Well-Being Questionnaire (SWBQ) which assesses how a person experiences his or her own social life and how this is related to the construct of social well-being [21]. The SWBS consists of 36 items in a 5-point Likert format, which consists of five categories. Strongly disagree (1), disagree (2), neither agree/disagree (3), agree (4) and strongly agree (5). On the other hand, The Emotional Well-Being Scale (EWBS) was developed by Portia and Shermila in 2015 for the purpose of measuring the emotional life of teacher participants. The EWBS contains 26 items in a 5-point Likert-type format with possible responses ranging from 1 = Strongly Disagree to 5 = Strongly Agree. Sample items on the scale include *in spite of physical and mental tortures in school/at work, I am calm and undisturbed,* and *I don't bother about ups and downs in my life.* The developer reported Cronbach's alpha coefficient of .83 which showed that the items on the scale are internally consistent with one another. Factor analysis was used to confirm the construct validity of the scale.

Data Collection

Data was collected using an electronic poll for the randomly selected participants. This was completed by the Primary Researcher and trained Research Assistant within 4 weeks. This study was criterion-based. Criterion sampling involves selecting cases that meet some predetermined criterion of importance [22]. Criterion sampling can help identify and understand information-rich cases and provide an essential qualitative component to quantitative data.

Data Analysis

Data was analyzed according to the following hypotheses:

1. Hypothesis one was analyzed using Independent –t –test.
2. Hypothesis two was analyzed using one way ANOVA.

Results

Hypotheses 1

There is no significant impact of Covid-19 on social wellbeing among school-aged children in Minnesota, USA.

Table 1. Coefficients of Simple Linear Regression Analysis for Impact of Covid-19 on Social Wellbeing

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	16.034	1.437	-	11.161	.000
	Covid_19	.714	.058	.607	12.301	.000

Dependent Variable: Social Wellbeing

Table 1 revealed significant results ($\beta = .607$, $t = 12.301$, $p < .05$). The null hypothesis is therefore rejected, while the alternative hypothesis is upheld, leading to the conclusion that there is a significant impact of Covid-19 on social wellbeing among school-aged children in Minnesota, USA.

Hypotheses 2

There is no significant impact of Covid- 19 on emotional wellbeing among school-aged children in Minnesota, USA.

Table 2. Coefficients of Simple Linear Regression Analysis for Impact of Covid-19 on Emotional Wellbeing

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.998	4.527	-	3.092	.002
	Covid_19	.669	.182	.223	3.667	.000

Dependent Variable: Emotional Wellbeing

Table 2 revealed significant results ($\beta = .223$, $t = 3.667$, $p < .05$). The null hypothesis is therefore rejected, while the alternative hypothesis is upheld, leading to the conclusion that there is a significant impact of Covid-19 on emotional wellbeing among school-aged children in Minnesota, USA.

Discussion

The finding of the first hypothesis was that there is a significant impact of Covid-19 on social wellbeing among school-aged children in Minnesota, USA. This suggests that the pandemic has negatively affected children's ability to connect with others and maintain social relationships, which is likely due to the disruptions in daily routines, limited social interactions, and increased isolation caused by the pandemic. The finding of a significant impact suggests that this issue should be a priority for policymakers, educators, and parents to address.

The Minnesota Department of Health has put up severe measures and recommendations to protect its residents against the impact of Covid-19. These recommendations include getting vaccinated, wearing a mask, getting tested, avoiding contacts, staying home if sick, maintaining ventilation, washing hands, and have access to treatment [23]. Specific policies have also been put in place by law makers and stake holders to address different entities and businesses operating in Minnesota that have been impacted by the Covid-19. These documents provides a list of guidance available for Covid-19 response [23].

The finding of the second hypothesis was that there was a significant impact of Covid-19 on emotional wellbeing among school-aged children in Minnesota, USA. This suggests that the pandemic has negatively affected children's mental health and emotional stability, which could be due to factors such as increased stress, anxiety, and uncertainty caused by it. This suggests that the pandemic has affected children's ability to socialize and interact with others, potentially leading to feelings of isolation and loneliness. This finding corroborated [10] report that children manifested negative emotional reactions such as sleep disturbance. The finding also supported those of [24, 25] who found that most children and adolescents infected with Covid-19 appeared to have mild to moderate symptoms of mental and emotional health problems such as anxiety, stress, depression, and panic disorder.

In the context of race, 44% Asian, 31% Black, 40% Latinx and 30% White students reported declining emotional health [26]. It was similarly observed that Black, Latinx and Indigenous communities as well as children with disabilities and refugee or immigrant communities experienced more significant negative effects of the Covid-19 pandemic [27].

Conclusion

Based on the findings of this study, it was concluded that the Covid-19 pandemic has affected children's ability to engage in social

activities, maintain relationships and experience a sense of belonging.

The pandemic has caused emotional distress and potentially affected their mental health and overall well-being. Furthermore, as the pandemic's impact increased, there was a corresponding decrease in both social and emotional wellbeing among school-aged children.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. School authorities and other stakeholders should develop targeted interventions focused on promoting social connections, providing mental health support, and fostering resilience among children.
2. Schools should collaborate with community organizations and resources to ensure comprehensive support for children's social and emotional wellbeing. This can involve partnerships with mental health professionals, community centers and youth organizations to provide additional support services, extracurricular activities, and safe spaces for children to express themselves and build social connections.
3. Governments and other stakeholders should, in order to minimize the impact of future pandemics or crises on children's wellbeing, implement preventive measures. This can include developing contingency plans, ensuring access to remote learning resources, promoting health education, and prioritizing mental health and wellbeing as integral components of the education system.
4. Regular monitoring and evaluation of the implemented interventions should be made by regulatory bodies to assess their effectiveness and make necessary adjustments. This will help ensure that the support provided meets the evolving needs of school-aged children and inform future interventions and policies.

Conflict-of-Interest Statement

The author whose name is listed immediately below certify that they have NO affiliation or involvement in any organization or entity with any financial interest. The author certify that the submission is original work and is not under review at any other publication.

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Factors Affecting the Success of an Organization: The Case of Zambian Breweries

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Abstract

The main purpose of this study was to assess the factors that affect the success of an organisation. A questionnaire was the main method used to collect data. Respondents answered to a survey that was distributed using the Google Forms platform. The survey found that Zambian Breweries' organizational structures enabled the management systems to efficiently run the company and boost production in order to help it reach its goals and objectives. Other systems that support the structure of the Zambian Breweries, make it possible to hire the right people for the right jobs and place them in the suitable required positions. The human resource policies and processes in place, the company was able to effectively carry out its strategic planning by having competent personnel and aligning their aptitudes, expertise, and talents to the needs of the Zambian Breweries. It was also found that the management's successful upkeep of internal communication, the staff were able to understand the short- and long-term goals as well as the direction the company was pursuing. Additionally, effective communication enabled personnel to receive timely feedback, boosting morale and enabling high performance even under tough conditions.

Keywords: *Organizational Structure, Communication, Strategy, Strategic Management, Leadership.*

Introduction

Management and leadership are significant concepts to understand since they are important decision-making processes that decide what should be done and how in groups and organizations [1]. There are many other types of groupings inside organizations, such as boards of directors, distinct departments, and project or work teams that contribute significantly to the organization's success. Additionally, organizations usually have both formal and informal groups that have a significant impact on employees' attitudes, ideas, behaviour, and activities linked to their jobs.

Decision-making and communication are two activities that have an effect on people in an organization, either directly or indirectly. Without communication, it would be impossible for businesses or organizations to achieve their goal of providing the appropriate people with the right information at the right time. As a result, efficient decision-making and communication are crucial for every business to succeed. It is essential to comprehend how these dynamics operate as well as potential difficulties and mistakes [1].

Although organizational improvements are a continuous process and each business has unique requirements, one of the requirements for organizational gains is employee engagement. Employees are engaged at different levels for example, a committee has been formed at the group level to offer a new perspective on diversity and inclusion, which are now part of Zambian Breweries' mission statement and aims. In addition, Zambian Breweries' human resources department has implemented anti-harassment and anti-discrimination policies and

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continues to track the gender balance in the hiring process [2].

Despite having a monopoly on the production and distribution of lager in Zambia, Zambian Breweries today faces increased competition from foreign alcoholic beverages. Annual reports from numerous Zambian Breweries mention business performance issues. For instance, throughout the six-month period ended June 30, 2020, Zambian Breweries Plc reportedly experienced huge losses totalling over K15.5 million. The significant depreciation of the kwacha against the key convertible currencies, which increased the company's debt load and raised manufacturing costs, was the main contributor to the losses. The company asserted that it was still well-positioned for a rebound due to its strong cash position, commitment to cost control, and financial discipline [3]. Hence, the study to know the factors that affect the success of an organisation such as Zambian Breweries.

Literature Review

A strategy is "management's action plan for running the business and executing operations" [4]. A company's strategy "consists of the competitive movements and business techniques that managers are utilizing to expand the business, acquire and satisfy consumers, compete successfully, conduct operations, and attain the goal levels of organizational performance" [4]. Strategic management consequently includes a range of activities such as environment scanning, strategy design, strategy implementation and monitoring, assessment, and review of the implementation process in order to ensure the effective and efficient attainment of business objectives.

A strategy is a pattern or plan that incorporates the primary objectives, guiding principles, and operational procedures of an organization. An effective strategy helps an organization organize and allocate its resources into a clear and workable posture based on its unique internal capabilities and limits, anticipated environmental changes, and probable moves by competent competitors [5].

Businesses can now identify parts of their plans that need improvement, align those areas with functional competences, and assess those areas in relation to the original strategy, if one was ever developed [6]. Organizations must ensure that a process of scanning the internal and external environments of the firm has been carried out while developing and reviewing these strategic options. They will be better able to understand the environment in which they are acting as a result.

One strategy is to try to achieve first-mover advantage or becoming the first company to market a new product, process, or service, given the speed of technical improvement and innovation as well as the expansion of the knowledge-based economy [7]. Even though innovation is likely to require a sizable investment of resources, it can result in the ability to create market operating standards, seize any scarce or limited resources needed, improve brand reputation, and be perceived as the market leader in consumers' minds, secure/establish a customer base by imposing buyer switching costs like contract terms, and more [8]. However, there are drawbacks to such a tactic, depending on how effective any following isolation measures are [9]. Competitors may strive to copy the technological advancement that has already been made. Additionally, they might focus on what the creative organization did badly and profit from any ensuing client displeased [10].

Once a competitive advantage is acquired by innovation or imitation, rivals may quickly erase it [11]. A corporation can maintain a competitive edge for a long time by erecting barriers that protect it from market forces, as opposed to constantly changing its operational and business strategy methods, which may be unreliable and incoherent. Isolating mechanisms may deter rivals from imitating how a company maintains its competitive advantage, slowing the rate at which resource values depreciate [9]. Other

researchers agree with this theory as well. Social scientists have now expanded on Chandler's thesis, arguing that an organization's strategy determines its surrounds, resources, and tasks [12]. The organizational structure of a firm refers to the formal agreements made between individuals and groups regarding the division of duties, responsibilities, and power. Along with growth rates and power dynamics, these factors also have an impact on organizational structure [13]. Organizations exist to accomplish goals. Tasks are created from these objectives as the building blocks of work. Departments are used to organize jobs. Organizational departments can be divided into categories using terms like marketing, sales, advertising, manufacturing, and others. Employees in each department perform extremely distinct tasks from one another. The organizational structure is made up of departmental links and is tailored to achieve its environmental goal [14].

Method

Although there are several organisations, businesses, and professionals who approach data analysis in diverse ways, data analysis maybe summed up in one general description. Data analysis is the process of modifying, evaluating, and cleaning raw data to produce important, valuable information that aids in business decision-making. The risk associated with decision-making is decreased since the procedure's critical data and insights are routinely given via charts, drawings, tables, and graphs [15]. The replies submitted by the various respondents were processed using the Google Forms platform, and the Microsoft Excel programme was then used to assess the outcomes.

Target Population

A sample of 17 replies was acquired by email from the Zambian Breweries Plc headquarters, located at Plot 6438, Mungwi Road, Lusaka, Zambia, after a survey was created on the Google Forms platform.

Instruments for Data Collection

The questionnaire was the main method used to collect data. 17 persons answered to a survey that was distributed using the Google Forms platform. A questionnaire is "a form that people fill out used to obtain demographic information and the opinions and interests of those questioned [17]. It can also be defined "method for the elicitation, recording, and gathering of information" [18]. The fact that data is gathered from a wide sample and from various places is one of questionnaires' benefits. Utilizing surveys also upholds confidentiality. Comparing a questionnaire to an interview also saves time.

The journals and other reliable published sources were reviewed for secondary data. As was stated in the section on the literature review, these studies have been done all over the world. By examining the numerous studies that have already been conducted, it is possible to compile data that is accurate and thorough in connection to the research subject.

Data Analysis Technique

Utilising Google Forms, data analysis was performed. The straightforward, user-friendly interface of Google Forms is one of its main benefits. With Googlanotherms, creating forms and surveys is quick and easy without the need for coding or another specialised knowledge. You can modify your form using Google Forms, which offers a variety of pre-built templates from which to choose, to meet your specific needs and brand. It takes less time to construct a form with all the relevant fields, including name, email address, and job title, and to customise the form's layout to reflect your brand because of the user-friendly interface. The real-time tracking and response analysis features of Google Forms are another important benefit. You may review and analyse the data as soon as someone fills out your form or completes your survey, providing you immediate insights into the ideas, viewpoints, and preferences of your audience. This study's primary goal was to

evaluate the elements that contribute to an organization's success.

Rationale of the Research

The rationale of the research is to pinpoint elements that affect a business's operation and provide helpful data for strategic planning at Zambian Breweries. Making decisions with greater attention and knowledge can be facilitated by this strategy.

Ethical Considerations

Absolute truthfulness is a fundamental ethical principle; scientists cannot and should not make up data to further their own goals. In essence, this shows that being honest is the most important requirement for any investigation. In order to obtain truth—rather than the researcher's own reputation—the researcher must own up to his or her faults, and this form of honesty must be recognised [19]. Since the respondent is the major subject of the study, any ethical issues they may have been quite important. Studies that concentrate on private data, such as person's marital status or religious convictions, are more zealous about respecting the privacy of those individuals. As a result, the researcher took care to ensure that no information was disclosed during the research without the respondent's permission.

Results and Discussion

The study took into account three factors—membership, board of directors, and executive directors—that affect association at Zambian Breweries. Respondents were graded on how well they understood the challenges affecting member association at Zambian Breweries. The results were as follows: 41.2% said that members' grasp of association-influencing issues was fair, 29.4% said that members' comprehension was good, 23.5% said that members' understanding was very good, and 5.9% said that members' understanding was very poor. The outcomes are depicted in Figure 1

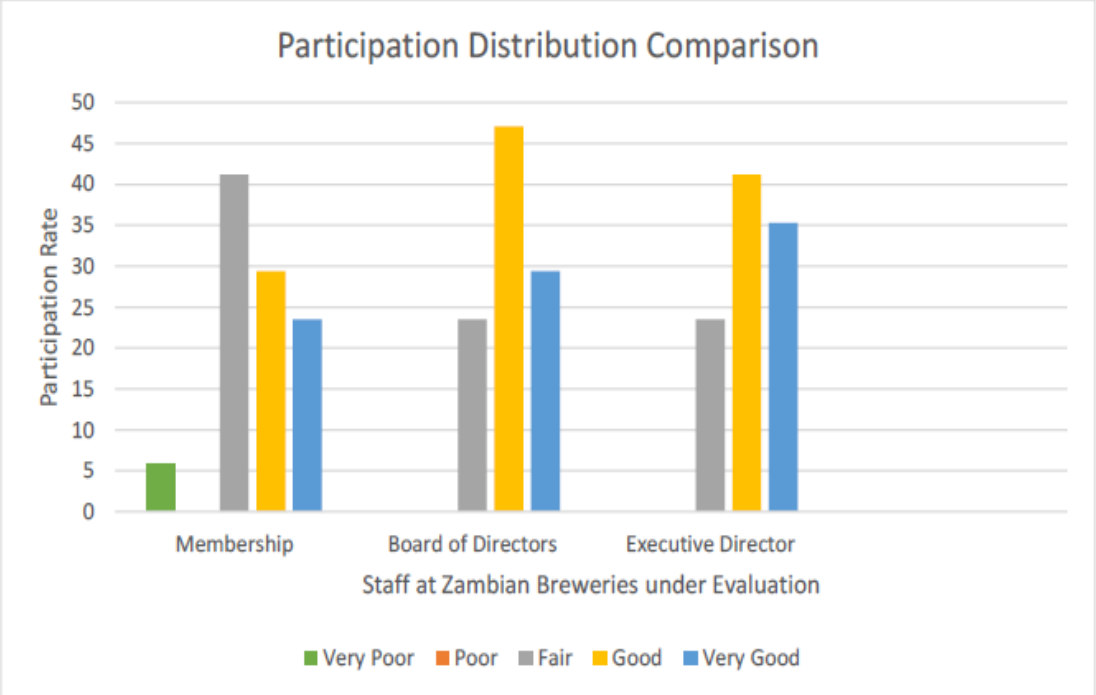

Figure 1. How Well do Membership, BOD and Executive Director Understand Problems that Affect Association of Members at Zambia Breweries

Employee engagement is one of the prerequisites for organizational benefits, despite the fact that organizational improvements are a continual process, and each firm has specific requirements. A committee has been formed at the group level to bring a fresh perspective on

diversity and inclusion, which are now part of Zambian Breweries' mission statement and goals. This is just one example of how employees are involved at different levels. The human resources division of Zambian Breweries has also put anti-harassment and anti-discrimination rules into place and is still keeping tabs on the gender balance in the employment process [2].

Additionally, respondents were asked how well they believed the Board of Directors (BOD) understood the problems that affected the association of the members at Zambian Breweries. According to the responses, 47.1% of the BOD had a good awareness of the challenges affecting association, 29.4% had a very good understanding while 23.5% of the BOD had a fair understanding of problems affecting association of the member at Zambian Breweries. The outcomes are depicted in Figure 1. The BOD and senior management are in charge of directing the governance system at Zambian Breweries. This includes approving business strategy, reviewing performance in regard to KPIs and the budget, and keeping an eye out for significant infractions of the company's code of business ethics [2].

In addition, respondents were asked how well they believed the Executive Directors understood the problems that affected the association of the members of Zambian Breweries. According to the responses, 41.2% of respondents felt that the Executive Directors had a good understanding of the difficulties affecting associations, 35.3% said that the Executive Directors had a very good understanding, and 23.5% thought that the Executive Directors had a fair understanding. The outcomes are depicted in Figure 1. To ensure that no one person has sole power over decisions, the Board has authorized a written Delegation of power document that specifies the distribution of responsibilities between the Board Chair and the Country Director [2]. The Board continues to have final say over company decisions, strategic planning, capital investments, annual budget approval, asset sales, and borrowing. Regarding Zambian Breweries' decision-making process, respondents were questioned about how they thought the company handled issues that affected it. According to the responses, 52.9% thought the decision-making process was good, 23.5% thought it was fair, and the remaining 23.5 thought it was poor. The outcomes are depicted in Figure 2.

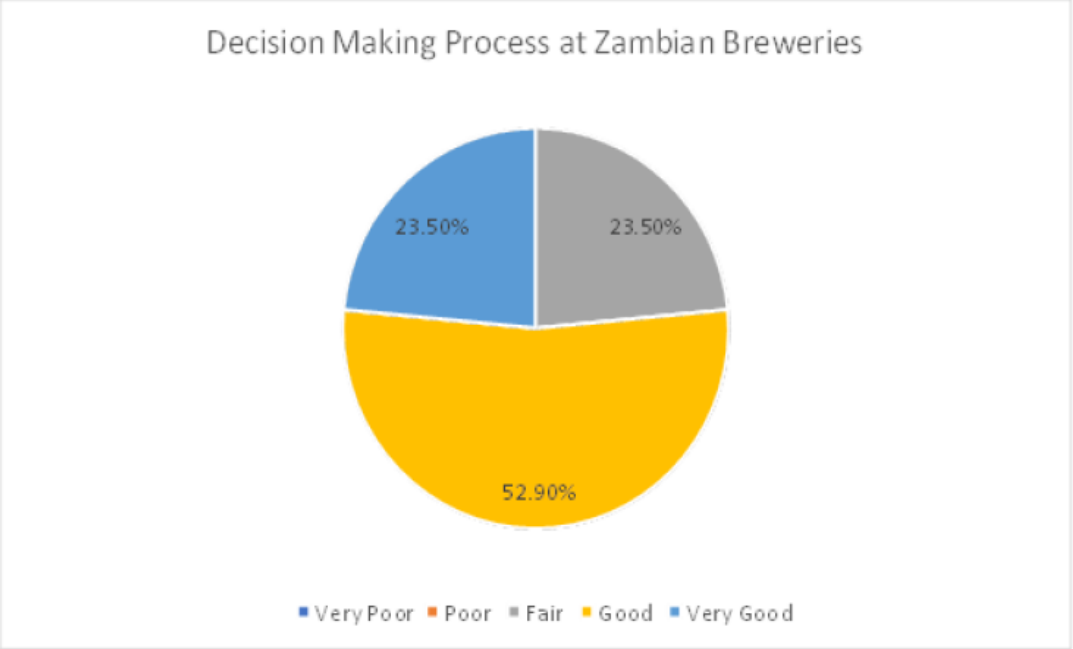

Figure 2. Respondent Rating of Decision-Making Process at Zambian Breweries

Establish Long Term Objectives

Every business entity has a range of objectives, some of which may alter gradually over time. New private sector businesses, for example, are probably more concerned with survival and finding their place in the market than with profitability and growth at first. Instead, most well-established firms would normally perceive profits and growth as significant objectives and may view them as a tool to achieve other goals, such as market dominance, maximum of sales revenue, and/or minimization of operational expenses [20].

The legal framework of the business has an impact on organizational goals as well. In sole proprietorships, partnerships, and some limited organizations, the owner(s) maintain ownership; regardless of the stage in the organization's life cycle, organizational aims will often coincide with the owner(s)' personal objectives. The goals of the owners (shareholders) may not always line up with those of the directors and senior management who operate public organizations, where ownership and control frequently have a propensity to be distinct. This is especially true when the latter are attempting to advance their own status, money, or rank inside the organization [20].

Respondents were questioned If the Zambian Breweries had developed long-term goals and according to the respondents, 70.6% answered that the Zambian Breweries had certainly set long-term goals, while 29.4% said they weren't sure. The outcomes are depicted in Figure 3.



Figure 3. Respondent's Responses on the Development of Long-Term Objectives of Zambian Breweries

The researcher asked respondents what they believed about the significance of setting long-term goals for Zambian Breweries. The replies were as follows: 64.7% of respondents agreed that long term objectives were very important to the organization, 17.6% said they were fairly important, 11.8% said they were important, and 5.9% said they were slightly important. The outcomes are displayed in Figure 4.

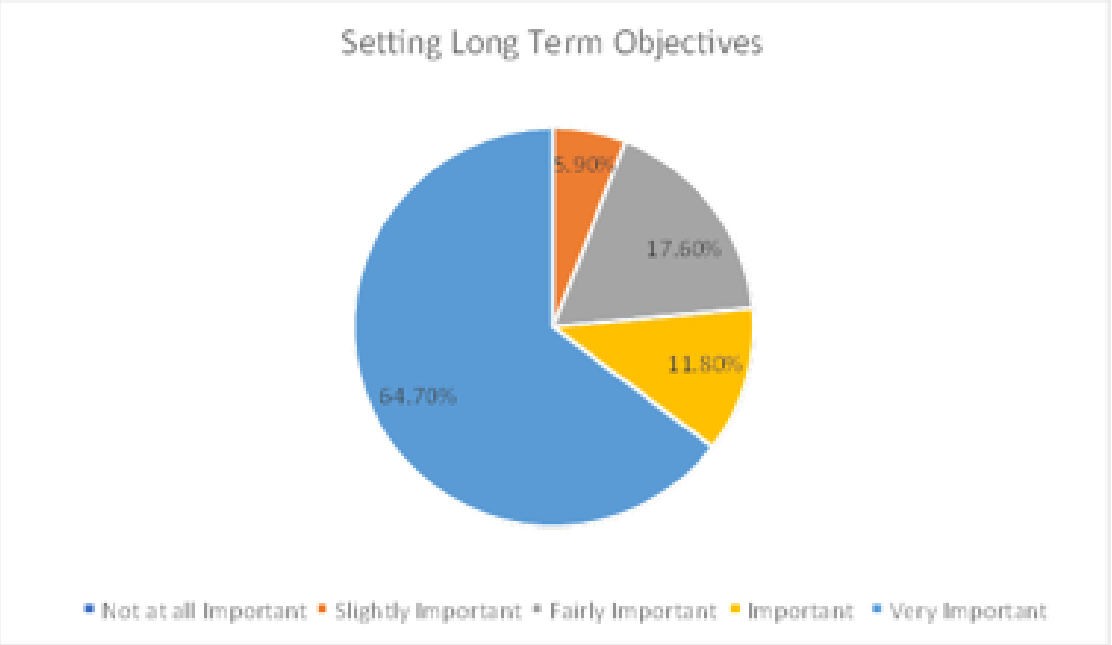

Figure 4. Respondents Response on the Importance of Setting Long Term Objectives for Zambian Breweries

According to Zambian Breweries (AB InBev Brewing-Zambia), the organization's overarching organizational strategy should be the focal point of its aims. The Zambian Breweries will find it simpler to maintain perspective while pursuing quantifiable goals and objectives as a result. The Zambian Breweries Innovation Strategy attempts to increase the performance of the company while also staying true to the organization's goal by keeping a strategic focus [21].

The BOD of a firm is its principal decision-making body. They are the shareholders, borrowers, and owners. They are in charge of and actively oversee the company's governance. Their actions are hampered by the Corporation Act and other laws. On occasion, they get involved in operational problems with the firm. The BOD's specialists offer advice as well as help obtain fresh viewpoints and ideas. They serve as the company's interface for environmental issues. The Chief Executive Officer (CEO), who is in charge of all facets of strategic management from formulation and implementation to review, is the most significant strategist. He serves as the organization's contact to the BOD and is the leader, motivator, and builder in charge of overseeing how the business interacts with the outside world. The entrepreneurs establish or open a new business independently of one another. A business can incorporate this technique by encouraging the entrepreneurial spirit. They oversee the endeavour and actively participate in seeing it through. Senior management is responsible for the CEO and BODs [20].

Respondents were asked to judge the effectiveness of Zambian Breweries' practice of coming up with problem-solving techniques. The responses were as follows: 52.9% said that Zambian Breweries' success/practice of generating strategies to deal with issues was excellent, 29.4% said that it was average, and 17.6% said that it was above average. The outcomes are depicted in Figure 5.

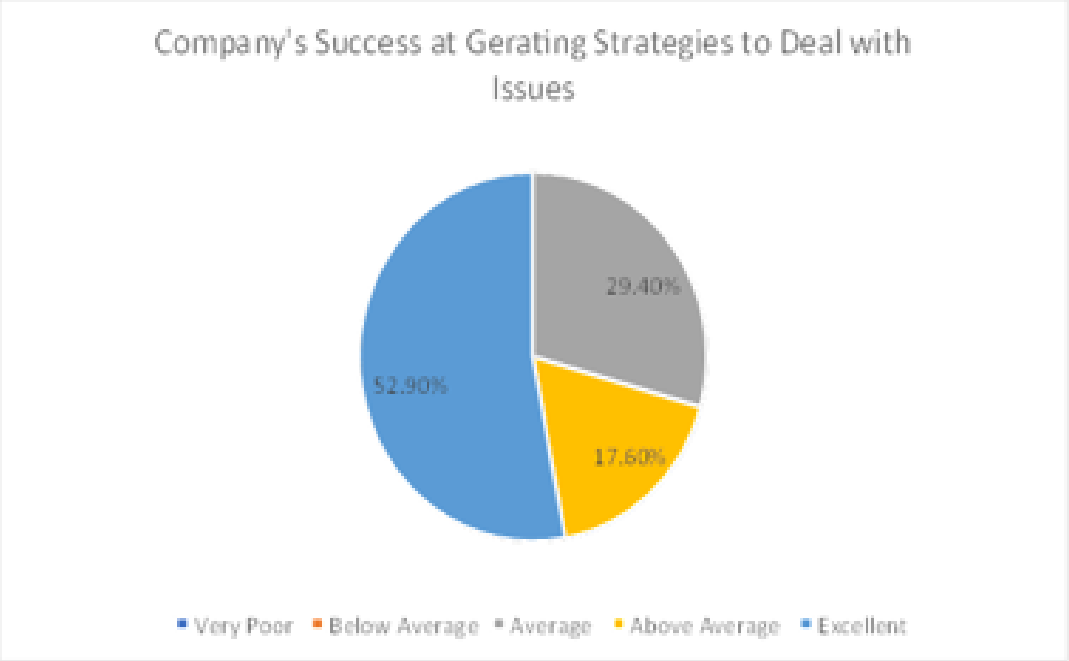

Figure 5. Respondents Response on the Successes of the Zambian Breweries Generating Strategies to Deal Issues

The necessity of developing strategies for issues at Zambian Breweries was asked of the respondents. According to the responses, 29.4% believed that developing strategies to address problems at Zambian breweries was very important, and another 29.4% of the respondents said that it was important, 23.5% of the respondents indicated that it slightly important and 17.6% respondents thought it was fairly important. The outcomes are depicted in Figure 6.

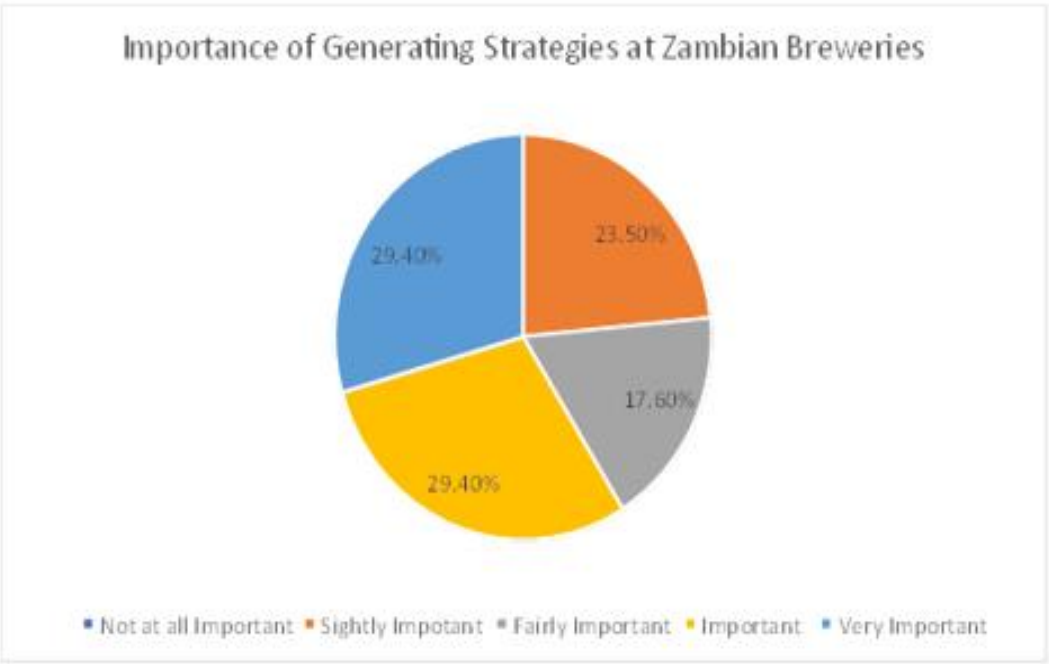

Figure 6. Respondents Response on the Importance of Generating Strategies at Zambian Breweries to Resolve Issues

Selecting Strategies to Pursue

Creating strategies is an essential step between deciding on your goals and making the necessary adjustments to attain them. Generally speaking, it is preferable to plan your strategies beforehand rather than figuring them out after the fact. Your actions could be a waste of time and money if you are unaware of the risk and how you might miss out on new opportunities. Strategies must occasionally be changed in order to adapt to a changing environment that presents new opportunities for growth.

Zambian Breweries chose particular tactics to deal with problems the company has, 76.5% of people thought Zambian Breweries had chosen specific methods to deal with the problems the firm was facing, while 23.5% weren't sure if Zambian Breweries had chosen specific strategies to deal with the problems the company was facing. The outcomes are depicted in Figure 7.

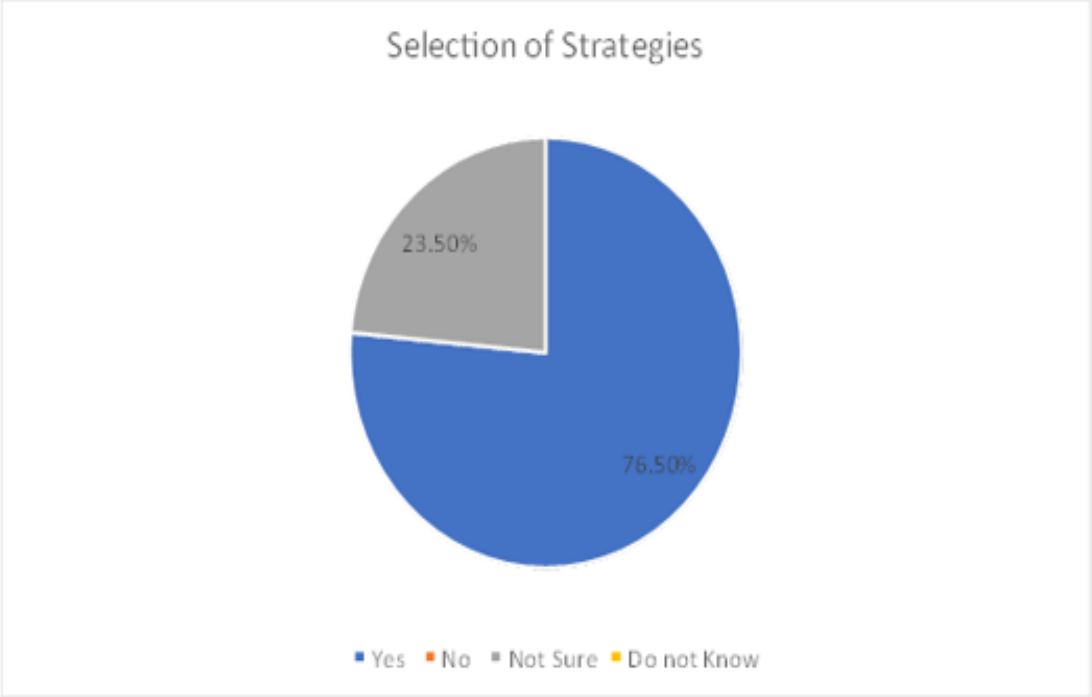

Figure 7. Respondents Response on whether the Zambian Breweries Selected Certain Strategies to Address Issues that Confronted the Company

The importance of picking strategic solutions to problems facing Zambian Breweries was rated by respondents. The responses were as follows: 35.3% thought it was very important for Zambian Breweries to have strategic solutions to address issues that confront the company, 23.5% said it was important for Zambian Breweries to have strategic solutions to address issues that confront the company while 41.2% of respondents thought it was fairly important for Zambian Breweries to have strategic solutions to address issues that confront the company. The outcomes are depicted in Figure 8.

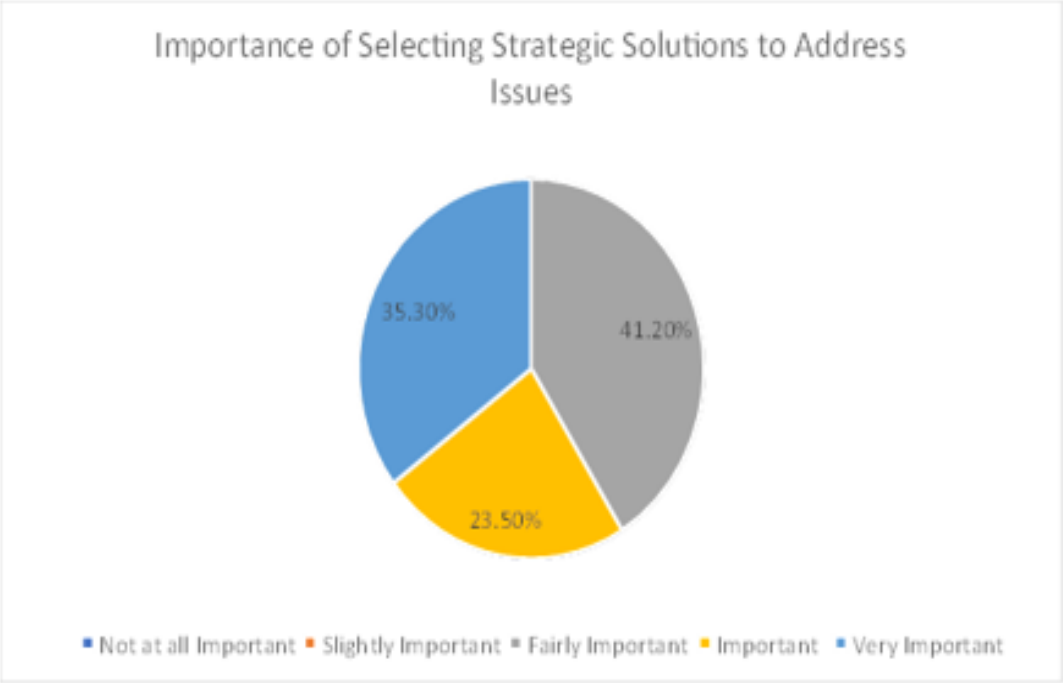

Figure 8. Respondents Responses on the Importance of Selecting Strategic Solutions to Address Issues at Zambian Breweries

The Zambian Breweries' existing procedures as they pertain to the continuous evaluation of strategic objectives were rated by respondents. The responses were as follows: 52.9% thought that the Zambian Breweries current practices as they related to the ongoing assessment of strategic initiatives were good, 35.3% thought that the practices were very good, and 11.8% thought that the practices were fair. The outcomes are depicted in Figure 9.

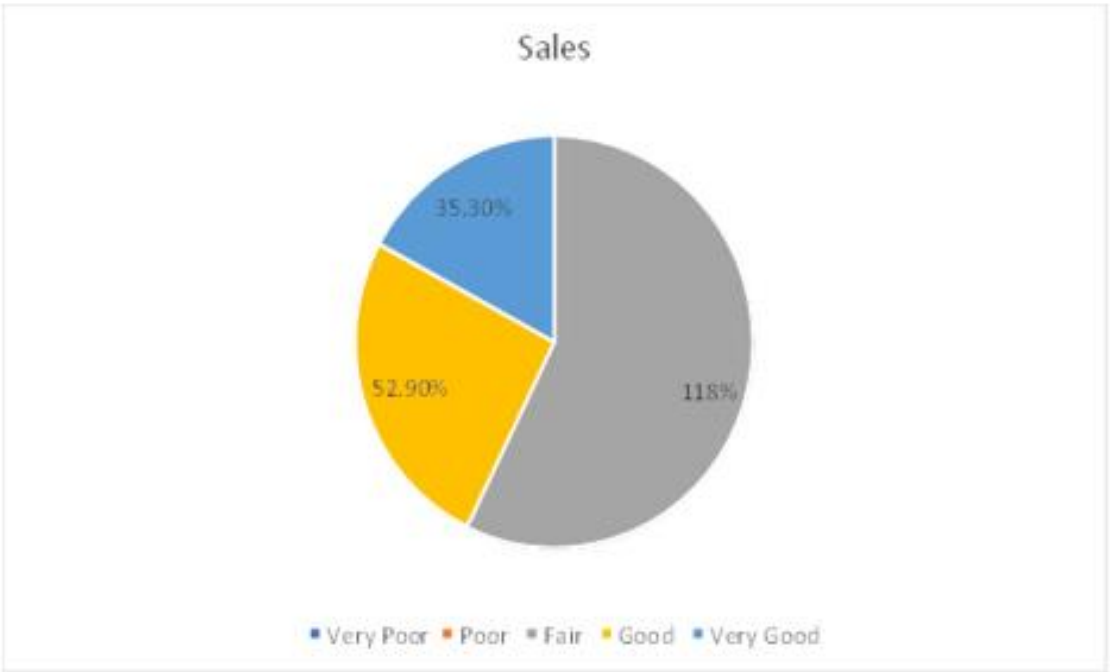

Figure 9. Respondent's Responses on the Importance of Selecting Strategic Solutions to Address Issues at Zambian Breweries

Communication within the Organization

Every employee's daily responsibility and those of the company include communication and decision-making. Communication requires participation and the sharing of information. In an organizational setting, communication is described as "an evolutionary, culturally dependent process of sharing information and developing relationships in a context structured for manageable, goal-oriented behaviour" [22]. The process through which people exchange information with one another is referred to as communication in its broadest definition [1].

Making decisions as a process entails picking one course of action from the available alternatives. Despite their close ties to problem-solving, communication and decision-making are frequently employed interchangeably. Processes of decision-making and communication are crucial for firms. Organizations, as social organisms, cannot function effectively without communication. The two methods work well together. Intentional and deliberate decision-making underpin organizational communication, and meaningful decision-making for organizations eventually necessitates notifying other organizational actors of decisions and actions. The transmitting, receiving, and use of information affects the relationship between communication and decision-making in organizations [1].

Respondents were asked to judge the Zambian Breweries' effectiveness in informing its members, BODs, auditors, and general public of the assessment results. The responses on communicating with members were as follows: 58.8% thought that the Zambian Breweries' performance in doing so was fair, 23.5% said it was good, and 17.7% thought it was very good. The outcomes are depicted in Figure 10. The responses of respondents were as follows when it came to the Zambian Breweries' performance in informing the BODs of the results of its assessment: 29.4% stated that it was very good, another 29.4% reported that the communication was good, 23.5% thought that it was poor, and 17.7% believed it was fair. The outcomes are depicted in Figure 10.

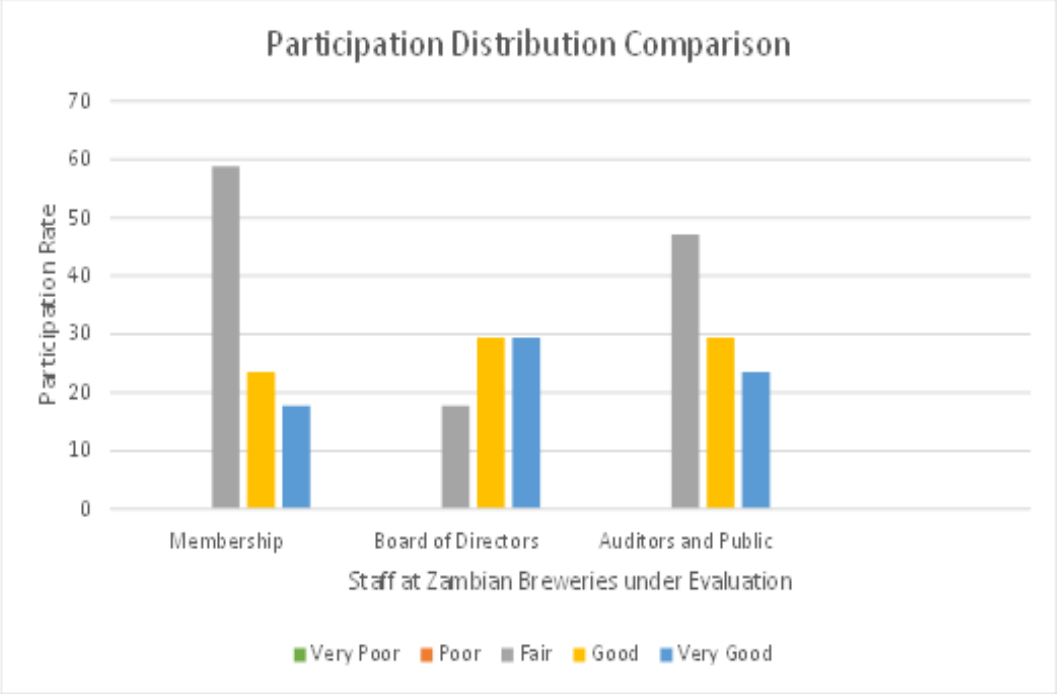

Figure 10. Zambian Breweries Effectiveness of Communication with the Membership, BODs and Auditors and the Public

The responses from respondents on how well Zambian Breweries communicated its performance to auditors and the public were as follows: 47.1% said that the company did a fair job of sharing its assessment results to the auditors and the public, 29.4% said that the communication was good, and 23.5% said that it was very good. The outcomes are depicted in Figure 10.

Measuring Performance for Zambian Breweries

Drucker asserts that "Work implies not only that someone is supposed to do the job, but also accountability, a deadline, and, finally, the measurement of results — that is, feedback from results on the work and on the planning process itself" [23]. Any business's growth and progress must be tracked through ongoing performance evaluation. It involves comparing an organization's stated goals and actual performance. Monitoring your company's performance on a regular basis will shield it from any structural or financial issues.

The process of gathering, analysing, and disseminating data on the effectiveness of an individual, group, organization, system, or component is known as performance measurement. The fact that performance measurements assist to qualitatively offer the relevant information about products, processes, and services generated in a firm is one of the most crucial factors for the performance measurement process. An excellent technique to oversee and enhance what a corporate organization accomplishes is to implement performance measurements [24].

Performance is continuously evaluated as part of performance measurement, and the results are compared to predetermined goals or targets. In order to properly manage the tasks and deliver the desired results, a manager must keep an eye on, monitor, and control the actions of his subordinates while reading through countless summaries or reports. In order to spot deviations and take appropriate action to resolve them, management must continuously monitor performance.

Consequently, performance measurement is a procedure that is continually being enhanced. Respondents at Zambian Breweries were asked if the company had developed key performance indicators or some form of accountability to track the success of strategic initiatives. 64.7% responded that the company had indeed developed key performance indicators or some form of accountability to track the success of strategic initiatives, while 35.3% indicated that they were not certain if the company had key performance indicators in place to track the performance. The outcomes are shown in Figure 11.

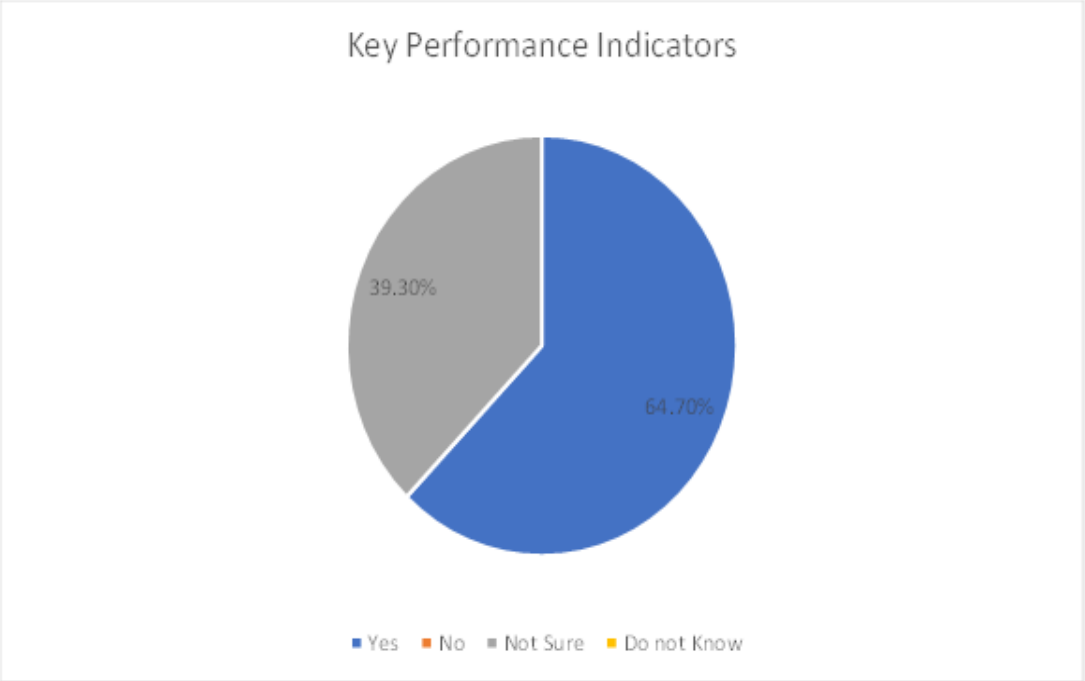

Figure 11. Respondents Responses on Whether the Zambian Breweries had Key Performance Indicators in Place

When asked to rate the Zambian Breweries' ongoing evaluation practices as they relate to strategic initiatives, the respondents gave the following responses: 52.9% gave the company's ongoing evaluation practices as they relate to strategic initiatives a good rating, 29.4% gave it a very good rating, and 17.6% gave it a fair rating. Figure 12 presents the findings.

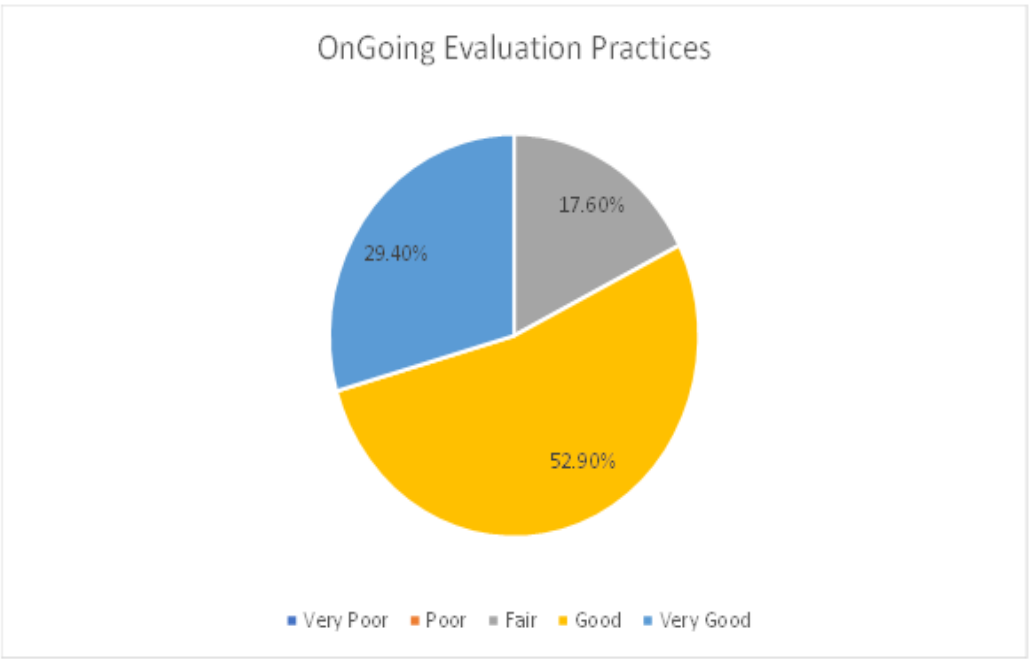

Figure 12. Respondent Responses Ongoing Evaluation Practices Relating to Strategic Initiatives at Zambian Breweries

Identifying where Corrective Action is Necessary

Using a corrective action plan, businesses can specify the activities required to address a situation that interferes with their operational procedures. Businesses can begin streamlining their processes and fixing mistakes as they use these. You can develop a corrective action plan for your company by becoming aware of the various elements that make up one. Due to the fact that they serve as documentation for a company's corrective activities, corrective action plans are crucial. Corrective actions offer a process for putting remedial action into practice that starts with research and ends with a review. Employers of this planning technique have a structure within which to build and organize their solutions [24].

Respondents were asked to rank the Zambian Breweries' ability to pinpoint the causes of its strategic projects' failures or areas in need of improvement. The replies were as follows: 52.9% said the company did a good job of identifying the necessary corrective actions when its strategic initiatives failed or needed to be improved, 29.4% said it did a fair job, and 17.6% said it did a very good job. The outcomes are displayed in Figure 13.

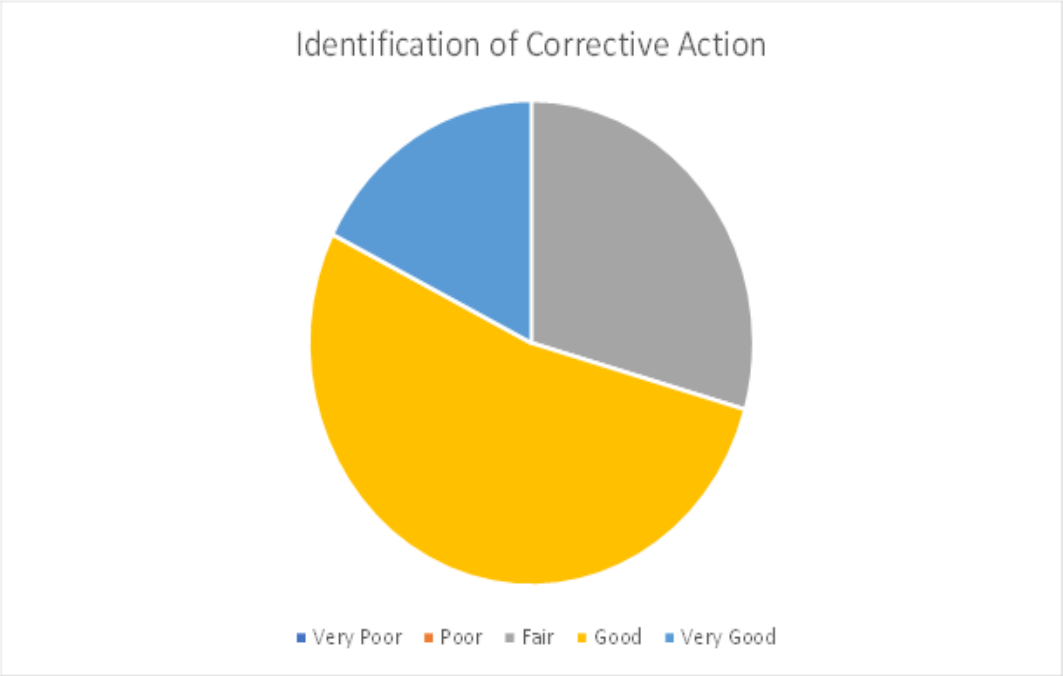

Figure 13. Respondents Responses on the Company's Success at Identifying Corrective Action When Strategic Initiative were Failing

Additionally, respondents were asked to judge how quickly Zambian Breweries responded after admitting that a strategic initiative was failing. The responses were as follows: 35.3% said the company was very good at acting quickly after admitting a strategic initiative had failed; another 35.3% said the company was good; 23.5% said the company was fair; and 5.9% said the company was poor at acting quickly after admitting a strategic initiative had failed. The outcomes are displayed in Figure 14.

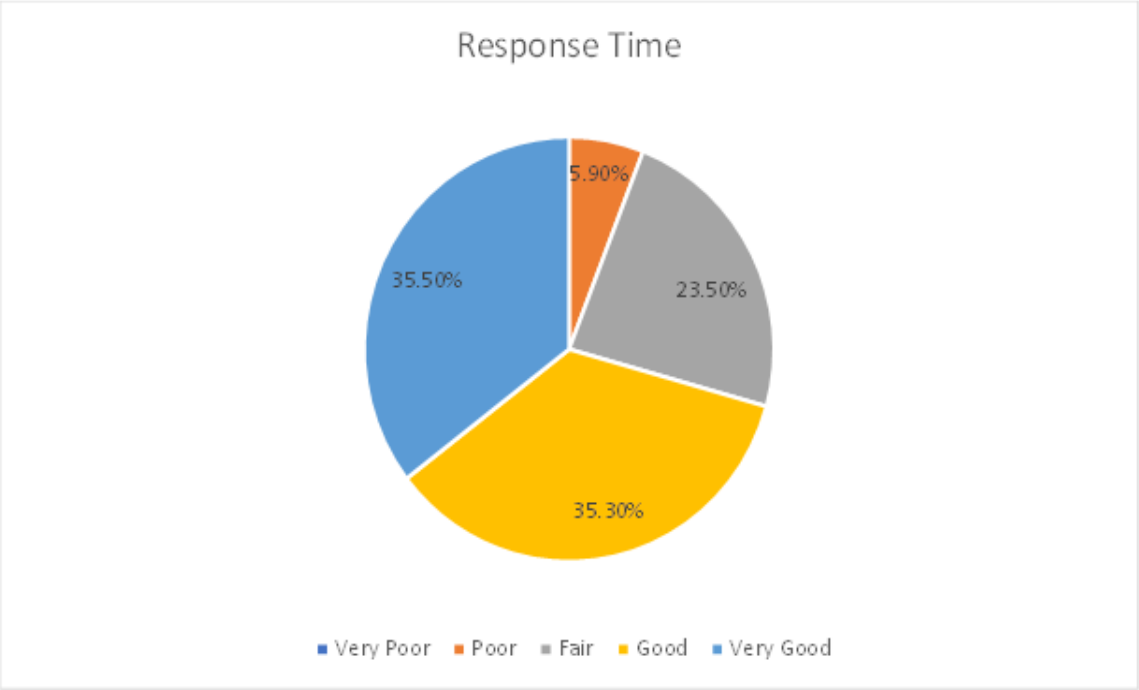

Figure 14. Respondents Responses on the Company's Success Response Time after the Company's Acknowledgement That a Strategic Initiative was Failing at Zambian Breweries.

Assess Impact of Change/Participation

Both internal and external forces can contribute to change in organizations and societies. The spread of information, political pressures, economic downturns, which could result in higher oil costs, and other factors are examples of external impacts. Internal pressures include, among other things, the need to improve socioeconomic position, the urge to advance academically, and the desire to live a better quality of life [25].

Change may be advantageous for both the individual employees and the organization as a whole, provided that the management has given it careful consideration. This is true even if change may make people in an organization anxious and confused. The manager will be able to assess the company's development and progress in creating policies related to change management in the organization with the help of his thorough grasp of change and its beneficial effects [26].

The beneficial effects of change can be felt more readily by both individuals and the business when it is acknowledged and successfully implemented. The staff's belief in management's ability to make the best management decisions is another sign of the favourable outcomes. Employees as a result are more driven and assured in their ability to carry out activities and make choices that will enhance their everyday lives [27].

Businesses must incorporate change into their daily operations if they want to advance [28]. Employees cannot be kept in the same position when business demands change because technology, work requirements, management structures, and other variables have changed. Infrastructure is also getting more and more important as a result of shifting consumer preferences and even industrial advancements. It also takes into account new marketing tactics, altered target market traits, and altered production methods, all of which require businesses to make the necessary expansion-related modifications [27].

The effectiveness of the Zambian Breweries in assessing the effects of modifications made after the initial strategy design was sought for feedback from the respondents. The replies were as follows: 41.2% claimed the company's

effectiveness at assessing the effects of adjustments made after the initial strategy formulation was good; 29.4% provided a rating of very good; 23.5% gave a rating of fair; and 5.9% gave a rating of poor. Figure 15 presents the findings.

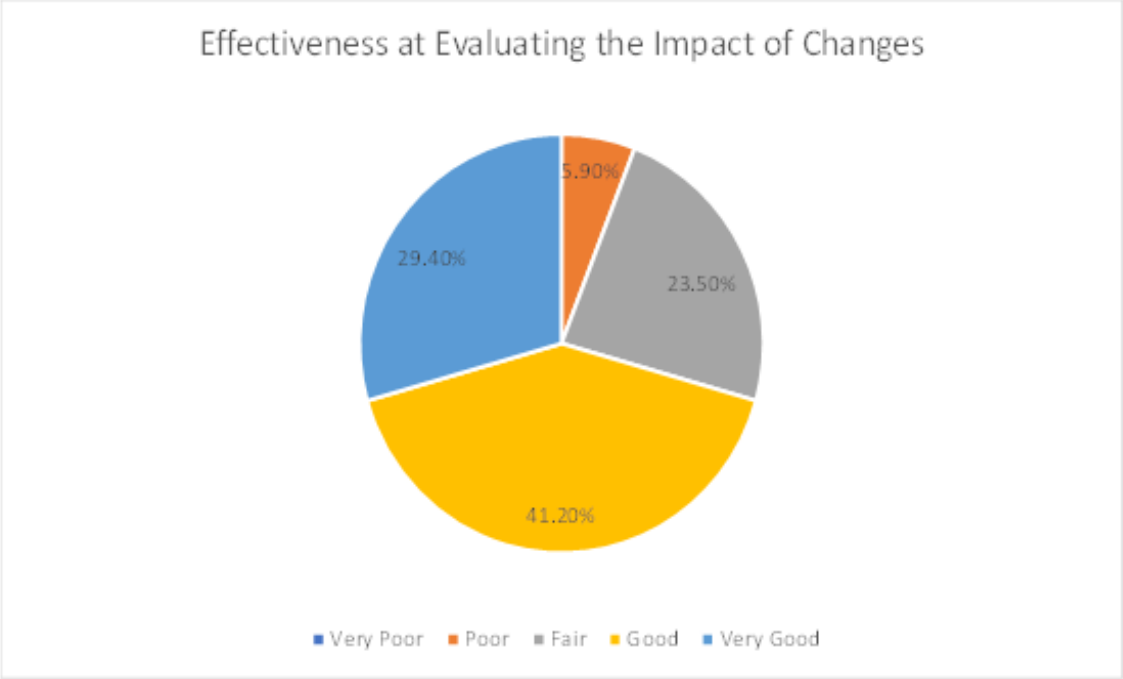

Figure 14. Respondents Responses on the Company's Effectiveness at Evaluating the Impact of Changes Subsequent to Initial Strategic Formulation.

The degree of BODs involvement in developing strategy at Zambian Breweries was rated by respondents. The responses on the level of BODs participation in strategy formulation were as follows: 17.7% thought it was very good, 52.9% thought it was good, 5.9% thought it was fair and 23.5% said it was poor. The outcomes are depicted in figure 16.

Regarding the Executive Committee's involvement in developing strategy at the Zambian Breweries, respondents' responses were as follows: 41% said that the Executive Committee's involvement in developing strategy was good, 17.7% thought that the Executive Committee's involvement was very good, another 17.7% thought that the Executive Committee's involvement was fair, and the final 17.7% thought that the Executive Committee's involvement was poor. The outcomes are depicted in figure 16.

According to respondents' responses, 41.2% of respondents said that the Executive Directors at Zambian Breweries participation in strategy formulation was at a good level, 29.4% thought that the Executive Directors participation was at a fair level, 23.5% thought that the Executive Directors participation was at a very good level, and 5.9% thought that the Executive Directors participation was at a very poor level. The outcomes are depicted in figure 16.

The respondents' opinions on the management staff's involvement in developing strategies at Zambian Breweries were as follows: 35.2% thought that the level of involvement was fair, 29.4% thought that the level of involvement was very good, 17.7% thought that the level of involvement by the management staff was good, and another 17.7% thought that the level of involvement by the management staff was poor. The outcomes are depicted in Figure 16.

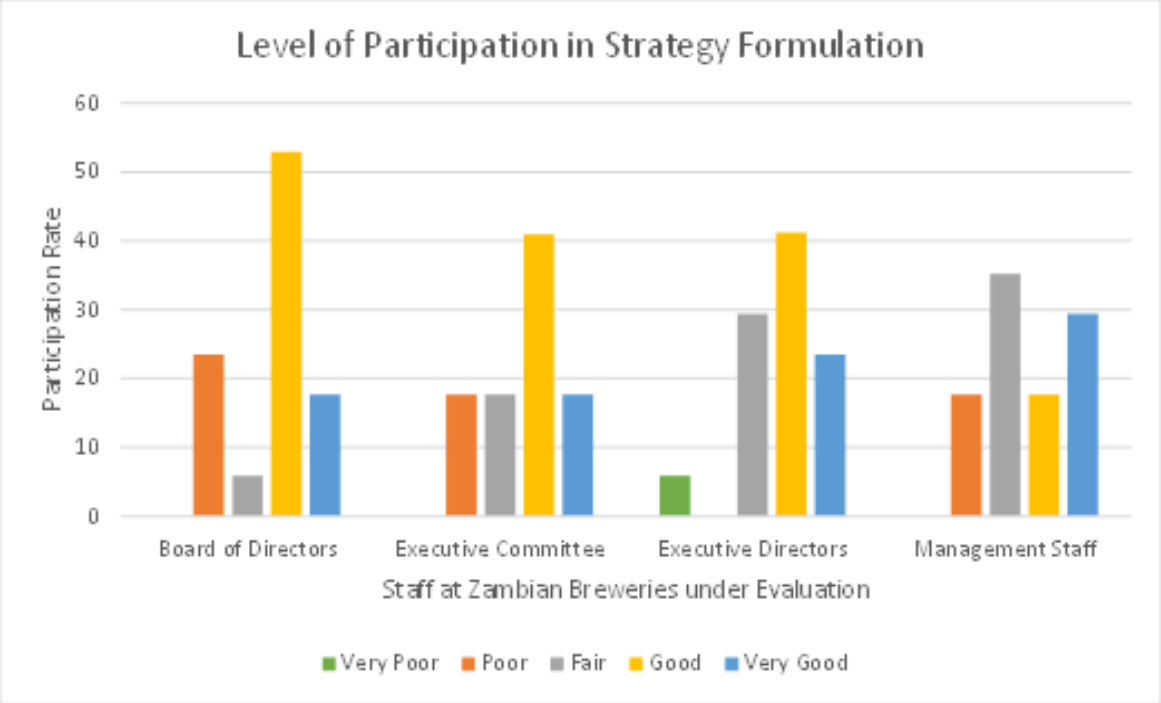

Figure 16. Involvement of BODs, Executive Committee, Executive Directors, and Management Staff at Zambian Breweries in Strategy Formulation

Moving Beyond Evaluation

In response to the BODs at Zambian Breweries evaluating the original initiatives, respondents were asked to rate the emphasis given to abandoning, changing, or developing new strategies following the evaluation of the initial strategies by BODs, the responses were as follows: 35.3% thought that the attention paid by BODs to abandoning, adjusting, or developing new strategies was good; 29.4% said that the attention paid was poor; 17.6% thought that the attention paid was fair; 11.8% thought that the attention paid was very good; and 5.9% said that the attention paid by BODs was very poor. The outcomes are depicted in Figure 17.

The Zambian Breweries received the following responses from respondents regarding attention paid to abandoning, adjusting, or developing new strategies after the Executive Committee evaluated the initial strategies: 11.8% said attention paid to abandoning, adjusting, or developing new strategies was very good, 29.4% thought the Executive Committee's attention was good, and 17.6% said the attention was fair and 35.3% said the attention was poor. The outcomes are depicted in Figure 17.

Regarding the Executive Directors at the Zambian Breweries' attention to abandoning, adjusting, or developing new strategies after evaluating the initial strategies, respondents' responses were as follows: 11.8% said that the Executive Directors' attention was very good, 29.4% thought that it was good, 35.3% said that the Executive Directors' attention was fair, 23.5% thought that it was very poor. The outcomes are depicted in Figure 17.

Regarding the attention given by the management staff at the Zambian Breweries to abandoning, adjusting, or developing new strategies after evaluating the initial strategies, respondents' responses were as follows: 29.4% thought that the attention paid by the management staff was poor, 35.2% said that the attention paid by the management staff was fair; 17.7% thought that the attention paid by the management staff was good; and another 17.7% thought that the attention paid by the management staff was very good. The outcomes are depicted in Figure 17.

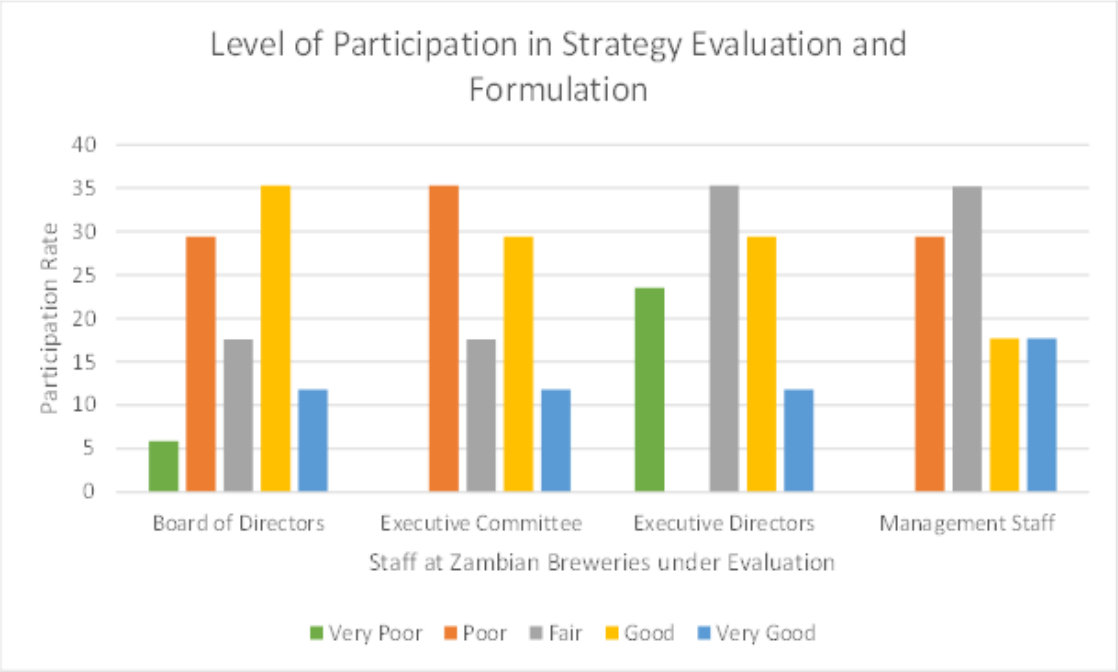

Figure 17. Emphasis given to abandoning, Changing or Developing New Strategies after the Evaluation of Existing Strategies by the BODs, Executive Committee, Executive Directors, and Management Staff at Zambian Breweries

Conclusion

The Zambian Brewers Private Limited Company uses strategic management to retain its dominance in the country's liquor sector. Structure is the architecture of corporate competency, leadership, talent, functional linkages, and organization. The survey found that Zambian Breweries' organizational structures enabled the management systems to efficiently run the company and boost production. Human resource policies and processes enabled the company to effectively carry out its strategic planning by having competent personnel and aligning their aptitudes, expertise, and talents to the needs of the company. Effective communication enabled personnel to receive timely feedback, boosting morale and enabling high performance.

Acknowledgement

I am incredibly grateful to Dr. Muchemwa Sinkala, my co-guide, for his guidance during the entire academic research endeavour. My thanks and excitement also go out to the Texila University tutors for their consistent encouragement and motivation in keeping me on top of my academic responsibilities. Last but not least, I'd like to thank my family for their moral support and encouragement to continue their support of my studies during the whole time, especially during the height of the COVID-19 outbreak, which halted numerous programmes.

Conflict of Interest

I, Jubert Twambo, hereby state that there isn't any sort of conflict of interest.

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Assessing the Customer Behaviour in Relation to Electronic Payment Systems (EPS) in Some Ghanaian Banks in the Kumasi Metropolitan Assembly- Kumasi, Ghana

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Abstract

Although other payment methods are available, like card, cheque, mobile, and online payments, most Ghanaians still use the cash payment system. The study examined how Ghanaian customers felt about using electronic payments. These included determining thesector andctors that influence consumer adoption and use of electronic payment services in Ghanaian banks, examining customer satisfaction with e-payment in the banking sector, and preventing fraud. A sample size of 100 participants was chosen for the study using purposive sampling to select participants from the banks and systematic sampling to select participants from the customers. According to the research's findings, factors such as usability, security, privacy, the caliber of the after-sales support, marketing mix, and reputation affect consumers' opinions of electronic payment systems. According to the study, customers are satisfied with the value offered for their banking requirements and the opportunity to experiment with e-payments in the banking sector. The study also found that while customers' top concerns are trust and security, barriers to e-commerce include a low internet penetration rate, fewer users, expensive and challenging e-commerce technology, and a lack of progress in other supporting industries. Trust and security are significant deterrents against using electronic payment systems. The ability of consumers and banks to reach a larger market and participate in the world payment system is another way that technology can help the economy. Stakeholders should offer the unbanked sufficient assurances of security for utilizing electronic payment systems on their privacy without requiring them to maintain accounts with them.

Keywords: *Electronic Payment Systems (EPS), Automated Teller Machines (ATMs), Kumasi Metropolitan Assembly (KMA)Payment Portal Services (PPS), Information and Communication Technologies (ICTs), and Central Business District (CBD).*

Introduction

Since the advent of electronic payments in the banking industry, many banks have had to reevaluate their strategies to remain competitive. This is especially true at a time when customers are smart and demand much more from financial services. Customers want strong and user-friendly financial tools, products, and services that traditional retail banking cannot provide, together with unprecedented levels of ease and flexibility. The impact of information and communication technologies (ICTs) on how most organizations function and adapt to shifting consumer expectations should not be understated. The promise of ICTs has been

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measured in the banking sector in terms of their capacity to increase customer base, lower transaction costs, enhance response quality and timeliness, increase advertising and branding opportunities, facilitate self-service and service customization, and enhance customer relationship management [1]. Most established banks now provide various e-banking sophistication levels, as do those in developing nations. On the other hand, only a few African banks appear to be making progress toward fully developed e-banking programs, with most of them appearing to be content with merely having a Web presence [2].

In addition to being quick, simple, and secure, electronic payment systems (EPS) can have several financial benefits. Mobilizing savings and guaranteeing that most Ghana's cash is kept in banks are two of EPS's main economic advantages. Because of this, borrowers will have access to funds (businesses and individuals). Moreover, an electronic payment system may be able to track individual spending, which would facilitate the creation of goods by banks. This information is helpful for the government's economic decisions as well. Also, EPS might lower your printing expenses and cash handling costs [3].

Most people in Ghana employ the cash payment method, which includes using the actual currency for transactions, unlike in other developed nations. Such nations use a variety of payment methods, including card payments, online payments, mobile payments, and cheque payments. Several payment options, other than checks, have not yet become widely accepted in Ghana. Before introducing electronic payment into the Ghanaian banking system, all customers had to physically visit a bank to execute any transaction, join confusing queues, and wait hours for a quick talk with a teller to finish their operations [4]. Although some consumers view the usefulness and simplicity of use as two of the many advantages that electronic payment systems provide, they have not applied this attitude toward the usage of e-payment in banking operations. Many bank customers hesitate to use Internet banking; some do not like the technology, while others worry that their computers can muddle their accounts. In addition, consumers are hesitant to make e-payments because they believe that even a small mistake could result in financial loss. Therefore, the study attempts to determine consumers' opinions toward accepting or rejecting electronic payments via Internet banking by Ghanaian consumers using mobile phones, iPods, and other devices as the "wallet" of the future.

The main goal of this study is to give important stakeholders the chance to share their opinions on how consumers feel about the banking industry's use of electronic payments, with a focus on how businesses in Ghana are expanding and developing. The report also analyzes the factors that contribute to Ghana's banking sector's inadequate use of electronic payment systems.

The study aims to address stakeholders' requirements and expectations by educating them on the economic effects of electronic payment systems. The findings and results also offer a more trustworthy scientific perspective and metric for characterizing and assessing the new system's level of effectiveness and its impact on business performance and customer satisfaction. The objective of this study is to increase the body of knowledge and body of literature on the subject at hand. Above all, it offers a justifiably valid and reliable guide to designing workable service delivery improvement strategies for creating and delivering consumer value, achieving consumer satisfaction and loyalty, building long-term mutually beneficial relationships with profitable consumers, and achieving sustainable business growth. It also provides empirical support for management strategic decisions in several important areas of their operations.

The Concept of Consumer Attitude

Over the years, researchers who are interested in the behaviour of bank customers and their

interactions with these institutions have given their attitude considerable attention. Attitude is the result of what we say, feel, and know [5], and it has a significant impact on consumers' purchasing behaviour [6]. An individual's attitude toward electronic payment through online banking is defined as his or her overall emotional reactions to using the Internet for banking reasons [7]. In 1975, Fishbein and Ajzenposited that one's attitude toward a behaviour is made up of one's views about partaking in the behaviour as well as how those beliefs are evaluated [8]. Furthermore, Byers and Leader in 2004 claimed that rather than the cost structure of banks, changing consumer behaviour and attitudes are what determine the adoption of Internet banking [9]. A person's demographic, motivation, and behaviour toward various banking technologies, as well as personal acceptance of new technology, are all factors that influence a person's attitude toward electronic payment via banking, according to research on consumer attitudes and adoption of electronic payment in the banking sector [10].

The five perceived attributes of an invention (relative advantage, compatibility, complexity, and trial ability) may be used to measure the many facets of attitudinal belief about the innovation. The advantages that come with using the technology are what decide how valuable the internet is for consumers' banking requirements. An innovation's rate of adoption is typically correlated with how valuable people judge it to be. How quickly it is adopted is inversely correlated with an innovation's relative advantage. In a similar way, customers of online banking services gain the advantage of being able to access their accounts from any location and at any time of day, which makes it easier for them to manage their money [11].

Compatibility is another important factor in the spread of innovation theory. It was found that innovation was more likely to be adopted when it was compatible with the individual's work responsibilities and value system, according to a meta-analysis of innovation undertaken by Tornatzky and Klein in 1982 [12], as cited by [6]. The distribution method of choice for today's banking customers, who are probably computer literate and accustomed to using the Internet, is said to be Internet banking.It was detected that complexity had a negative effect on Internet adoption and is defined complexity as the degree to which an innovation is seen as being somewhat difficult to understand and use [13]. Complexity, which has been proven to have a direct impact on Internet adoption, is the exact opposite of usability [9]. According to Rogers' 2005 theory of trial-ability, potential users of new technology who are given the chance to test it out will feel more comfortable with it and will therefore be more likely to embrace it [14]. If customers are given the chance to test the innovation, it will lessen certain unanswered concerns, especially if they learn that errors can be fixed, leading to a predictable situation [15].

Influences on Customer Attitudes Toward Electronic Payment

Several prior studies have identified several key factors, including usability, security, privacy, after-sales assistance, marketing mix, and reputation, that may have an impact on customers' views about electronic payment [16].

Usability

Usability is the extent to which a website enables users to use its capabilities easily and effectively [17]. Online usability is all about making the design straightforward enough for customers, who are naturally goal-oriented, to do their assignments as quickly and painlessly as feasible (www.webcredible. com). The Internet serves as the fundamental building block for all online transactions, including electronic payments. As a result, the attitudes of online shoppers and the success of e-commerce are greatly influenced by website usability. Ease of use, reaction time, navigation, interactivity, design, convenience, learnability, efficiency, site findability, and accessibility are among the

factors that have been compiled in several earlier studies as a benchmark for measuring website usability.

Safety

Online security, according to Salisbury et al. in 2001, is "the extent to which one believes that the World Wide Web is secure for transferring sensitive information" [18]. The results of the study showed that perceived e-transaction security was positively correlated with the desire to make an online purchase, and that perceived e-transaction security affected online banking transactions. In a similar vein, one of the most crucial factors in electronic payments in banking was the customers' perception of security-related challenges. This has had a tremendous impact on customers' perceptions of e-payments and made security one of the most important reasons why they hesitate or fear using them.

Privacy

A significant issue when it comes to privacy is always personal information. Generally speaking, "data not normally accessible via public sources" is what is meant by "personal information" [19]. Online privacy issues are frequently caused by the gathering and exchange of personally identifiable information about specific website visitors. In 2011, Guo& Noor defined four dimensions of online privacy, including illegal access to digitally stored personal information, illicit secondary use of personal information, improper personal information acquisition, and inaccurate personal information gathering. Anonymity, intrusion, surveillance, and autonomy as issues with online privacy [20].

In conclusion, there are many areas of consumer privacy protection in the virtual world that are challenging to control. Internet privacy is therefore more challenging to protect than conventional offline privacy. This is the reason why many consumers still oppose using electronic payment systems.

The Electronic Payment (E-Payment) System Concept

Financial agents can communicate and settle financial obligations using a payment system, which is a collection of organizations, resources, and processes [21]. Considering this, an effective payment system is one in which the financial architecture makes sure that financial responsibilities are transferred and settled with the least amount of time, money, and trouble possible. The core of this effectiveness is the payment system's clearing and settlement processes. The first is when buyers and sellers exchange bonds and money, while the second is when a financial transaction is completed, and securities or money are delivered from one party to another.

A payment system is the entire matrix of institutional infrastructure arrangements and procedures in a country for initiating and transferring monetary claims in the form of commercial and central bank liabilities, according to the 2010 Bank of Ghana Annual Report [22]. This matrix includes: 1) Payment instruments used to initiate and direct funds transfer, 2) Network arrangements for transacting and clearing payment instruments, 3) Institutional players in the system, and 4) Market participants. Nonetheless, a number of definitions have been provided as a result of the nature of electronic payment systems. The researcher has made an effort to highlight a few noteworthy ones, from the now-common automated teller machines (ATMs) to online bill payments. E-payment is described as payment via direct credit, electronic transfer of credit card details, or some other electronic means, as opposed to payment by cheque and cash [23]. Electronic payment refers to the use of computer networks, such as the Internet, and digitally stored value systems for financial and related activities. Technology has eliminated the need for customers to visit a bank or write and mail checks to pay their bills [24]. Electronic payment, as defined by the European Central Bank in 2003, is the transfer of a payer's

financial claim to a third party that the recipient accepts. Electronic payment is a financial exchange that occurs between the customer and the seller online. The essence of this exchange typically takes the form of a digital financial instrument that is backed by a bank, an intermediary, or legal tender (like encrypted credit card information, electronic checks, or digital cash) [25]. Electronic payment is a sort of financial transaction made possible by electronic communication between the buyer and the provider [26].

The researcher can describe an electronic payment as any digital financial payment transaction, including a money transfer between two or more parties, based on the definitions provided above. An e-payment transaction is, to put it simply, a transaction in which funds are sent electronically or digitally between two parties (banks, companies, and individual customers) in exchange for goods and services. It is obvious that electronic payment is one that is done without using paper-based instruments. To achieve effective and efficient retail payment systems, it is necessary to take into account a number of factors, such as ease of use, dependability, and security, the service's level and structure of fees levied by financial institutions; consumer preferences and demographics; and technological advancements that have increased the speed, flexibility, and convenience of retail payment systems.

Forms of Electronic Payment

Electronic payment systems are generally made for customers who make payments using credit, debit, or prepaid cards [27]. There are several different types of electronic payments that are most frequently employed in today's banking industry.

Credit Cards

The credit card system, as it is referred to, is a pay-later (credit) payment mechanism where the sale's value is credited to the payee's bank account before the payer's account is debited. Simply put, credit cards enable customers to make purchases up to a pre-set limit. The credit may be paid partially with the remaining balance being provided as credit, or it may be paid in full at the end of a specified term, typically a month. Credit cards are well-recognized by customers, and merchants accept them [27]

Debit Instruments

The payer's account is deducted at the time of payment in the pay-now payment system. This category includes ATM card-based systems. Debit instruments allow the payer to have purchases immediately charged (debited) to funds on his or her deposit-taking institution account, such as a bank. Direct debits, debit cards, and checks are all examples of debit instruments [28].

Prepaid Payment Services

To conduct any financial transaction, users of this payment system must first deposit money. This comprises electronic wallets with smart cards, digital money, and (certified/guaranteed) bank cheques [27]. This also applies to the E-zwich payment system from Ghana. Both pay-now and pay-later are direct payment methods since they necessitate communication between the payer and the payee. There are also systems for indirect payments, where either the payer or the payee initiates the transaction without the involvement of the other party [27].

Payment Portal Services (PPS)

Payment portals are companies that offer a variety of payment options and give merchant accounts to internet stores generally. Payment portals manage the payment portion of e-commerce operations for merchants. Merchants can lead clients to the payment portal's website to make online payments, where they can select from a number of payment methods. The gateway notifies the online merchant that the order can be shipped once the payment has been received successfully [26].

Benefits of Electronic Payments for Consumers

Electronic payments and transactions have expanded greatly since the advent of the Internet. Recently, consumers have decided to make transactions online by sending credit card information that is not encrypted across the network, which offers little security and privacy. Yet, a plethora of fresh secure network payment options emerged as consumers grew more concerned with their privacy and security. Digital money benefits banks, retailers, and financial organizations alike [28]. A secure electronic cash system can guarantee anonymity for authorized users while also enabling tracking for cash that has been issued illegally or that has been cleaned up. The anonymity of digital money may be revoked if criminal activity is found in order to protect the bank. Digital cash is a surefire method of preventing the unauthorized transfer of intellectual property and materials since it can track double spending, and double spending protects content by disclosing the name of the double spender [29].

In addition to their convenience and security, electronic payments have a wide range of economic benefits. Automated electronic payments contribute to the growth of bank deposits, increasing the amount of money available for commercial loans, a key engine of overall economic activity. The massive amount of cash transactions boosts the electronic payment sector, but it costs local economies. Money needs to be printed, moved safely, totaled, and reconciled, and then preserved and kept safe for future usage. The cost of an electronic system is set, but the cost of a single payment is significant and will always be such [30]. By using their cards at the point of sale, cardholders support the preservation of funds within the banking system. EPS can help displace shadow economies, bring hidden transactions into the banking system, and increase the transparency, confidence, and involvement of the financial system [30]. Higher point-of-sale volumes and higher demand deposits are related. Automatic electronic payments are a powerful growth engine and a gateway into the banking industry. By removing cash from circulation and depositing it in bank accounts, these payments create low-cost funds that can be used to encourage bank lending for investment, a major driver of overall economic activity [31].

The method results in greater accountability and transparency, which boosts productivity and boosts economic performance. Consumers find electronic payment to be especially convenient. In most cases, you only need to input your account information once, like your credit card number and shipping address. The information is then stored on the retailer's Web server in a database. When you visit the website again, you just need to log in using your username and password. To finish a transaction, all you need to do is click your mouse once, confirm your purchase, and you are done [32]. Businesses can cut costs by using electronic payments. Less money is spent on paper and shipping as more electronic payments are made. The availability of electronic payment methods may also aid businesses in retaining clients. If a consumer has already registered and stored their information, they are more likely to return to the same e-commerce site [32]. Bank customers can make routine financial transactions without having to go to their neighbourhood branch by using electronic payments. By substituting electronic payment methods for cash, merchants might save time and money [33]. Automating and streamlining electronic payments made through self-serve channels like ATMs, branch office terminals, and point-of-sale (POS) systems can reduce costs and errors associated with paper-based transactions. The prompt and secure receipt and processing of electronic payments must be possible in every nation. By allowing customers to pay with their chosen credit or debit card, businesses can gain a significant competitive advantage.

Ghana has lagged far behind the rest of the world in the effort to boost microeconomic

activity generally by reducing the significance of actual cash in day-to-day transactions and promoting the development of a cashless society (including many of its African contemporaries). However, financial experts have cautioned that unless something radically innovative, practical, and shrewd is introduced, which takes into account attitudes as well as the nation's sizable unbanked population, the country's dream of becoming a functionally cashless society in the quickest time possible may be elusive [34].

Materials and Methods

Research Design

The research design for the study was a descriptive cross-sectional design, which entails data collection at a single moment in time. In order to gather information from bank staff and clients of certain banks operating in the Kumasi Metropolitan Assembly (KMA) in the Ashanti Region, the researcher used standardized questionnaires that outlined the research's objectives. This study's primary data came from a structured questionnaire that was given to participants (customers and bank workers), who were purposefully chosen at random from the study's coverage region with the help of field assistants.

Study Site

The survey was conducted in the Kumasi Metropolitan Assembly (KMA), Ghana in three major Banks, within the Central Business District (CBD),Happer Road, and Adum Shopping Center. The Banks included Ecobank Ghana Ltd, Standard Chartered Bank, and Absa Bank Ghana Limited all located within the KMA.

Size of Sample and Sampling Techniques

The population is the study's target audience and the group to which the researcher wants to extrapolate its findings [35]. Furthermore, the population is the entire group of people (subjects), things, or events that the researcher is interested in and that have observable characteristics [36].

Two populations were looked at to address the study's research questions. Customers who use the chosen banks' electronic payment systems made up the first population and the chosen banks' bank staff who provide services for such systems inside the Kumasi Metropolis made up the second.

The researcher chose the three major banks that offer electronic payment services and have branches on Harper Road- Adum in the Kumasi Metropolis. These banks are Ecobank, Standard Chartered Bank, and Absa Bank Ghana Limited. Three hundred people, both consumers and staff, were the study's projected population. For each category or group, the sample size formula developed by Prof. David de Vaus in 2002 was used in order to obtain a sample size that is representative of the population of customers:

$$n = N/[1 + N(\propto)^2]$$

Where n = sample size,

N= population universe and,

$\propto$ = Margin of Error.

The formula adopted a confidence level of 90% and a margin of error of 10%, which is acceptable in social science research. The breakdown for each of the groups is calculated as follows:

1. Bank officials: N=11 and $\propto$=10%.

n = 11/ [1+11(0.1^2)] = 11/ [1+11(0.01)] =11/1.11 = 9.91 ∴ n ≈ 10.

The required Sample size (n) for each Bank is 10 Participants.

2. Bank Customers: N = 34.

Applying Prof. David de Vaus' Formula (2002) $n= N/ [1+N (\propto^2)]$.

n= 34/ [1+34(0.1^2)] = 34/ [1+34(0.01)] =34/ [1+34/1.34] = 25.37 ∴ n ≈ 25.

In summary, one hundred (100) participants were sampled for the study. For bank customers, 25 participants were sampled from each of Ecobank and Standard Chartered Bank, and 20 respondents from Barclays Bank making seventy (70) customers for all three (3) banks;

and for the bank staff, 10 respondents for each bank were sampled making a total of thirty (30).

Sampling Technique

The purposive sampling methodology was used in this study to select sample units or respondents from the staff, whereas the systematic sampling method was used to select customers. Purposive sampling was used to pick bank employees since the goal was to obtain insight into the phenomenon, necessitating the use of persons who were familiar with electronic payments in the banking business. As a result, members of staff who are directly responsible for all electronic payment processes were sought and interviewed. Purposive sampling was also used to select which branch of the banks to visit within the metropolis for the study. This is guided by the fact that even though there are other branches of the selected banks in the Kumasi Metropolis, only Harper Road branches of Ecobank, Standard Chartered, and Absa Bank Ghana Limited banks were selected for the study. To select staff for the study, stratified random sampling was used at the branches. The researcher divided the entire population into different subgroups or strata, and then randomly selected the final subjects proportionally from the different strata. This was directed by the leadership structure used by the banks in their branches. As a result, this sampling approach assured that questionnaires were distributed to employees in the clerical, supervisory, and management categories. Prior to administering the questionnaire, the managers of the branches chosen for the study were approached for approval, and a staff list of their individual branches was collected. In the case of customers, the researcher useda systematic sampling method. The systematic sampling method is defined as a probability sampling procedure in which the initial sampling point is selected at random, and then the cases are selected at regular intervals (Saunders et al. d, 2007). In this method, every 10th customer that approached the enquiry counter was served with a questionnaire on the study. The customers were chosen from all the classified customer groups, such as salaried workers, retail, small and medium enterprises as well as corporate clients with a basic appreciation of electronic payments. This was intended to ensure representativeness in the sample.

Inclusion Criteria

Customers who use the chosen banks' electronic payment systems and are above 18 years found in the study site were included in the study site. The bank staff of Ecobank, Standard Chartered, and Absa Bank Ghana Limited banks only who provide services for such systems inside the Kumasi Metropolis were selected for the study.

Exclusion Criteria

Apart from the three major banks that offer electronic payment services and have branches on Harper Road- Adum in the Kumasi Metropolis, the researcher excluded all other bank staff and customers. Customers without knowledge of EPS were excluded.

The Instrument for Data Collection

Primary data were mostly used in this study and were collected by asking respondents to fill out questionnaires with the assistance of friends and coworkers. Both open-ended and closed-ended surveys were used, and the questions focused on how customers felt about electronic payment systems, their difficulties using them, and the measures taken to increase customer acceptance. Two sets of questionnaires were used: one set for employees and the other for customers. The questionnaire used both open and closed-ended questions. The open-ended questions offered the opportunity for the respondents to freely express themselves on the issue of customer acceptability on the use of the electronic payment system. The closed-ended questions on the other hand restricted the respondents to the options offered to them. Other issues on which the questionnaire was used to collect data included the problems associated

with the electronic payment system and the strategies adopted to promote customers' acceptability of the electronic payment system.

A 5-point Likert style with Very Much (5) being the highest and Very Low (1) the lowest and Average (3) was used to assess various variables for the study.

Data Presentation and Analysis

Raw data collected are meaningless unless they are converted into information. The collected data was reviewed to check and correct possible errors and omissions that may have occurred to ensure consistency across respondents. The Microsoft Excel 2016 program, which is frequently used by researchers for data analysis, was utilized to handle primary data that had been gathered through questionnaires. The mean, median, and standard deviation are combined with descriptive statistical methods, such as bar graphs and pie charts, for data analysis. Quantitative facts were given meaning, and their implications were explained using qualitative justifications. The researcher's conclusions were used to generate the appropriate recommendations.

Ethical Standards

Throughout this investigation, all applicable ethical criteria for conducting research were upheld. Along with gaining the study subjects' informed consent, disclosures to the study subjects about the goals and advantages of the study, the confidentiality of their information, and volunteers were made. All data obtained were discreetly manner.

Analysis and Discussion of Results

Respondents' Demography

The study revealed 20-30 years as the modal class with total respondents of 39 constituting 39%; this is followed by those within the age limit of 31-40 years which is made up of 33 respondents (representing 33%), while the age group of 41-60 years had 25 respondents (constituting 25.00%) and 3.00% were found to be 60 years plus. The results further show that the study is made up of 46.00% male and 54.00% female as demonstrated by Table 1.

Table 1. Gender and Age of Respondents

Detail	Female	Male	Total	Percentage
20-30 years	24	15	39	39.00%
31-40 years	18	15	33	33.00%
41-60 years	11	14	25	25.00%
61 and above	1	2	3	3.00%
Total	54	46	100	100.00%
Percentage	54.00%	46.00%	100.00%	-

Source: Field Survey, April 2023

As shown in Table 2 both customers and staff have been with their respective banks in their mentioned capacities for several years. In general terms, 65.00% (Ecobank-25%, Standchart-23%, Absa-17%) have had more than 4 years of acquaintances in their banks. The study shows that the majority, which is made up of 31.00% (comprising 12%-Ecobank, 10%-Standchart, and 9%-Absa) of the respondents, have been with their respective banks between 4-6 years. It became known that 19% have worked with their banks for more than 8 years, while 15% have worked for 6-8 years and 14% for less than 2 years. These findings show that the respondents have worked with their respective banks for different years, though the majority have been with the bank for more than 4 years as mentioned earlier. This result is a reflection of the fact that the majority of the respondents have adequate working experience and have a lot of knowledge on the subject matter of consumer attitude to e-payment.

Table 2. Number of Years Being with the Bank - Customers and Staff

Years	Ecobank	Standchart	Absa	Total	Percentage (%)
Less than 2 years	4	4	6	14	14%
2 - 4 years	6	8	7	21	21%
4 - 6 years	12	10	9	31	31%
6 - 8 years	8	5	2	15	15%
More than 8 years	5	8	6	19	19%
Total	**35**	**35**	**30**	**100**	**100%**

Source: Field Survey, April 2023

On the educational level of respondents, the study found out that, the majority (25%) of the respondents (only consumers) are holders of secondary school certificates; 24% are holders of a postgraduate degree, 16% are holders of the first degree; 17% (10% of staff and 7% of consumers) holds professional certificates in their respective fields and 10% (only consumers) have Ordinary and Advanced level certificates whiles 8% are holders of Middle School/JHS certificates. This finding shows the diversity in terms of educational backgrounds of respondents of both staff and customers of the selected banks who could be assumed to have a perfect understanding of the consumer attitude towards electronic payment systems in the banking industry in Ghana.

Table 3. Level of Education

Level	Staff	Customers	Total	Percentage (%)
Postgraduate	15	9	24	24%
First Degree	5	11	16	16%
Professional	10	7	17	17%
Secondary	0	25	25	25%
O' & 'A' Level	0	10	10	10%
Middle School/JHS	0	8	8	8%
Total	**30**	**70**	**100**	**100%**
Percentage (%)	**30%**	**70%**	**100%**	

Source: Field Survey, April 2023

As illustrated by Table 4 above, top management staff as expected are the least represented with 4.00%, supervisors recorded 5.00%, middle level attained 6.00% and 15.00% are operational level. This, in summary, is an indication that the organizational structure of the banks is in consonance with the conventional pyramid structure; it is a fair representation of employees, which cuts across all the job positions.

Table 4. Job Position

Level	Percentage (%)
Top Management	4%
Supervisor	5%
Middle Level	6%
Operational Level	15%
Total	**30%**

Source: Field Survey, April 2023

The study again showed that the staff respondents are a cross-section of the entire selected banks who can provide the requisite answers to the questionnaires administered. Sales/Marketing registered 6.00%, 10.00% by Finance, 4.00% for IT, Corporate recorded 2.00% and others which were represented mostly by operations attained 8.00%.

Table 5. Departmental Representation of Staff

Department	Percentage (%)
Sales/Marketing	6%
Finance	10%
IT	4%
Corporate	2%
Others	8%
Total	**30%**

Source: Field Survey, April 2023

Determinant Factors for the Consumer to Accept and Adopt EPS in Ghanaian Banks

In affirmation of [16], the study identified six (6) factors that affect consumers' attitudes towards electronic payment systems, namely usability, security, privacy, after-sales service quality, marketing mix, and reputation. The ranking of the above factors in terms of most influential on consumer attitude to e-payment is shown in Table 6 below.

Table 6. Determinant Factors for the Consumer to Accept and Adopt EPS

Criteria	Mean	Rank
Usability	4.51	3rd
Security	4.73	1st
Privacy	4.60	2nd
After-sales service quality	4.45	5th
Marketing Mix	4.47	4th
Reputation	4.39	6th

Source: Field Survey, April 2023

It was detected that six factors attained a very high mean value of over 4.00 (representing 80%); which is an indication of the high level of influence on consumers' attitudes to electronic payments by the aforementioned factors. Moreover, in terms of ranking, the study shows that consumers consider security with a mean of 4.73 as the most important factor when contemplating the adoption of e-payment in the banking sector. This result conforms to [19]'s which stressed that the consumers' perception of security-related issues was one of the most important factors in electronic payments in banking.

Furthermore, buttressing the security consciousness of consumers, the respondents indicated that consumers look at privacy (4.60) as the next most influential factor. This is not surprising at all taking cognizance of the importance consumers attaches to security. The findings of the study on privacy agree with the assertion of [20], which includes anonymity, intrusion, surveillance, and autonomy, and for that reason, many consumers still are indifferent to electronic payments. Usability was ranked third with a mean of 4.51, followed by 4.45 for marketing mix; the fifth position was occupied by 'After-sales service quality' which had 4.45, and the sixth position was taken by 'Reputation'

with a mean of 4.39 (87.8%). In spite of its low ranking by respondentsits rating of 87.8% is high; thereby affirming [41]'s position that an employee's overall reputation has a positive and statistically significant impact on the consumers' willingness to adopt electronic payment.

Customer Attitudes and Views Towards Electronic Payment Systems

The study looked at the variables in relation to customer attitude and views from both the staff and customers' points of view and analysis and discussion weredone using Tables 7, 8, 9, 10 and 11, respectively.

Table 7. Attitudes and Views of Staff

Views	Very Much	Much	Average	Low	Very Low	Mean
To what extent are you acquainted with the concept and application of EPS	11	15	4	0	0	4.22
How important is the implementation of EPS to your company	15	12	3	0	0	4.44

Source: Field Survey, April 2023

Questions based on the attitudes and views of the staff of the selected banks making use of the EPS were solicited, as shown in Table 8. It was detected that there was a registered mass acquaintance with the concept of EPS as the majority of the staff of the banks in respect of the resultant mean of 4.22, which indicates a high acquaintance with the electronic payment system. Moreover, it was also recorded that, such as system was very important to the banks as it reduces much work and creates efficiency in terms of payments through the electronic system. This payment system ensures cashless transactions and improves the accuracy and safety of monetary transactions on the part of the banks. Therefore, the researcher agrees with [9] that concluded that changing consumer behaviour and attitudes rather than banks' cost structure determine the adoption of Internet banking. In that customer attitude is the driving factor behind the adoption of EPS.

On the part of respondent customers, a5-point Likert scale was used for the various measurements of the study which intended to know the extent of agreement with an assertion or disagreement with the assertion of consumer attitude on electronic payment in respect of 'value towards the banking needs', 'complexity', 'compatibility' and 'trial ability'. For a five-point Likert Scale: 5 – Strongly agree, 4 – Agree, 3 – I am not sure, 2 – Disagree, 1 - Strongly disagree.

Therefore, for the analysis of consumer attitude based on 'value towards the banking needs', 'complexity', 'compatibility', and 'trial ability' weights were assigned to the extent of agreement to each variable in order for the mean and standard deviation of each benchmark to be found as shown in Table8, Table 9, Table 10, and Table 11 and below.

Table 8. Value towards the Banking Needs-Customers

Value toward the banking needs	Mean	Std. Dev
I find electronic payment systems by the banks an easier way to solve my banking needs	4.33	0.936
Electronic payment system through the banks gives me greater control over my finances	4.03	0.742

Electronic payment system through the banks allows me to manage my finance effectively	4.14	1.032
I find the electronic payment system a convenient way to manage my finance	4.03	0.742
An electronic payment system allows me to manage my finance efficiently	4.02	0.653
Electronic payment system services are fast to use	4.43	0.742
Average	**4.16**	

Source: Field Survey, April 2023

As clearly shown in Table 8, some of the variables have a mean of values approximately to the notion of agreement of better values towards the banking needs by the three selected banks, such as "I find electronic payment systems by the banks an easier way to solve my banking needs" which recorded a mean of 4.33; 'Electronic payment system through the banks gives me greater control over my finances' and 'I find electronic payment system a convenient way to manage my finance' had a mean of 4.03. Furthermore, it is noted that consumers' assessment of 'Electronic payment system through the banks allows me to manage my finance effectively' had a mean in the dimension of 4.14 representing 82.4% with 'Electronic payment system services are fast to use' registering the least mean of 4.43. In summary, the study shows that an average of 4.16 representing 83.27 % is an indication of the banks placing value on the banking needs of consumers by having their hands firmly on the implementation of the e-payment system.

Table 9. Complexity-Customers

Complexity	**Mean**	**Std Dev**
Electronic payment system requires a lot of knowledge to use	2.456	1.638
The electronic payment system is difficult to use	4.533	1.839
I am reluctant to use an electronic payment system service unless it has been tried and tested by others first.	4.016	1.046
The electronic payment system is an easy way to conduct banking transactions.	1.376	1.201
I always find it easy to remember the password of my ATM card	4.203	1.490
The electronic payment system is technologically easy to get started	2.046	1.084
Average	**3.105**	

Source: Field Survey, April 2023

On the issue of complexity, the study found out that, the total average as illustrated in Table9, collectively, the study recorded a level of approximately 3.105 i.e., 62.1%. However, 'Electronic payment system is difficult to use', 'I am reluctant to use electronic payment system service unless it has been tried and tested by others first', and 'I always find it easy to remember the password of my ATM card' are the main factors which were accepted by almost all the consumers involved in the study as evidenced by the recorded mean of 4.533, 4.016 and 4.203 respectively. The study shows that consumers are really bothered by the 'Electronic payment system requires a lot of knowledge to use'; 'Electronic payment system is technologically easy to get started' and 'Electronic payment system is an easy way to conduct banking transactions, evident by the 2.456, 2.046 and 1.376 mean respectively. This portrays non-performance by the banks in those three major areas assessed.

Table10. Compatibility-Customers

Compatibility	**Mean**	**Std. Dev**
Electronic payment system with the banks is well suited to my lifestyle	2.153	0.846
Electronic payments fit well in the way I like to manage my finances	2.078	1.274
I am happy with my old way of banking operations	1.957	1.475
I am knowledgeable about the various methods for accessing my account	1.685	0.674
Automated banking services make me uncomfortable	1.372	1.586
I believe that many transactions can be done by electronic payment system	2.434	1.085
Using an electronic payment system for me is the same as paying by cash	2.746	1.684
Average	**2.061**	

Source: Field Survey, April 2023

The total average in Table 10 illustrates that about compatibility, the banks attained an abysmal mean level of 2.061 i.e., 41.22%. Seven major variables were severally used to assess the compatibility of electronic payments by the selected banks; except for the notion 'Using electronic payment system for me is the same as paying by cash' which recorded a mean of 2.746, the rest of the six variable measured means below 2.5; with the least of them being 'Automated banking services make me uncomfortable', which attained 1.372 means.

Table 11. Trial Ability-Customers

Trial ability	**Mean**	**Std. Dev**
Before I use the electronic payment system, I need to try it for at least one month	4.02	0.933
There are many opportunities for electronic payment systems available for us to use	4.43	0.742
The electronic payment system is available to me to adequately try it	4.00	0.663
Average	**4.15**	-

Source: Field Survey, April 2023

The total average as per Table11 illustrates that with regards to 'trial ability', cumulatively, a level of approximately 4.15 i.e., 83% was attained. Three major variables were severally used to assess trial ability. 'Before I use the electronic payment system, I need to try it for at least one month' had a mean of 4.02; 'There are many opportunities about electronic payment system available for us to use', attained 4.43; and 'Electronic payment system is available to me to adequately try it' recorded 4.00. The study revealed the above means that consumers hold in high esteem all the necessary variables needed for trial ability are in place. This shows that the consumers of the selected banks are actually satisfied with the trial ability with respect to e-payments in the banking sector. The findings as per the view of the respondent customer agree with the importance that [6] different dimensions of attitudinal belief toward EPS to users' banking needs relating to the advantages that accrue to the users of the technology in question.

Degree or Level of Usage of E-Payments by Customers in Ghanaian Banks

Table12. Extent of Adoption of E-Payment

Importance	Very Much	Much	Average	Low	Very Low	Mean
Making payment for almost all services	13	11	6	0	0	4.22
Receiving payments for all services rendered	5	7	6	12	0	3.09
Delivery of goods and services	6	2	7	10	5	2.77
Ordering and payment of inventory purchasing	9	14	7	0	0	4.01

Source: Field Survey, April 2023

From the staff point of view, concerning issues of the importance and extent of adoption of the e-payments in the systems, it was detected that the banks virtually make all their payments through the e-payments system, as well as ordering and payment of inventory purchasing, which had a higher average score of 4.22 and 4.01 respectively, indicating a mass usage among the banks in making their payments.

This is attributed to the fact that the banks make their payments through banking infrastructure which makes use of transfers and electronic payment and not cash due to the high volume and amount of goods of which such payments are made. Furthermore, payment receipts of their services rendered to their clients do not all pass through the e-payment systems. The study revealed that substantial parts of the receipts are not paid through the electronic system but rather, through cash as indicated in Table 12.

This influenced the average mean to be 3.09 even though some part is paid to the banks through the e-payment systems. Nevertheless, the delivery of goods and services to the banks is hugely not paid through the e-payment system.

Table 13. Infrastructure Requirement

Infrastructure	Very Much	Much	Average	Low	Very Low	Mean
Hardware and network (computers, internet, intra/extranet, email, modem)	13	8	9	0	0	4.12
Software (public and specialized/advanced packages, standardized processes &systems)	5	9	13	3	0	3.60
IT experts	8	12	10	0	0	4.00
Skilled staff (in e-commerce)	11	13	6	0	0	4.20

Source: Field Survey, April 2023

The study indicated that for the electronic payment system to be effective, there is the need for the needed infrastructure to be in place and to make sure that, the stakeholders do have the required human resources and the available technology in place to manage the e-payment system. The banks have the requisite hardware and network, IT experts, and skilled staff available for the execution of the electronic payment systems in its effectiveness as indicated by the high mean of over 4.00 (80%) as shown in Table 13. This indicates the preparedness and readiness of the banks to manage and execute the electronic payment systems to their highest

benefit to both the banks and their clients. However, the software (public and specialized/advanced packages, standardized processes, and systems) recorded a mean of 3.60 (registering a representation of 72%). The findings of the study agree with [24] and [32] attaches to the importance of EPS since most electronic payments cost only about one-third to one-half as much as paper-based non-cash payment, it is obvious that the social cost of a payment system could be considerably reduced if it is automated.

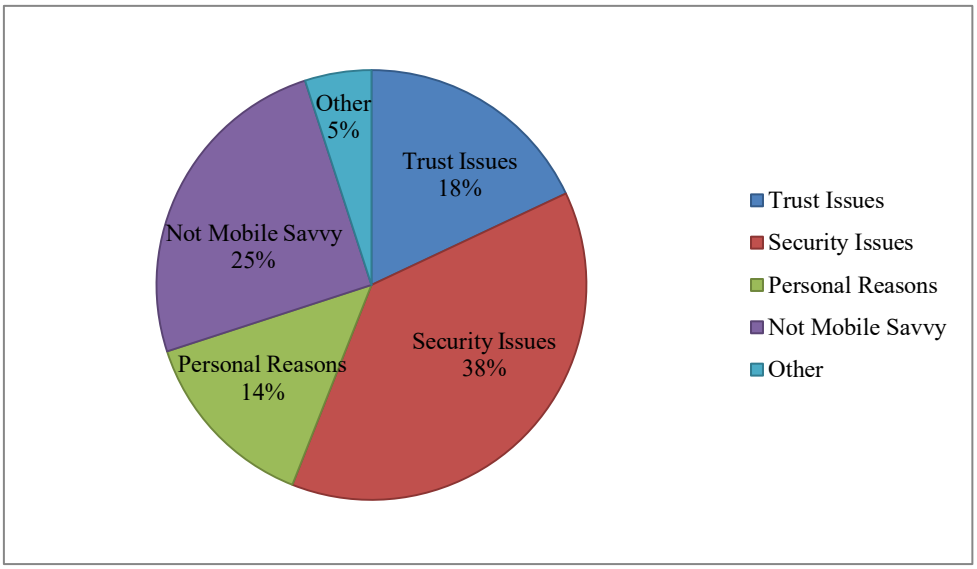
Degree or Level of satisfaction of customers with EPS in the Ghanaian banks

Table 14. Awareness of the E-Payment System in Ghana

Item	Frequency	Percentage (%)
Very well aware	27	39%
Not really	24	34%
Somehow	8	11%
No, I am not aware	11	16%
Total	**70**	**100%**

Source: Field Survey, April 2023

Contrary to [37], Table 14 indicates that 39% (27 in absolute terms) of the consumers were very much aware of the existence of an e-payment system in Ghana; 34% (24 in absolute terms) were recorded as 'not really', 'somehow' registered 11% and '16% for 'no, I am not aware'. It could be deduced that the notions of 'not really' and 'somehow' represents the group of respondents who are too sure of their status as far as the awareness of e-payments in Ghana is concerned, and those two classes cumulatively registered 45%. Furthermore, in spite of the 16% of the customer sample for the study registered respect of 'not aware' of such an existence the study indicated that the majority of the populace is abreast with the development of the e-payment existence in one way or the other within the economy of Ghana. Moreover, all those who indicated an awareness or somehow awareness also indicated that their banks operate electronic payment systems through E-zwich, ATM, and money transfer on their mobile networks of which 45% indicated such preference on their mobile phones.

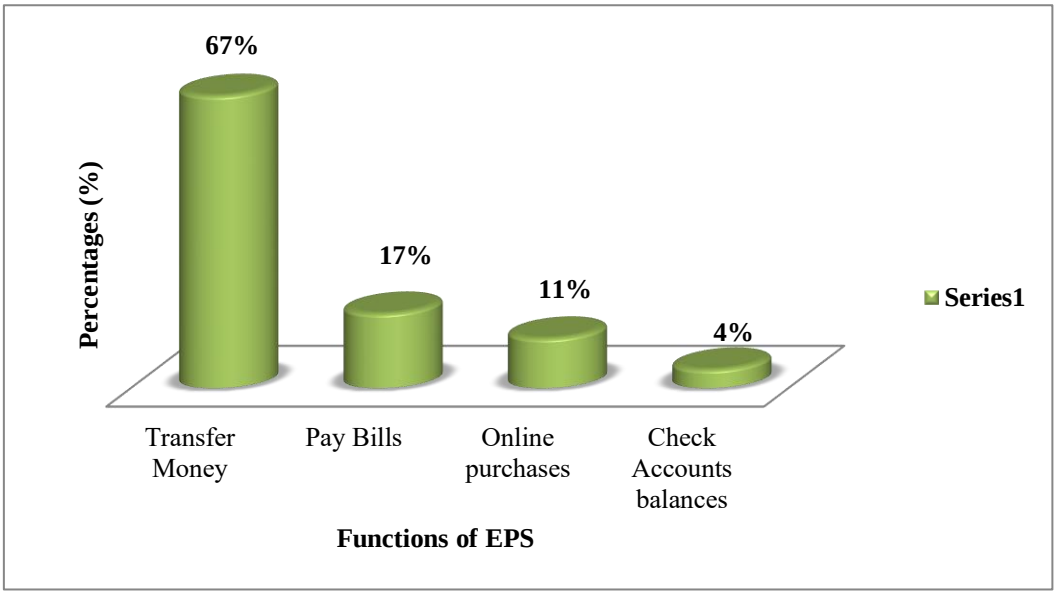


Source: Field Survey, April 2023

Figure 1. Unlikeness to Use Electronic-Payment on Mobile Phone

As demonstrated by Figure 1, certain reasons were identified by the study as reasons why consumers of the three selected banks do not fancy the use of mobile phones as a means of e-payment system. It was discovered that 25% of the respondents indicated that their prime reason for not opting for E-payment is 'not mobile savvy'. This is because most of those respondents in this category are not acquainted with the use of the mobile phone for other purposes such as making transactions (buying goods and services) over the internet and in the shopping mall. They consider the use of mobile phones for only making calls and other social network services but not for financial services.

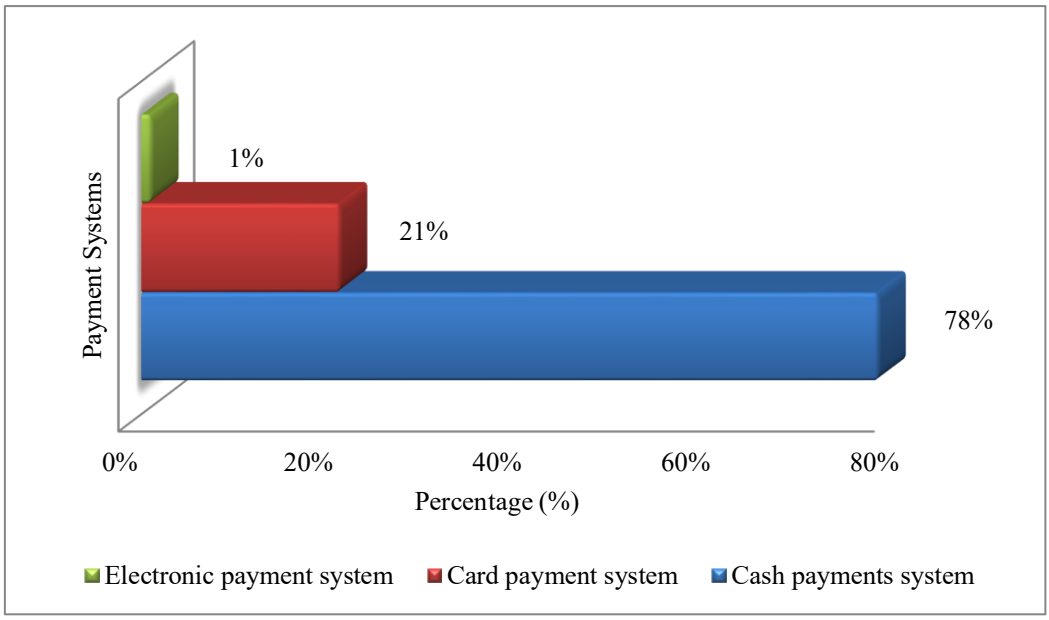
Besides, the study discovered that the major issues considered by customers are security reasons (registering 38%); followed by issues of trust (represented by 18%) of the usage of mobile phones; and 14% was recorded for those whose reasons are personal.



Source: Field Survey, April 2023

Figure 2. Functions of the Electronic Payment System

Consequently, as picturesquely demonstrated by Figure 2 above, the majority (67%) of the respondents use the e-payment system mainly for the purpose of 'Transfer Money', 17% recorded the customers use it for payment of bills (such as electricity bills, DSTV, particularly, at Ecobank); 11% for online purchase; and only 4% use it to check their account balances, through the Account alert services which provide the balance of a client the moment there is a deposit or withdrawal of accounts. Nevertheless, the usage of those services recorded a very satisfactory response (69%) as indicated by all the respondents who use E-payment for either money transfer, payment of utility bills, online purchases, and checking of balances. Furthermore, it was detected that as much as 78% of the populace prefer the cash payment system to the electronic payment system (registering 21%) and the card payment system (1%) as demonstrated by Figure 3 below.



Source: Field Survey, April 2023

Figure 3. Payment systems

The main reason assigned by most of their preference for cash payment is that the Ghanaian populace is skeptical about the use of cards and electronic payment systems basically because of security and privacy matters. The ordinary Ghanaian seems more comfortable with lots of currency notes in their pocket than loading them on their cards. The study has shown that position of [33] which mentioned that Ghana has lagged way behind most of the world (including many of its peers in Africa) in the general quest to boost microeconomic activity by reducing the role played by physical cash in daily transactions and by encouraging the creation of a cashless society.

Challenges Faced by Consumers as they Adopt EPS in the Ghanaian Banking Sector

The results as stated below agrees in totality with the assertions held by [37] and [38] on the challenges that confront Africa in general and Ghana, in particular, the area of EPS, which has been the bane for the continents to develop a cashless society.

Table 15. Major Obstacles

Major Obstacles	Very Much	Much	Average	Low	Very Low	Mean
Low internet usage and fewer users	10	12	8	0	0	4.10
Security reservations	11	13	6	0	0	4.20
Expensive and complicated technologies of e-commerce	16	13	1	0	0	4.47
Product complexity and low-interest products	12	8	1	9	0	3.76
Scarcity of skilled staff	5	12	5	8	0	3.60
Inflexible organizational chart and resistance to change	4	6	12	8	0	3.29
Lagging of other supportive sectors (e.g., internet service providers)	9	14	6	1	0	4.04

Source: Field Survey, April 2023

As shown in Table 15, the study identified certain major obstacles hindering the implementation and the usage of the e-payment system in the three selected banks. It was detected that the most ascetic major obstacle facing the banks is 'expensive and complicated technologies of e-commerce' with a mean of 4.47 (89.4%); followed closely with a mean of 4.20 was 'security reservations'; 'low internet usage and fewer users' attained a mean of 4.10; 'lagging of other supportive sectors (e.g. internet service providers)'; 'product complexity and low-interest products'; 'scarcity of skilled staff'; and 'inflexible organizational chart and resistance to change recorded 4.04, 3.76, 3.60 and 3.29 respectively.

Table 16. Potential Application

Departments	Very Much	Much	Average	Low	Very Low	Mean
Sales/Marketing	16	14	0	0	0	4.53
Information Technology	13	15	2	0	0	4.42
Accounting and Finance	16	12	2	0	0	4.44
Technical Services	23	6	1	0	0	4.73
Production and Operations	11	15	4	0	0	4.22
Quality Assurance	7	14	9	0	0	3.94

Source: Field Survey, April 2023

As illustrated by Table 16 six major departments were found to have the potential application of the e-payments, which impacts on the business execution of the various departments at the selected bank. The 'Technical Services' with a mean of 4.73 (94.6%) is shown to be the department that has a potential application of the e-payment. The study revealed that Sales/Marketing, Accounting and Finance, IT, Production and operations and quality assurance departments registered 4.53, 4.44, 4.42, 4.22 and 3.94 respectively as departments with potential application.

Table 17. Perceived Benefits

Perceived Benefits	Mean
Brand and image promotion (as a pioneer and modern company)	2.96
Lower investment for establishing the sales and after-sales services work	3.03
Decentralization and no restriction imposed by national borders	2.98
Cost reduction in value chain management (product/service development)	3.81
Increase in sales volumes (Premium)	3.92
Mass-customization and innovation	4.10
Promotion enhancement with lower cost desired CRM (customer relation management) through continuous service (24/7) and fast response	3.95
Good knowledge management and better stakeholder relationship	3.86
Job enrichment and high productivity	4.29
An extended corporation with management	3.87
Globally, to what extent is your company ready to embrace e-commerce	4.34

Source: Field Survey, April 2023

As shown in Table 17, the results agree with [42] that the perceived benefits in respect of staff of the banks selected an enormous advantage that might be recouped because of the full and smooth usage of e-payment in the economy. The most perceived benefit will be the readiness of

the banks to embrace global e-commerce as it will make transactions across borders effectively hurdle-free and help the banks to compete globally. This had a higher agreement among the staff of the banks, which had a mean of 4.34, followed by 'job enrichment and high productivity' which also had a mean of 4.29 as well as 'mass customization and innovation' which also had a mean of 4.10.

These are wheels for the expansion of technology and improvement in service quality delivery as well as openness of the global economy to clients and individuals alike. This finding shows that the electronic payment system has the potential to benefit which benefits each sector of the economy and increase the security of individual finance and gives individual and corporation the openness to access services across the globe. Therefore, the research results affirm [42] position which indicated that with the advent of modern technologies in telecommunications, infrastructure, and protocols, future payments will be made through e-payments by Business to Business, Business to Customer, and Customer to Government.

Conclusions and Recommendations

Conclusion

The electronic payment system establishes a platform for payments to be made easily and comfortably, ensuring that there is less currency in circulation and enhancing security and privacy. Nonetheless, issues about security and privacy still exist when using technology. The study found that the main reasons people do not use electronic payment methods are trust and security. Additionally, the system has the ability to boost the economy and expand clients' and banks' access to markets, ushering them into the multilateral payment system.

Recommendations

The following recommendations are made to help enhance the consumer attitude to the electronic payment system in the Ghanaian banking sector.

Uniformity across all Electronic Payment System Platforms

The central bank should harmonize the platform for using the electronic payment system in order to employ all service providers uniformly. The convenience of using the card payment system, cash payment system, and mobile payment system will all enhance as a result, increasing utilization. This would ensure that users of the system could use their preferred payment method throughout the nation, which would boost demand for it.

Expert Security Training

It is also suggested that those involved with e-payments organize a successful training session for experts on how to deal with security-related concerns, particularly cyberattacks and information storage, as lack of confidence is one of the main barriers to using the electronic payment system. In addition, this will aid in stopping the unease associated with using the card payment system or the mobile payment system.

Assurance on Privacy

It is also recommended that stakeholders give users of electronic payment systems sufficient assurance regarding their privacy, as such data through electronic payment systems may be used to track and monitor users inadvertently during global cyber-security and data storage. In order to promote the use of the electronic payment system, will foster more confidence and trust among businesses and their clients and restore the necessary assurance.

Intensification of Education

In general, it is acceptable that Ghana has lower EPS usage than the rest of the globe since customers are less aware of the services available to them, how they work, and the advantages they offer. Most Ghanaians, particularly the elderly, lack the knowledge and

skills necessary to guarantee the system is used effectively and efficiently. As a result, banks must inform customers about all of their payment system choices and thoroughly outline the advantages and disadvantages of all EPS-related services. In order for consumers to comprehend how new forms of electronic payment vary from cash, they must be made aware of the potential liabilities associated with their use.

Attracting the unbanked

One of the primary barriers to electronic payments in Ghana, according to [32], is the inability to persuade the millions of people who do not yet have bank accounts to join the mainstream financial system. It is well recognized that the unbanked challenge is one that the banking industry has not given much thought or effort to. Thus, it is advised that the different banks implement ways to draw the unbanked into the EPS without necessarily having to open accounts with them.

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Conflict of Interest

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