TEXILA AMERICAN UNIVERSITY

TEXILA INTERNATIONAL JOURNAL

# TEXILA INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH



ISSN: 2520-3088
volume 10 Issue 1

# EDITORIAL POLICY

Papers must be submitted with the understanding that they have not been published elsewhere (except in the form of an abstract or as part of a published lecture, review, or thesis) and are not currently under consideration by another journal published or any other publisher. The submitting (Corresponding) author is responsible for ensuring that the article's publication has been approved by all the other coauthors. It is also the authors' responsibility to ensure that the articles coming from a particular institution are submitted with the approval of the necessary institution. Only an acknowledgment from the editorial office officially establishes the date of receipt. It is a condition for submission of a paper that the authors permit editing of the paper for readability. All enquiries concerning the publication of accepted papers should be addressed to ejournal.assist@tau.edu.gy**.**


## CHIEF EDITOR

Dr. Rakesh Kumar, Manager Examinations, Texila Educational and Management Services.

## EDITORIAL BOARD MEMBERS

Dr. T. Selvankumar, Professor and Head, Mahendra Arts and Science College.

Dr. Rakesh Ranjan, Educational Management and Administration, MAEERs Vishwashanti Gurukul School, Solapur.

Dr. Sunil Kumar D, Associate professor in the Department of Community Medicine, JSS.

Mr. Forkpah Pewee, Chairman of University of Liberia, Public Health Department.

# ABOUT PLAGIARISM

Plagiarism is the use or close imitation of the language and ideas of another author and representation of them as one's own original work. Duplicate publication, sometimes called self-plagiarism, occurs when an author reuses substantial parts of his or her own published work without providing the appropriate references. This can range from getting an identical paper published in multiple journals, where authors add small amounts of new data to a previous paper.

Plagiarism can be said to have clearly occurred when large chunks of text have been cut and pasted. Such manuscripts would not be considered for publication in TIJN Journal. But minor plagiarism without dishonest intent is relatively frequent, for example when an author reuses parts of an introduction from an earlier paper. The editors will judge any case of which they become aware (either by their own knowledge of and reading about the literature, or when alerted by referees) on its own merits.

The paper containing the plagiarism will be obviously returned back to the author's for review, but we earnestly request the authors to avoid submitting plagiarized.

# DISCLAIMER

Texila International Journal of Academic Research (TIAR) make every effort to ensure the accuracy of all the information (the "Content") contained in its publications. However, the TIAR and its agents make no representations or warranties whatsoever as to the accuracy, completeness or suitability for any purpose of the Content and disclaim all such representations and warranties whether express or implied to the maximum extent permitted by law. Any views expressed in this publication are the views of the authors and are not necessarily the views of the Editor's or Texila International Journal of Academic Research.

# TABLE OF CONTENT


| | | |
|---|---|---|
| 1 | A Critical Analysis of the Clinical Effect and Application of Acupuncture Treatment for Shoulder Pain Disorders in Adults<br>Murukesu M Margapandu | 1 |
| 2 | Modelling Geographic Accessibility of Primary Health Care Facilities in Bauchi Local Government Area<br>Isah Mohammed Bello | 19 |
| 3 | Covid-19 Psycho-social Impact among United Nations Staff in Burundi<br>Jean Claude Musengimana | 34 |
| 4 | Research on the Impact of Covid-19's Purported Impacts on the Prevalence of Stress, Anxiety, and Depression<br>Babasaheb Ghodke | 45 |
| 5 | Role of NOS3 894G>T Gene Polymorphism in Traumatic Cerebral Hemorrhagic Contusion Khartoum, Sudan, 2020-2021<br>Samah Abdelrahman Hassan Ibrahim | 55 |
| 6 | Prevalence of Cervical Cancer and Associating Factors among HIV Infected Women of Omaruru District in Namibia<br>Tshipamba Njila Sebastien | 63 |

Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.10.01.Art001

# A Critical Analysis of the Clinical Effect and Application of Acupuncture Treatment for Shoulder Pain Disorders in Adults

Murukesu M Margapandu
*School of Research, Texila American University, Guyana, South America*

***Abstract***

*The study's objective is to evaluate the clinical effect and application of acupuncture treatment for shoulder pain disorders in terms of effectiveness and safety. A narrative review of RCTs in which acupuncture was used as an intervention for patients with shoulder pain disorders (SPD) was conducted. All randomised controlled trials that evaluate the effects of acupuncture for shoulder pain disorders compared with controls were included. The primary outcomes were pain and shoulder function. Based on the inclusive and exclusive criteria, 22 randomised control trials involving 1801 participants that evaluated the effects of acupuncture for various shoulder pain disorders were retrieved from various databases, and the intervention and results were examined. Eleven studies found that acupuncture treatment had significantly greater effects when compared with other therapies or treatments. Nine studies showed that, when combined with other therapies or treatments, the acupuncture group showed a better therapeutic effect than the therapy group itself. The results also show that acupuncture treatment can produce the same therapeutic effects as physical therapy, manual therapy, the uses of tropical NSAIDs, oral medications, and corticosteroid injections. No serious adverse events were observed. The findings indicated that acupuncture could be a safe and effective treatment for shoulder pain disorders by reducing pain and restoring shoulder functions. The results are consistent with those of past literature reviews. Although there is some evidence for the effectiveness and safety of acupuncture for shoulder pain disorders, the level of evidence is still low. Due to several limitations and heterogeneity, the results are inconclusive, and therefore the findings need to be interpreted with caution. Future large-scale studies should be more rigorous and well-designed RCTs with high-quality studies, a longer study duration with more subjects, an ideal standardised treatment regimen, and transparent reporting.*

***Keywords:*** *Acupuncture, Shoulder pain, Shoulder disorders, Acupuncture safety, Alternatives therapies, Traditional Chinese medicine, Pain relief.*

## Introduction

Pain on the elevation of the arm is a common symptom of various shoulder disorders [1]. Shoulder pain disorder (SPD) is referred to as any level of pain or discomfort in or around the shoulder joint. Since the shoulder joint is one of the most movable joints in the human body, shoulder pain can have a wide range of aetiologias, either from intrinsic disorders of the shoulder or referred pain [2]. Regardless of the disorder, SPD is one of the most common musculoskeletal and disabling complaints in primary care [3, 4]. It is the third most common musculoskeletal presentation after back and knee pain [5], with an estimated prevalence of 4%–26% in the global population [6]. According to population surveys, shoulder pain affects 18–26% of adults at any point in time [7], making it one of the most common regional pain syndromes. According to reports, the prevalence of shoulder pain in the general population ranges

***Received: 20.11.2022*** ***Accepted: 13.12.2022*** ***Published on: 31.01.2023***
***Corresponding Author: mmurukesu@yahoo.com***

from 7% to 30%. It increases with age, with women having a higher prevalence than men [8]. The impact of shoulder pain disorders has resulted in a significant socioeconomic burden on society [9-11]. Furthermore, there are significant economic costs associated with rising healthcare demands, subpar job performance, prolonged sick leave, and early retirement or job loss [12].

General treatment for shoulder pain will depend on the cause and severity of the pain. Nonsurgical treatment is effective for most of the shoulder pain aetiologias. Some systematic reviews have reported on various nonsurgical treatments available, such as pharmacotherapy (corticosteroid or hyaluronate injections, glucocorticoid injections, steroid injections, non-steroidal anti-inflammatory drugs [NSAIDs], and oral analgesics), [13, 14]. In many cases, studies reveal that the majority of pharmacotherapy has a wide spectrum of adverse effects. Side effects of oral analgesic medications are a well-documented barrier to successful pain management [15]. Anyway, oral analgesics do not treat disorders but help by changing the way the body senses pain and reducing the pain signals sent by the nervous system and the brain's reaction to those pain signals [16]. The most common side effects are nausea or vomiting, constipation, sedation, cognitive failure, myoclonus, and pruritis [17]. NSAIDs have well-known adverse effects affecting the gastric mucosa, renal system, cardiovascular system, hepatic system, and hematologic system [18]. Hyaluronic acid injections may work better than painkillers for some people with osteoarthritis, but they may be less effective in older adults and people with severe osteoarthritis [19]. In some cases, surgery may be required to correct and restore shoulder pain disorders if nonsurgical options are unable to bring about the desired pain relief or return of shoulder function.

Until today, there has been disagreement inside the medical community over which treatment is the most effective in terms of safety, pain reduction, and improving shoulder function for SPD. The new guidelines encourage nonpharmacological therapies as the first-line treatment for various types of shoulder pain [20, 21]. According to research, acupuncture treatment is one of the few evidence-based nonpharmacologic therapies for pain management [22]. There is no doubt that numerous studies [23-25] have indicated the beneficial effects and safety of acupuncture for several chronic pain conditions; however, there are other studies that continue to raise concerns about the effects and safety of acupuncture for SPD. This query is raised when a reference is made to non-randomized studies. Randomized clinical trials (RCTs) are preferred by clinical researchers over non-randomized clinical trials because they are the gold standard study for evaluating health interventions and are considered the second level of evidence for clinical decision-making [26].

The argument about the effectiveness and safety of acupuncture for shoulder pain is still going on. But, at present, there are no proper narrative reviews conducted to evaluate the effect and application of acupuncture treatment for shoulder pain disorders in adults. The purpose of this study is to evaluate the clinical effect and application of acupuncture treatment for shoulder pain disorders (SPD) in adults. In order for acupuncture treatment for disorders of shoulder pain to be evaluated for its effectiveness and safety, a comprehensive critical analysis of its safety and efficacy must be conducted.

## Methods

### Search Strategy

This study follows the preferred narrative review format, IMRADC (Introduction, Aim, Methods, Results, Discussion, and Conclusion). There is a certain weakness in the quality of narrative reviews in comparison to systematic reviews. Therefore, by synthesizing some of the PRISMA guidelines, such as article selection methods (Figure 1), rigorous evaluation, results,

and evidence-based conclusions, the quality of the narrative review was attempted to be improved. A comprehensive search strategy was designed to search all the available literature related to this research topic. An electronic literature search was conducted on the following multiple electronic databases: PubMed, Google Scholar, PMC free articles, ScienceDirect, Eric, and Web of Science. The database language was set to English. Abstracts, reviews, full-text articles, clinical trials, systematic reviews, and randomized control trials were searched. Relevant controlled vocabulary supplemented with keywords such as "traditional Chinese medicine," "alternative therapy," "acupuncture," "shoulder pain," "shoulder disorder," "pain relief," and "acupuncture safety" was used to search for clinical trials of the effect and application of acupuncture treatment for shoulder pain disorders in adults. Multiple electronic databases from January 2012 to March 2022 were used to source articles for the review. The search process ended on March 15, 2022. Due to language limitations, only English databases were searched. Articles are screened according to the title and then selected after the abstracts are read. Only full-text articles that meet the inclusion criteria were downloaded.

## Inclusion Criteria

### Types of Studies

Regardless of publication type, the critical analysis included only RCTs of acupuncture for SPD, with or without blinding. Only studies with well-defined hypotheses, objectives, settings, participants (with inclusion and exclusion criteria), assessments, interventions, results, and conclusions were selected. The sample size of every study must be more than twenty patients. If the sample size is too small, the study is unlikely to produce any conclusive findings.

### Types of Participants

All adult participants or subjects aged 18 years or older with shoulder pain disorders were considered regardless of gender, race, ethnicity, region, and religion. The majority of the participants in these trials were outpatient clinic patients. All types of shoulder pain, whether acute or chronic, were considered as long as the area of the pain was localised to the scapula and humerus, with their surrounding muscles, tendons, and ligaments. Most types of shoulder pain, such as adhesive capsulitis, shoulder impingement, frozen shoulder, rotator cuff injury, labrum injury, bursitis, arthritis, tendonitis, and shoulder pain due to recovering from surgery, are included.

### Types of Interventions

Acupuncture, either traditional Chinese acupuncture (MA), electroacupuncture (EA), or laser acupuncture, was compared to the following control interventions: sham acupuncture or sham EA; pharmacological (western medication); and other therapies or treatments such as physical therapy, physiotherapy, ultrasound, ESWT, physical training, ashi point acupuncture, trigger point acupuncture, or exercise therapy. Co-interventions were allowed as long as all trial arms received the same co-intervention. For the purposes of this analysis, there are no limitations on the types of needles, duration of treatment, or number of treatments. Only meridian acupuncture points, tender points (ashi points), and trigger points are considered.

## Exclusion Criteria

The following criteria will be excluded from this study: (1) the duplicate articles as well as data that cannot be obtained or is incomplete; (2) other types of acupuncture, such as hydro acupuncture, fire needle acupuncture, or warm needle acupuncture, bee venom acupuncture, and small needle acupuncture (due to a lack of studies); (3) research involving acupuncture points other than those on the body (ear acupuncture or microsystem acupuncture); (4) participants with fractures, severe dislocations or sprains, terminal disease, mental illnesses,

cognitive impairment, or serious infection; (5) observational studies, cross-over studies, animal studies, conference abstracts, letters, and studies involving children; and (6) acupuncture plus other therapies, such as Chinese herbal medicine.

### Outcome Measures

The primary outcomes include pain intensity. Scores or scales such as the Visual Analogue Scale (VAS), Numerical Rating Scale (NRS), Constant-Murley score (CMS), Patient Global Assessment (PGA), and Doctor Global Assessment (DGA) are used to assess pain intensity. Secondary outcomes include shoulder functions and the occurrence of adverse effects. The range of motion (ROM), the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, the Shoulder Pain and Disability Index (SPADI), and the Fugl-Meyer Motor Assessment (FMA) are all used to evaluate the shoulder pain and functionality of the shoulder.

## Results

### Search Results

The literature search for this study adopted the same features as the systematic review search methodology. Figure 1 shows a literature selection process for the study using some guidelines from the literature selection process in systematic reviews. The titles and abstracts of 1,161 potentially relevant studies were identified and screened for retrieval. A total of 493 citations were screened after duplicates were removed. Again, another 447 records were excluded, with reasons for not fulfilling inclusion criteria. 46 full-text publications were reviewed for potential inclusion. Again, another 24 full-text articles were excluded for not fulfilling further inclusion criteria. Finally, 22 studies were included in the qualitative synthesis. The full text of the articles could only be obtained when the abstracts discussed acupuncture treatment, its application and effectiveness for shoulder pain and shoulder disorders, the causes and effects of shoulder pain disorders, the safety of acupuncture treatment, the side effects of acupuncture, and the effects of combining acupuncture treatment with conventional medicine or other forms of alternative medicine.

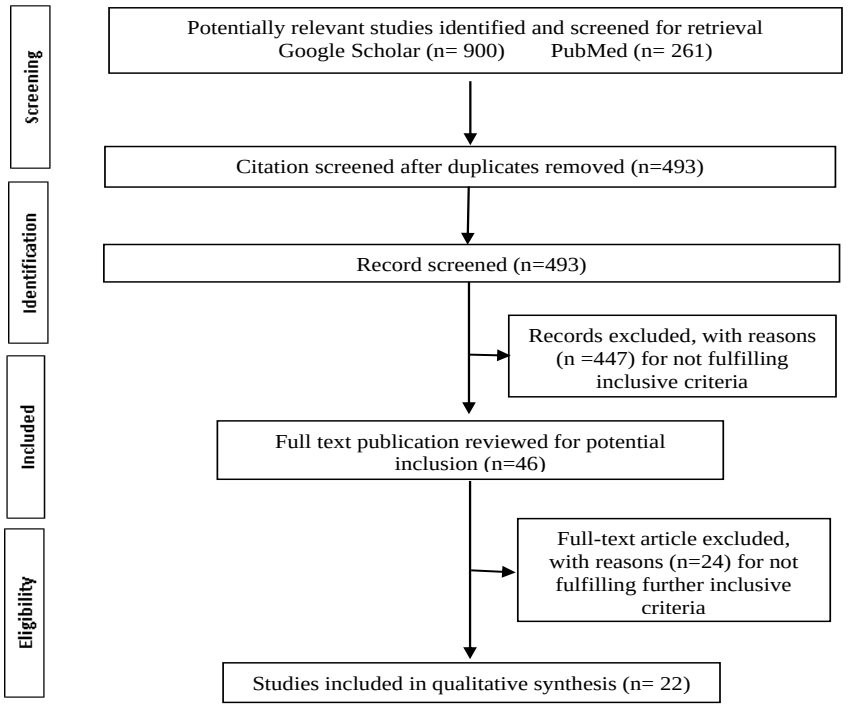


**Figure 1.** Flow Chart of the Literature Selection Process for the Study

## Description of the Study

All 22 included RCTs were published in English. The included RCTs were published from the years 2005 to 2020. Table 1 and Table 2 show the summary characteristics of 22 RCTs of acupuncture for shoulder pain disorders. Six RCTs of acupuncture for shoulder pain disorders without co-intervention are summarized in Table 1, while sixteen RCTs of acupuncture for shoulder pain disorders with co-intervention are summarized in Table 2.

Of the 22 studies, twelve studies were from China [27-38], three studies were from Spain [39-41], two studies from Sweden [42, 43], two studies from Taiwan [44, 45], and one each from Turkey [46], Iran [47]and Greece [48]. The total number of participants are 1,808 person). The number of participants in each study ranged from 21 to 425 individuals. They were between the ages of 20 and 75. All the participants involved were diagnosed with SPD (clinical, as well as clinical and imaging). The conditions or diagnosis reported in these studies are: four cases of poststroke shoulder pain [35-38]; four cases of the frozen shoulder [34, 44, 45, 47]; one case of Scapulohumeral periarthritis [33]; three cases of supraspinatus tendinitis [29, 31, 48]; two cases of the unilateral subacromial syndrome [39, 41]; two cases of shoulder impingement syndrome [42 43]; three cases of rotator cuff injuries or tears [27, 30, 32]; and three cases of chronic shoulder pain [28, 40, 46]. Only three studies revealed that participants experienced chronic shoulder pain.

The 22 studies used 12 manual acupuncture (traditional Chinese acupuncture) interventions [33-36, 38-39, 41-46] and six electroacupuncture interventions [27, 31, 48, 32, 45, 38]. One study used laser acupuncture [46], and another study used contralateral acupuncture [28]. Two studies used local non-acupuncture points (ashi points and trigger points) [37, 40]. Of the 12 studies, nine made use of both local and distal acupuncture points [34, 35, 38, 39, 42-46], while three based their treatment only on the distal acupuncture points [33, 36, 41].

The most frequently used acupuncture points in these studies were LI 15 (8 studies), TE 14 (8 studies), SI 9 (4 studies), and LI 14 (4 studies). LI-11 (Quchi) was frequently used for the treatment of post-stroke shoulder pain [35, 38], LI-15 (Jianyu) for the treatment of shoulder impingement pain [39, 42, 43], and LI-11 (Quchi) for the treatment of frozen shoulder [34, 44, 45]. The most common meridian types used are large intestine (LI) [10 studies], triple burner (TE) [9 studies], small intestine (SI) [7 studies], and stomach (ST) [4 studies]. Regarding needle positioning, four studies performed acupuncture on the affected parts directly [33, 37, 40, 46]. One study performed it on the healthy side (opposite side) of the affected shoulder [28]. The depth of the needle insertion ranged from 0.3 cm to 5 cm. The duration of needle retention was reported to be between 5 and 40 minutes. Among the 22 included studies, ten studies assessed acupuncture's effects on pain intensity using VAS [28, 33, 35, 37, 39, 43-47]. Two NRSs were used [40, 41]. Three studies assessed the acupuncture effects on shoulder function using CMS [33, 41, 42]. Six studies assessed the acupuncture effects on both shoulder pain and shoulder functionality using ROM [29, 32, 44-48]. Three studies assessed the acupuncture effects on both shoulder pain and shoulder functionality using SPADI [45-47].

**Table 1.** Summary Characteristics of 6 included RCTs of Acupuncture for Shoulder Pain Disorders without Co-interventions

| Author/Year/ Country | Condition | Sample size (TG/CG) | Treatment duration | Without Co-Intervention (TG) | Control (CC) | Outcome measures *Adverse effects* | Results |
|---|---|---|---|---|---|---|---|
| Chen (2019) China | RC injury | 40 (20/20) | 6 weeks | EA | Exercise | 1.Pain, function, shoulder ROM | 1. Favours EA: TG>CG |
| | | | 5 times/week | | | 2. Post treatment | 2.No difference: TG=CG |
| | | | | | | ***Not reported*** | |
| Kibar (2017) Turkey | Shoulder pain lasting more than 3 months | 73 (36/37) | 3 weeks | LA | Sham-LA | 1.Reduction in SPADI | 1.TG>CG (P<0.001) |
| | | | | | | 2.Reduction in VAS | 2.TG>CG (P<0.001) |
| | | | 3 trial/week | | | 3.Reduction in PGA, DGA | 3.TG>CG (P<0.001) |
| | | | | | | ***Not reported*** | |
| Garrido (2016) Spain | Unilateral injury with clinical symptoms | 68 (35/33) | 4 weeks | MA | Sham-MA | 1.Reduction in VAS | 1.G>CG (P<0.05) |
| | | | 1 trial/week | | | 2.Increase in Kruskal-Wallis test | 2.TG>CG (P<0.05) |
| | | | | | | ***No severe adverse events*** | |
| Johansson (2005) Sweden | Shoulder impingement syndrome | 85 (44/41) | 5 weeks | MA | Ultrasound | 1.Reduction in CMS | 1.TG>CG (P=0.045) |
| | | | | | | 2.Increase in Kruskal-Wallis test | 2.TG>CG (P=0.045) |
| | | | 2 trial/week | | | 3.Increase in Al-score | 3.TG>CG (P=0.045) |
| | | | | | | ***No adverse events*** | |
| Zhang (2016) China | Chronic shoulder pain (Clinical) | 80 (38/42) | TG: 4 weeks 5 times/week | Contralateral MA | PT | 1.Pain VAS | 1.Favours MA: TG>CG |
| | | | | | | 2.Reduction in VAS | 2.No difference |
| | | | CG: 4 weeks Daily | | | ***No adverse events*** | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ma (2006) Taiwan | Frozen shoulder | 75 (30/30/15) | MA; 4 weeks 8 treatments | MA | 1.PT | ROM, VAS, SF36 Health Survey (ADL) 1. Pain reduced in AC | 1.TG<CG |
| | | | | | | 2.ROM improved more in PT | 2.MA + PT had the best outcome |
| | | | PT: 4 weeks 20 treatments | | 2.MA+PT | ***Not reported*** | |

**Table 2.** Summary Characteristics of 16 included RCTs of Acupuncture for Shoulder Pain Disorders with Co-interventions

| Author /Year/Country | Condition | Sample size (TG/CG) | Treatment duration | With Co-Intervention (TG) | Control (CC) | Outcome measures *Adverse effects* | Results |
|---|---|---|---|---|---|---|---|
| Johansson (2019) Sweden | Shoulder impingement syndrome | 91:(42/49) | 5 weeks | MA+ Exercise | Corticosteroid injection + Exercise | 1.Reduction in VAS | 1.No differences |
| | | | | | | 2.Increase in Al-score | 2.No differences |
| | | | 2 trial/week | | | ***No severe adverse events*** | |
| Arias Buria (2017) Spain | Non-traumatic shoulder in pain | 50: (25/25) | 5 weeks | MA+ Exercise | Exercise | 1.Reduction in NRS | 1.No deference |
| | | | | | | 2.Increase in DASH questionnaire | 2.TG>CG (P<0.01) |
| | | | 1 trial/week | | | ***No severe adverse events*** | |
| Vas (2008) Spain | Unilateral subacromial syndromes | 425:(205/220) | 4 weeks | MA+ Physiotherapy | Mock TENS+ Physiotherapy | 1.Reduction in CMS | 1.TG>CG (P<0.001) |
| | | | | | | 2.Reduction in NRS | 2.TG>CG (P<0.001) |
| | | | 1 trial/week | | | ***No severe adverse events*** | |
| Chai (2019) China | Supraspinatus tendinitis | 60:(30/30) | 2 weeks | MA + tropical NSAID | ESWT+ tropical NSAID | Pain, shoulder abduction ROM | Favours MA: TG>CG No difference |
| | | | 1week post-treatment | | | ***Not reported*** | |
| Lu. H (2019) China | Supraspinatus tendinitis (clinical) | 40:(30/30) | TG:40 days/ once every other day | EA+ ESWT | ESWT | Pain, function, proportion of improved participants | Favours EA: TG>CG No difference |
| | | | CG: 6 weeks Once a week | | | ***No adverse events*** | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Lu. M (2019) China | RC tear (Clinical and imaging) | 60:(30/30) | 3 weeks<br>5 times/week | MA +MT | MT | Proportion of improved participants<br>***No adverse events*** | Favours MA: TG>CG No difference |
| Papadopoulos (2019) Greece | Supraspinatus calcific tendinitis | 40:(20/20) | TG: 3 weeks 2 session/week<br>Oral medication:<br>3 weeks/ session not reported<br>Exercise: 3 weeks 5 times daily | EA + Oral medication + Exercise | Oral medication + exercise | Pain, ROM (forward elevation, abduction)<br>***Not reported*** | Favours EA +oral medication: TG>CG No difference |
| Shi (2019) China | RC tear (Clinical and imaging) | 104:(52/52) | 6 weeks<br>Session not reported | EA+ MT | MT | Pain, function, ROM<br>***Not reported*** | Favours EA +MT TG>CG No difference |
| Lo (2020) Taiwan | Frozen shoulder syndrome | 21 (11/10) | 6 weeks<br>18 sessions 2-3 session/week | EA+PT | Sham EA+PT | 1.Decrease in VAS<br>2.Increase in SPADI, ROM<br>***No adverse events*** | 1.TG>CG<br>2.No significant change between the two groups in VAS, SPADI. ROM in the follow-up periods |
| Zhang (2019) China | Scapulohumeral periarthritis | 64 (32/32) | 4 weeks<br>6 times/week | MA + Ashi points | Ashi points | VAS, CMS, HAMA, cured, effective, or ineffective<br>***Not reported*** | TG>CG Significant improvement of both groups compared to the control. |
| Asheghan (2016) Iran | Frozen shoulder | 40 (20/20) | MA: twice/weekPT: once every other day | MA + PT | PT | SPADI, VAS, ROM Follow-up: 1.5 months 3 months | In ROM TG>CG After 3 months:VAS TG>CG ($P < 0.05$).No difference in SPADI |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 6 weeks | | | ***Not reported*** | |
| Shang (2012) China | Frozen shoulder | 64 (32/32) | 12 Days | MA + AQF | MA | Cured, improved: failed ADLPain and moving functions of shoulder and ADL improved. | TC>CG (P<0.05). Statistically significant improvement in both groups |
| | | | once every day | | | ***Not reported*** | |
| Gao (2014) China | Poststroke shoulder pain | 75 (25/25/25) | 4 weeks | MA + RH | 1. MA 2. RH | 1.Decrease in VAS | 1.TC>CG (P<0.001) |
| | | | 6 times/week | | | 2.Improve in FMA | 2.Had a significant effect |
| | | | | | | ***No adverse events*** | |
| Sheng & Shi (2013) China | Poststroke shoulder pain | 60 (33/27) | 4 weeks | MA + RH | RH | FMA | TC>CG (P<0.001) Had a significant effect |
| | | | Once every day | | | ***No adverse events*** | |
| Ni (2013) China | Poststroke shoulder pain | 64 (32/32) | 60 days | MA + RH | RH | 1.Decrease in VAS | 1.TC>CG (P<0.001) |
| | | | Once every day | | | 2.Improve in FMA | 2.Had a significant effect |
| | | | | | | ***No adverse events*** | |
| Bao (2012) China | Poststroke shoulder pain | 129 (46/41/42) | 30 days | EA + RH | 1. EA 2. RH | FMA | TC>CG (P<0.001) |
| | | | Once every day | | | Improve in FMA | Had a significant effect |
| | | | | | | ***No adverse events*** | |

MA: manual acupuncture; EA: electroacupuncture; PT: physical training; MT: manual therapy; RH: rehabilitation treatment; NRS: numeral rating scale; DASH: disability of arm, shoulder, and hand; NSAID: non-steroidal anti-inflammatory drug; TENS: transcutaneous electric nerve stimulation; RC: rotator cuff; ESWT: extracorporeal shock wave therapy; HAMA: hamilton anxiety scale; FMA: the fugl-meyer assessment; AOF: accelerating Qi-flow along meridians.

## Effects of Interventions on Pain, Shoulder Function, and Adverse Events

### Acupuncture Versus Sham Acupuncture

Two studies compared acupuncture treatment with sham acupuncture [39, 46]. Both studies observed that there was a significant reduction in VAS scores, an improvement in the Kruskal-Wallis test, a reduction in SPADI scores, and a reduction in PGA and DGA scores in the acupuncture group compared to the control groups. Both studies showed that acupuncture treatment is more effective than sham acupuncture in terms of shoulder pain reduction and improvement in shoulder functions. In comparison, the study showed that laser acupuncture is more effective than manual acupuncture. One study reported that no adverse events occurred during the trial [39], whereas the other study did not provide any data on adverse events [46]. The studies concluded that, when compared to sham acupuncture, acupuncture treatment has a significant impact on the recovery of shoulder pain and shoulder functionality.

### Acupuncture Versus Non-Pharmacological Interventions

Three studies compared acupuncture with non-pharmacological interventions such as physical therapy, exercise therapy, and ultrasound treatment. [28, 27, and 42]. Acupuncture treatment showed favorable results on pain reduction measured using VAS scores compared to physical therapy [28], ultrasound treatment [42], and exercise therapy [27]. Although the results showed an increase in DASH score [27] and a high CMS score [28], both studies [27, 28] concluded that there was no significant difference between the acupuncture group and the control group (exercise therapy and physical therapy) in reducing pain and improving shoulder functions. However, one study [42] found a significant difference in pain reduction and improvement in shoulder function in acupuncture treatment compared to ultrasound treatment. These studies showed that acupuncture produced the same therapeutic effect as physical therapy and exercise therapy but had a better effect on shoulder pain recovery compared to ultrasound therapy.

### Acupuncture Versus Non-Pharmacological Interventions and Acupuncture Plus, Non-pharmacological Interventions

One study [44] compared acupuncture with non-pharmacological interventions (physical therapy) and acupuncture plus non-pharmacological interventions (physical therapy) for frozen shoulders. ROM, VAS, and Health Survey (ADL) indicators were used to measure pain intensity, shoulder function, and quality of life. Both the intervention and control groups showed improvements in quality of life as measured by the Health Survey. The results showed that pain was reduced in the acupuncture group, while shoulder function improved in the physical therapy group. The results concluded that acupuncture treatment plus physical therapy as a combined intervention had a better outcome than acupuncture or physical therapy alone. The initial results showed a noticeable decrease in shoulder pain measured using VAS, improvement in shoulder pain and shoulder function measured using SPADI, and improvement in shoulder function measured using ROM in both the treatment group and control group. However, the end results showed no significant difference between the two groups in VAS scores, SPADI scores, and ROM scores in the follow-up periods. The findings showed that both the treatment group and the control group had the same therapeutic effects on shoulder pain disorders.

### Acupuncture Plus Non-Pharmacological Interventions Versus Non-Pharmacological Interventions

Nine studies compared acupuncture plus non-pharmacological interventions with non-pharmacological interventions. The non-

pharmacological interventions included in this study are manual therapy, ashi points, physical therapy, rehabilitation treatment, manual therapy, ESWT, exercise therapy, and acupuncture. In terms of shoulder pain and function improvement, seven studies found a statistically significant difference between the acupuncture group and acupuncture alone [32], physical therapy alone [45], rehabilitation therapy alone [34, 35]; manual therapy alone [30], ESWT alone [29], and ashi point treatment [31]. These findings demonstrated the efficacy of acupuncture therapy for SPD. One study showed that acupuncture plus exercise therapy had no significant effect on shoulder pain reduction, but there was a significant improvement in shoulder function when compared to exercise therapy alone [38]. However, another study showed that acupuncture plus manual therapy had no significant effect on shoulder pain reduction and shoulder function improvement when compared to manual therapy alone [28].

### Acupuncture Plus Non-Pharmacological Interventions Versus Non-Pharmacological Interventions and Non-Pharmacological Interventions

Two studies compared acupuncture plus non-pharmacological interventions with non-pharmacological interventions and another non-pharmacological intervention. One study compared electroacupuncture plus rehabilitation treatment with electroacupuncture and rehabilitation treatment [38], whereas another study compared manual acupuncture plus rehabilitation treatment with manual acupuncture and rehabilitation treatment [35]. Both studies showed that the acupuncture plus rehabilitation treatment groups were superior to the acupuncture group and the rehabilitation treatment group alone. Both studies showed significant improvements in the FMA score. However, one study showed significant improvements in VAS score [35] and another study showed significant improvements in FMA score. The results of the observations indicated that acupuncture had a significant impact on pain relief and shoulder function improvement among the participants in both studies.

### Acupuncture Plus Non-Pharmacological Interventions Versus Same Non-Pharmacological Interventions Plus Another Non-pharmacological Interventions

One study [41] compared acupuncture plus physiotherapy with mock Tens plus physiotherapy. The observation showed a significant reduction in the CMS score ($p>0.001$) and a significant reduction in the NRS score ($p>0.001$). Acupuncture plus physiotherapy was found to be more effective than mock tens plus physiotherapy. These demonstrated that there was a significant difference between acupuncture plus physiotherapy and Mock Tens plus physiotherapy for pain relief and shoulder function improvement at the end of four weeks of treatment. According to these findings, acupuncture had a significant impact on pain relief and shoulder function improvement compared to mock TENS plus physiotherapy at the end of the trials.

### Acupuncture Plus Non-Pharmacological Interventions Versus the Same Non-Pharmacological Interventions Plus Pharmacological Interventions

One study [43] compared acupuncture plus exercise with exercise plus corticosteroid injection. The non-pharmacological intervention in this study was exercise therapy and the pharmacological intervention was corticosteroid injections. The study showed a significant reduction in the VAS score and a significant improvement in the Al-score in both groups. The observation showed that acupuncture plus exercise and corticosteroid injection plus exercise have a similar effect in terms of pain reduction and shoulder function improvement among patients suffering from shoulder

impingement syndrome. However, the results showed that there were no significant differences between the acupuncture plus exercise group and the corticosteroid injection plus exercise group. These results clearly indicate that acupuncture is not superior to corticosteroid injections or vice versa in treating SPD. The outcomes showed that both acupuncture therapy and corticosteroid injections are equally effective at reducing shoulder discomfort and enhancing shoulder functionality among SPD patients.

### Acupuncture Plus Pharmacological Interventions Versus Non-Pharmacological Interventions Plus Pharmacological Interventions

Two studies compared acupuncture plus pharmacological interventions with non-pharmacological interventions plus Pharmacological Interventions. One study [29] compared acupuncture plus tropical NSAIDs with ESWT plus tropical NSAIDs, whereas another study [48] compared electroacupuncture plus oral medication plus exercise with oral medication plus exercise. The results from [29] study showed that the mean VAS score was much lower in the treatment group compared to the control group. Obviously, the results favor acupuncture treatments plus tropical NSAIDs more than extracorporeal shock wave therapy (ESWT) plus tropical NSAIDs. However, the study demonstrated that there was no significant difference between the treatment group and the control group. According to these findings, both groups had an equivalent impact on the participants with SPD in terms of reducing pain and enhancing shoulder function. Another study [48] compared electroacupuncture plus oral medication plus exercise with oral medication plus exercise. The results showed that there was a modest reduction in pain in the acupuncture group compared to the control group. However, there was a remarkable improvement in shoulder function in the acupuncture group compared to the control group. Again, the results favor acupuncture treatments plus oral medication plus exercise more than oral medication plus exercise in terms of pain reduction and shoulder function improvement. However, the trial demonstrated that there was no significant difference between the treatment group and the control group in pain reduction and shoulder function improvement in the participants with SPD.

### Adverse Events

Out of 22 studies, only 13 studies provided information on adverse events during the acupuncture treatment for SPD [28, 30, 31, 34-43, 45]. None reported any serious adverse events that occurred throughout the study period. Only a minor adverse event was reported in one study [41]. In this study, gastralgia was reported as a side effect of treatment in 3% of the acupuncture plus physiotherapy group and 5% of the mock TENS plus physiotherapy group (control group). Anyhow, the duration of this adverse event was not mentioned in any detail. This study indicated that there are some possibilities for minor adverse events in acupuncture treatments. However, the study showed that acupuncture is still a safe treatment. The remaining nine studies did not provide any details about adverse events in their studies [27, 30-32, 42, 44-46]. Overall, the findings indicated that acupuncture is a safe procedure with few side effects.

## Discussion

### Summary of the Main Findings

This study investigated and evaluated the clinical effects and application of acupuncture treatment for shoulder pain disorders in adult patients with SPD by critically analyzing 22 RCTs involving 1,808 participants. Most studies compared acupuncture either alone, in combination with active comparators, or with an active comparator alone, indicating that the current body of evidence has been primarily concerned with assessing the additive effects or comparative efficacy of acupuncture in comparison to other interventions. The studies

demonstrated that acupuncture treatment is better and more effective than sham acupuncture [39] and ultrasound treatment [42]. Laser acupuncture is much better than manual acupuncture. Studies have shown that acupuncture treatment can produce the same positive effects as exercise therapy, physical therapy, accelerating Qi-flow along the meridian (AOF), and ashi point acupuncture in reducing pain and improving shoulder function among SPD patients [27, 28, 33, 34, 40, 42, 47]. These observations indicated that acupuncture treatment can effectively replace ultrasound treatment, exercise therapy, and physical therapy for treating SPD. The same effects were observed in studies comparing acupuncture with pharmacological interventions such as the usage of tropical NSAIDs, oral medications, and corticosteroid injections [29, 43, 48]. There was no significant difference between acupuncture treatment and pharmacological intervention such as diclofenac gel, prednisolone, or triamcinolone, oral medicine such as oral analgesics and non-steroidal anti-inflammatory drugs, and corticosteroid injections such as hydrocortisone, triamcinolone, and methylprednisolone, which come with some adverse events. This finding indicates that acupuncture treatment alone can produce the same therapeutic effect for shoulder pain and shoulder function recovery as pharmacological interventions. Therefore, in such a case, the best option to replace the use of pharmacological interventions for SPD in this situation is acupuncture, which is safe, effective, and free of any serious adverse events. This finding is supported by a study stating that acupuncture is increasingly used as a non-drug therapy for shoulder pain. In addition to enhancing blood circulation and energy (Qi) flow, acupuncture also blocks pain signals sent by other nerves and chronic pain-carrying nerves while also releasing chemicals that block pain [49].

Acupuncture treatment was found to be more effective when combined with other treatments or therapies such as exercise therapy, physical training, accelerating Qi-flow along meridians (AOF), ashi points, and rehabilitation. These findings indicated that combined acupuncture interventions are much more effective than single acupuncture treatments [34, 35, 36, 37, 38, 41]. Again, these findings suggest that combined acupuncture treatments produce a better outcome in treating SPD by significantly improving shoulder function and reducing shoulder pain. Again, in this study, acupuncture was shown to be a safe treatment with significant effects in regard to reducing pain and improving shoulder function in the short and medium terms. However, there was no evidence to support the use of acupuncture for long-term outcomes in patients with SPD, as all trials reported short-term results, and roughly half provided intermediate-term results. Overall, acupuncture's short-term advantages were found to have some certainty of evidence when compared to the same active comparison when used alone or in combination. Even though there was a high prevalence of incomplete reporting of safety data in the studies included in this review, the reported adverse events were minor and infrequent. Although there is some evidence for an effect of acupuncture treatment on shoulder pain disorders, the results are not conclusive. Therefore, due to a large number of confounding factors and significant unexplained heterogeneity, the results must be interpreted with extreme caution.

## Implication for Clinical Practice

Based on the findings from the RCTs, short-term benefits of acupuncture treatment for SPD were observed. When applying acupuncture alone or as an adjunct therapy to ultrasound, physical training, physiotherapy, ashi points, AOF, and rehabilitation, acupuncture might benefit the treatment of SPD. Most studies compared acupuncture either alone or in combination with active comparators or with active comparators. Most trials reported short-term outcomes, and almost half provided intermediate-term outcomes. The preliminary

findings support the benefits of acupuncture in terms of pain reduction and shoulder function. The long-term effects of acupuncture on SPD were not investigated in this study. Therefore, whether acupuncture can yield a long-term improvement in shoulder pain and shoulder function in patients with SPD remains unclear. There were numerous confounding variables, such as age range, sample size, number of acupuncture points, duration of treatment, ideal treatment regime, and types of acupuncture. Therefore, any regimen of intervention or an ideal standardized regime cannot be endorsed for this current study. The overall low quality of the included studies necessitates further confirmation of the current findings in well-designed RCTs in the future.

### Implication for Future Research

Age, gender, the severity or condition of the case, the types of interventions, and withdrawals or drop-outs along with the reasons should all be clearly recorded and reported. Age and gender factors should be considered [50]. Essential information on specific acupuncture points, types of needles, insertion depth, insertion angle, deQi sensation, needle manipulation techniques, retention time, length of the treatment, follow-ups, and sham acupuncture must be provided in detail. In the future, high-quality RCTs in a variety of settings should be conducted with the statistical power to produce significant results. Validated instruments or indicators for outcome measures should be used to assess the clinical effects of the intervention. More evidence is required to support acupuncture's benefits for patient satisfaction, long-term healing, and improvement of quality of life. Every adverse event should be recorded and clearly reported. It should be noted that a complete description of the safety of the interventions must be reported explicitly.

### Limitation

The limitation of this study was that the number of RCT studies selected was small, of poor quality, and had methodological shortcomings. The current study only searches English-language electronic databases to identify potential studies published in English due to language barriers and limited access to databases developed in other languages. Therefore, papers published in other languages, such as Chinese, Japanese, Korean, German, or Spanish, may have been missed. In addition, the present study did not include non-RCTs and incorporated unpublished data, which may result in the loss of important information in the field. Some of the studies were unable to provide a valid measurement technique. A number of studies used less common measurement tools, and the calculation method is not fully described. Only two studies, out of the 22 included studies, compared the acupuncture group to a sham acupuncture group in order to eliminate the placebo effect. The large variety of measurement tools in SPD studies makes critical analysis much more difficult. Treatment duration for the majority of the studies was 1-4 weeks, and not all studies continue with follow-up. The follow-up time of 1 year should stand as the standard follow-up for SPD due to its long recovery time without treatment of 1-4 years.

## Conclusion

In this critical analysis, acupuncture was shown to be a safe treatment with a significant effect on reducing shoulder pain, improving shoulder function, and overall increasing the quality of life. Acupuncture has been shown to relieve pain by promoting energy (qi) or blood circulation, blocking pain signals through chronic pain-carrying nerves and other pain nerves, and releasing pain-relieving chemicals. The results indicated that acupuncture treatment could effectively replace ultrasound treatment, exercise therapy, and physical therapy for treating SPD. The same effects were observed in studies comparing acupuncture with pharmacological interventions such as the usage of tropical NSAIDs, oral medications, and

corticosteroid injections. Therefore, acupuncture may be an effective and safe treatment for SPD.

However, very low-certainty evidence for the short-term benefit of acupuncture alone or acupuncture combined with other active treatments was observed compared with other active treatments. The reported benefits should be interpreted with great caution because of the small number of included studies, small sample size, methodological limitations, incomplete reporting, and substantial unexplained heterogeneity. To reach a robust conclusion, a more rigorous study design, a larger sample size, and high-quality RCTs are needed to determine the effectiveness and safety of acupuncture treatment for SPD. Longer follow-up times are also required to investigate the effects of acupuncture in the medium and long term. The duration of future SPD study follow-up should be increased to one year. Future studies should compare acupuncture to other popular alternative treatments such as cupping therapy, moxibustion, herbal medicine, chiropractic, acupressure, arthroscopic capsular release, hydro dilatation, and manipulation under anesthesia. Because a wide range of measurement tools are used in SPD studies, the homogeneity of the results is compromised; therefore, it is recommended that reliable tools and measurement scales be used. Further clinical studies involving acupuncture must use an optimal form of treatment. Through rigorous designs, reasonable evaluations, and critical analyses, it is possible to arrive at a more robust conclusion on the efficacy and safety of acupuncture treatment for shoulder pain disorders.

## Funding Sources

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## Acknowledgment

I would like to thank my supervisor and my colleague for their help in assisting me in writing this manuscript.

## Conflicts of Interest

The authors have no conflicts of interest to declare.

## Reference

[1] Svendsen, S. W., Bonde, J. P., Mathiassen, S. E., Stengaard-Pedersen, K., & Frich, L. H. (2004). Work related shoulder disorders: quantitative exposure-response relations with reference to arm posture. Occupational and environmental medicine, 61(10), 844-853.

[2] Tidy, C. (2021, Oct 18). Shoulder Pain Causes, Assessment, and Treatment. https://patient.info/doctor/shoulder-pain-pro.

[3] Schwarzkopf, R., Oron, A., & Loebenberg, M. (2008). Shoulder pain: assessment, diagnosis, and treatment of common problems. Harefuah, 147(1), 71-6.

[4] Cadogan, A., Laslett, M., Hing, W. A., McNair, P. J., & Coates, M. H. (2011). A prospective study of shoulder pain in primary care: prevalence of imaged pathology and response to guided diagnostic blocks. BMC musculoskeletal disorders, 12(1), 1-18.

[5] Artus, M., Holt, T. A., & Rees, J. (2014). The painful shoulder: an update on assessment, treatment, and referral. British Journal of General Practice, 64(626), e593-e595.

[6] Murphy, R. J., & Carr, A. J. (2010). Shoulder pain. BMJ clinical evidence, 2010.

[7] Luime, J. J., Koes, B. W., Hendriksen, I. J. M., Burdorf, A., Verhagen, A. P., Miedema, H. S., & Verhaar, J. A. N. (2004). Prevalence and incidence of shoulder pain in the general population; a systematic review. *Scandinavian Journal of Rheumatology*, 33(2), 73-81.

[8] Pribicevic, M. (2012). The epidemiology of shoulder pain: A narrative review of the literature. *Intech Open*.

[9] Gutierrez, D. D., Thompson, L., Kemp, B., & Mulroy, S. J. (2007). The relationship of shoulder pain intensity to quality of life, physical activity, and community participation in persons with paraplegia. *The journal of spinal cord medicine*, 30(3), 251-255.

[10] Struyf, F., & Meeus, M. (2014). Current evidence on physical therapy in patients with adhesive capsulitis: what are we missing? Clinical rheumatology, 33(5), 593-600.

[11] Laumonerie, P., Dalmas, Y., Tibbo, M. E., Robert, S., Faruch, M., Chaynes, P., ... & Mansat, P. (2020). Sensory innervation of the human shoulder joint: the three bridges to break. *Journal of Shoulder and Elbow Surgery*, 29(12), e499-e507.

[12] Palmer, A. (2012). Introduction to marketing: Theory and practice. *Oxford University Press*.

[13] Cho, C. H., Bae, K. C., & Kim, D. H. (2019). Treatment strategy for frozen shoulder. Clinics in orthopedic surgery, 11(3), 249-257.

[14] Askari, A., Gholami, T., NaghiZadeh, M. M., Farjam, M., Kouhpayeh, S. A., & Shahabfard, Z. (2016). Hyaluronic acid compared with corticosteroid injections for the treatment of osteoarthritis of the knee: a randomized control trail. Springerplus, 5(1), 1-6.

[15] Villars, P., Dodd, M., West, C., Koetters, T., Paul, S. M., Schumacher, K., ... & Miaskowski, C. (2007). Differences in the prevalence and severity of side effects based on type of analgesic prescription in patients with chronic cancer pain. *Journal of pain and symptom management*, 33(1), 67-77.

[16] Marks, J. L. (2015, November 25). What Is an Analgesic? https://www.everydayhealth.com/analgesic/guide/.

[17] Rogers, E., Mehta, S., Shengelia, R., & Reid, M. C. (2013). Four strategies for managing opioid-induced side effects in older adults. Clinical geriatrics, 21(4).

[18] Ghlichloo, I., & Gerriets, V. (2019). Nonsteroidal anti-inflammatory drugs (NSAIDs).

[19] Dunkin, M.A. (2021, April 27). Hyaluronic Acid Injections for Osteoarthritis. https://www.webmd.com/osteoarthritis/hyaluronic-acid-injections-for-osteoarthritis.

[20] Jancuska, J., Matthews, J., Miller, T., Kluczynski, M. A., & Bisson, L. J. (2018). A systematic summary of systematic reviews on the topic of the rotator cuff. *Orthopaedic journal of sports medicine*, 6(9), 2325967118797891.

[21] Pieters, L., Lewis, J., Kuppens, K., Jochems, J., Bruijstens, T., Joossens, L., & Struyf, F. (2020). An update of systematic reviews examining the effectiveness of conservative physical therapy interventions for subacromial shoulder pain. Journal of orthopaedic & sports physical therapy, 50(3), 131-141.

[22] Tick, H., Nielsen, A., Pelletier, K. R., Bonakdar, R., Simmons, S., Glick, R., & Zador, V. (2018). Evidence-based nonpharmacologic strategies for comprehensive pain care: the consortium pain task force white paper. Explore, 14(3), 177-211.

[23] Kligler, B., Teets, R., & Quick, M. (2016). Complementary/integrative therapies that work: a review of the evidence. American family physician, 94(5), 369-374.

[24] Xiang, A., Cheng, K., Shen, X., Xu, P., & Liu, S. (2017). The Immediate Analgesic Effect of Acupuncture for Pain: A Systematic Review and Meta-Analysis. Evidence-based complementary and alternative medicine, 2017, 1-13.

[25] Yuan, Q. L., Wang, P., Liu, L., Sun, F., Cai, Y. S., Wu, W. T., & Zhang, Y. G. (2016). Acupuncture for musculoskeletal pain: A meta-analysis and meta-regression of sham-controlled randomized clinical trials. Scientific Reports, 6(1), 1-24.

[26] Flecha, O. D., Douglas de Oliveira, D. W., Marques, L. S., & Gonçalves, P. F. (2016). A commentary on randomized clinical trials: How to produce them with a good level of evidence. Perspectives in clinical research, 7(2), 75–80.

[27] Chen, M., Yan, M., & Li, Z. (2019). Clinical Observation of Electroacupuncture on Rotator Cuff Injury of Volleyball Players. Fujian Sports Sci. Tech, 2019(38), 55-58.

[28] Zhang, H., Sun, J., Wang, C., Yu, C., Wang, W., Zhang, M., & Wan, Y. (2016). Randomised controlled trial of contralateral manual acupuncture for the relief of chronic shoulder pain. Acupuncture in Medicine, 34(3), 164-170.

[29] Chai. W. (2019). Clinical Observation of Shock Wave Combined with Flurbiprofen Gel Paste in the Treatment of Supraspinatus Tendonitis. Heilongjiang

(China): Heilongjiang University of Chinese Medicine.
[30] Lu M. (2019). Observation on Therapeutic Effect of Acupuncture Combined with Joint Mobilization on Rotator Cuff Tears of Qi Stagnation and Blood Stasis Type. Fujian (China): Fujian University of Traditional Chinese Medicine.
[31] Lu, H. (2019). The Clinical Observation of Electroacupuncture Combined with Extracorporeal Shock Wave in the Treatment of Supraspinatus Tendinitis. Nanjing (China): Nanjing University of Chinese Medicine.
[32] Shi, Y., Yu, L., Mao, J., & Tang, L. (2019). Effect of electroacupuncture combined with joint mobilization on pain and joint function of patients with rotator cuff injury. *World J Integr Tradit West Med*, 14, 1575-1578.
[33] Zhang, M., Fan, C. X., Zhu, P. Y., Nie, W. T., & Hai, Q. I. N. (2019). Regular acupuncture at combined with join valley needling at ashi point for scapulohumeral periarthritis: a randomized controlled trial. *World Journal of Acupuncture-Moxibustion*, 29(4), 269-273.
[34] Shang, Y. J., Wang, Z. D., & Zhang, Y. (2012). Acupuncture accelerating gi-flow along meridians for treating periarthritis of shoulder. *World Journal of Acupuncture-Moxibustion*, 22(2), 17-21.
[35] Gao, Z.Z., Xu, D.M., Li, C.Y., & Guo, H.Y. (2014). "Observation on the effect of acupuncture combined with shoulder rehabilitation training on post-stroke shoulder pain," *Chinese Journal of Rehabilitation Medicine*, 29(4), 370–372.
[36] Sheng, L. I. U., & Shi, Z. Y. (2013). Observation on the therapeutic effect of scalp acupuncture and body acupuncture in combination with rehabilitation exercise for hemiplegia and shoulder pain after stroke. *World Journal of Acupuncture-Moxibustion*, 23(1), 21-26.
[37] Ni, H.H., Wu, Y.C., Bao, X.Y., et al., (2013). Observations on the efficacy of superficial needling plus rod exercise in treating poststroke shoulder pain," *Shanghai Journal of Acupuncture and Moxibustion*, 32(12), 1001–1003.
[38] Bao, Y. H., Wang, Y. W., Chu, J. M., Zhu, G. X., Wang, C. M., & Hou, H. M. (2012). Clinical observation of electroacupuncture combined with rehabilitation in pain and improvement of upper limb motor function after stroke in patients with hemiplegic shoulder pain. *Chinese Journal of Traditional Medical Science and Technology*, 19(1), 59-60.
[39] Garrido, J. C. R., Vas, J., & Lopez, D. R. (2016). Acupuncture treatment of shoulder impingement syndrome: a randomized controlled trial. Complementary Therapies in Medicine, 25, 92-97.
[40] Arias Buría, J. L., Fernández-de-Las-Peñas, C., Palacios-Ceña, M., Koppenhaver, S. L., & Salom-Moreno, J. (2017). Exercises and dry needling for subacromial pain syndrome: a randomized parallel-group trial. *The Journal of Pain*, 18(1), 11-18.
[41] Vas, J., Ortega, C., Olmo, V., Perez-Fernandez, F., Hernandez, L., Medina, I., ... & Aguilar, I. (2008). Single-point acupuncture and physiotherapy for the treatment of painful shoulder: a multicentre randomized controlled trial. Rheumatology, 47(6), 887-893.
[42] Johansson, K. M., Adolfsson, L. E., & Foldevi, M. O. (2005). Effects of acupuncture versus ultrasound in patients with impingement syndrome: randomized clinical trial. Physical therapy, 85(6), 490-501.
[43] Johansson, K., Bergström, A., Schröder, K., & Foldevi, M. (2011). Subacromial corticosteroid injection or acupuncture with home exercises when treating patients with subacromial impingement in primary care—a randomized clinical trial. Family practice, 28(4), 355-365.
[44] Ma, T., Kao, M. J., Lin, I. H., Chiu, Y. L., Chien, C., Ho, T. J., ... & Chang, Y. H. (2006). A study on the clinical effects of physical therapy and acupuncture to treat spontaneous frozen shoulder. *The American journal of Chinese medicine*, 34(05), 759-775.
[45] Lo, M. Y., Wu, C. H., Luh, J. J., Wang, T. G., Fu, L. C., Lin, J. G., & Lai, J. S. (2020). The effect of electroacupuncture merged with rehabilitation for frozen shoulder syndrome: a single-blind randomized sham-acupuncture controlled study. *Journal of the Formosan Medical Association*, 119(1), 81-88.
[46] Kibar, S., Konak, H. E., Evcik, D., & Ay, S. (2017). Laser acupuncture treatment improves pain and functional status in patients with subacromial

impingement syndrome: a randomized, double-blind, sham-controlled study. Pain Medicine, 18(5), 980-987.

[47] Asheghan, M., Aghda, A. K., Hashemi, E., & Hollisaz, M. (2016). Investigation of the effectiveness of acupuncture in the treatment of frozen shoulder. Materia socio-medica, 28(4), 253-257.

[48] Papadopoulos, D. V., Koulouvaris, P., Aggelidakis, G., Tsantes, A. G., Mavrodontidis, A., & Papadopoulos, G. (2019). Electroacupuncture for the treatment of supraspinatus calcific tendonitis. *Journal of clinical orthopaedics and trauma*, 10(3), 624-628.

[49] Green, S., Buchbinder, R., & Hetrick, S. E. (2005). Acupuncture for shoulder pain. Cochrane Database of Systematic Reviews, (2).

[50] Hermoso, F. E., & Calvo, E. (2009). Shoulder pain in the elderly. Aging Health, 5(5), 711-718.

Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.10.01.Art002

# Modelling Geographic Accessibility of Primary Health Care Facilities in Bauchi Local Government Area

Isah Mohammed Bello[1*], Kabiru Ibrahim Musa[2], Godwin Ubong Akpan[3], Chefor Ymele Demeveng Derrick[3], Frank Sallet[4], Selva Brunda[1]

[1]*Information Technology, Central University of Nicaragua, Managua, Nicaragua*
[2]*Management Sciences, Abubakar Tafawa Balewa University, Bauchi, Nigeria*
[3]*World Health Organization, African Regional Office, Congo -Brazzaville*
[4]*World Health Organization, Avenue Appia, Geneva -Switzerland*

***Abstract***

*Achieving universal health care (UHC) coverage has been at the forefront of the United Nations (UN) agenda for 2030. Inequality in health care service provision continues to increase, hence militating against the achievement of reducing unequal access to health care. Access is a critical component of the healthcare delivery system that is impacted by both spatial and non-spatial elements. This study utilized health facilities, population, and other open-source data to analyze the distribution and spatial accessibility of healthcare service centers by using Geospatial technologies in the Bauchi Local Government Area of Bauchi State - Nigeria. Two traveling scenarios (Driving and Walking) were used to determine the travel time to the nearest health facilities, defined within a maximum of 30 minutes traveling time using AccessMod (Online) and ArcGIS Pro. It was found that 87% and 75% of the population are within 15 and 30 minutes of travel time by driving and walking, respectively, while 1.3% of the population are outside a 15 km radius of any health facility with a ratio of 1 to 4,454 population to a health facility. The result shows a significant spatial disparity in geographic accessibility and spatial coverage, with some parts of the rural areas not having access to the existing health facility network, regardless of the travel scenario chosen. This will offer an innovative approach to reducing gaps in healthcare access and subsequently enhance the efficient and effective delivery of healthcare services in low- and middle-income countries (LMIC) to achieve UHC.*

***Keywords****: AccessMod, Bauchi Local Government Area, Geographic Accessibility, Health Facilities, Spatial Coverage, Universal Health Coverage.*

## Introduction

The relationship between the geographic location of health facilities and the population they are serving is progressively limiting access to health care, which exacerbates health disparities (defined as variations in health status between social groups) [1].

The third Sustainable Development Goal (SDG), one of the 17 global objectives created by the United Nations, is to ensure healthy lifestyles and promote the well-being of all people of all ages. Inequalities in geographic access to health care are one of the key hurdles in attaining the third SDG, resulting in unfulfilled objectives for decreasing maternal and newborn mortality, HIV/AIDS, Malaria, Hepatitis B, and Tuberculosis epidemics [2, 3].

The term “access” refers to “the degree of fit between the system and the patient”. Different aspects aid in providing an overview of healthcare access. Access dimensions include things like accessibility, availability, accommodation, price, and acceptability [4]. The connection between the location of health

***Received: 02.12.2022*** ***Accepted: 06.12.2022*** ***Published on: 09.01.2023***

****Corresponding Author: isahbelloh@yahoo.com***

services and the location of a patient determines accessibility [5]. The World Health Organization (WHO) defines accessibility in a variety of ways, including economic, informational, and physical accessibility. Each level of accessibility tackles a distinct set of health needs and challenges [6]. Access to relevant information reinforces an individual's or group's right to seek and receive health-related information. However, after being told of their need, there is still the financial element to consider, as well as the proximity of the desired health services to the individuals in the community. Geographic accessibility becomes a significant aspect in measuring access, along with travel time, ease of travel, and distance to health care services, among other considerations. Travel, cost, and duration [7].

There exist different approaches that proved to be effective in measuring accessibility to health care services, which include, among others, catchment area, kernel density, and seriousness. But in public health research, Euclidean and network distance techniques are still commonly used [8], because it is generally driven by the distance relationship between the population and the location where the health services are provided.

The network distance is the path taken to reach the destination [9]. However, there is no universally approved distance for people to travel for medical care, implying that no one factor can be used to decide how far healthcare services may be termed as inaccessible. But the World Health Organization (WHO) and other key stakeholders recommend the use of journey time as against travel distance in measuring accessibility for healthcare, as these methods assess the road condition and the transportation mode [10].

Healthcare service planners and policymakers provide comprehensive healthcare planning that addresses the health requirements of a country's whole population. As a result, individuals must have a precise understanding of healthcare units, identify regions of need, and distribute units to these areas to resolve their health condition [11].

Accessibility to healthcare services is a critical issue to society, which cannot be over-emphasized. In this context, accessibility refers to physical or spatial accessibility that is expressed as geographical accessibility. Ebener opined that physical accessibility is influenced by a substantial interdependence between population distribution and the availability of healthcare services [12]. Accessibility has been a topic of concern to policy and healthcare planners, as it is generally influenced by many factors such as cost, distance, and other behavioral factors [13-16].

Different published literature attempted to document factors that influence the acceptability and use of healthcare services. In 2003, a study was conducted to examine the effect of distance, where they determined that residents in rural areas traveled longer distances to access healthcare services as compared to those in metropolitan areas [17]. Another study examined the association between several indicators of physical access to health care, and distance was found to be one of the aspects, distance [11]. These findings and others suggest that the utilization of healthcare services is increasingly seen to have a direct relationship to accessibility.

Therefore, it can be said that the proximity of healthcare services plays an important role in delivering primary healthcare services to people [8, 17-19]. It was established that traveling long distances to seek health care services discourages people from seeking these services [20].

The use of geographic information systems (GIS) in analyzing geographical geographic accessibility has proven to be a reliable and robust tool used by policymakers and health planners in reducing inequality due to accessibility. It enables monitoring of issues related to healthcare planning regarding catchment area population and health facility management [21, 22]. Here is a considerable

number of published materials available on the use of GIS for evaluating geographical accessibility to healthcare, which enabled an important tool for measuring healthcare services [17, 23-26].

In Nigeria, the health policy institutes the timely evaluation of primary health care (PHC) accessibility with a special focus on rural areas. Hence, their spatial structures and locations impact accessibility and utilization, even though neither is spread uniformly across space [27]. Accessing healthcare services in a timely manner protects and saves patients from many types of health-related disasters, enhancing accessibility and reducing inequalities in healthcare with a view to supporting the achievement of universal health coverage. Therefore, the objective of this study is to analyze the health facilities distribution and their geographical accessibility using GIS and Remote Sensing technologies in the Bauchi Local Government of Bauchi State, Nigeria. The study also aims to evaluate the geographic coverage of all health facilities in the local government to identify areas with good accessibility as relates to travel times (car and walking), as well as identify catchment populations with poor accessibility and under-served settlement for health care services. Accessibility to health care services is a societal right that must be met without bias or discrimination; hence this study will help in identifying the gaps that exist in health care facilities distribution in the local government and support policy and health planners on effective distribution of these facilities towards reducing the closing inequality to services provision and consequently support the achievement of universal health coverage.

## Study Area

The study was conducted in Bauchi Local government Area (LGA), which is the capital city of Bauchi state–Nigeria, located between 9° 3’ and 12° 3’ North latitude, and 8° 50’ and 11° East longitude (Figure 1).

The local government is one of the largest LGAs in the state, divided into twenty (20) political wards. The LGA is unique in its characteristics of having both urban (9) and rural (11) wards. It has two types of vegetation (Sudan and Sahel Savanna) and an altitude of 785.2 meters. It has an average annual rainfall of 1,091.4 mm, with the highest temperature being 40.56℃ and the coldest temperature of 6.11℃ the LGA has a population of 493,810 and 672,540 (2006 population census projected– a 3.4% growth rate applied at the state level for all LGAs) and Rapid population Estimate (RPE-WorldPop).

The total area covered by the district is 3,687 $km^{2,}$ and it holds the most populous LGA in the state and the 5th largest position among the LGAs of the states in terms of size area. A total of 19 tribes are dominant in the LGA, with a literacy rate of 26.60%, with most of the population living below the poverty line. There are a total of 151 health facilities (6 hospitals [teaching/specialist/general/military], two educational medical clinics, 12 maternity homes, 80 primary health care centers, 44 health clinics/posts, and 7 private on-profit clinics) providing healthcare services (Figure 2) [28].

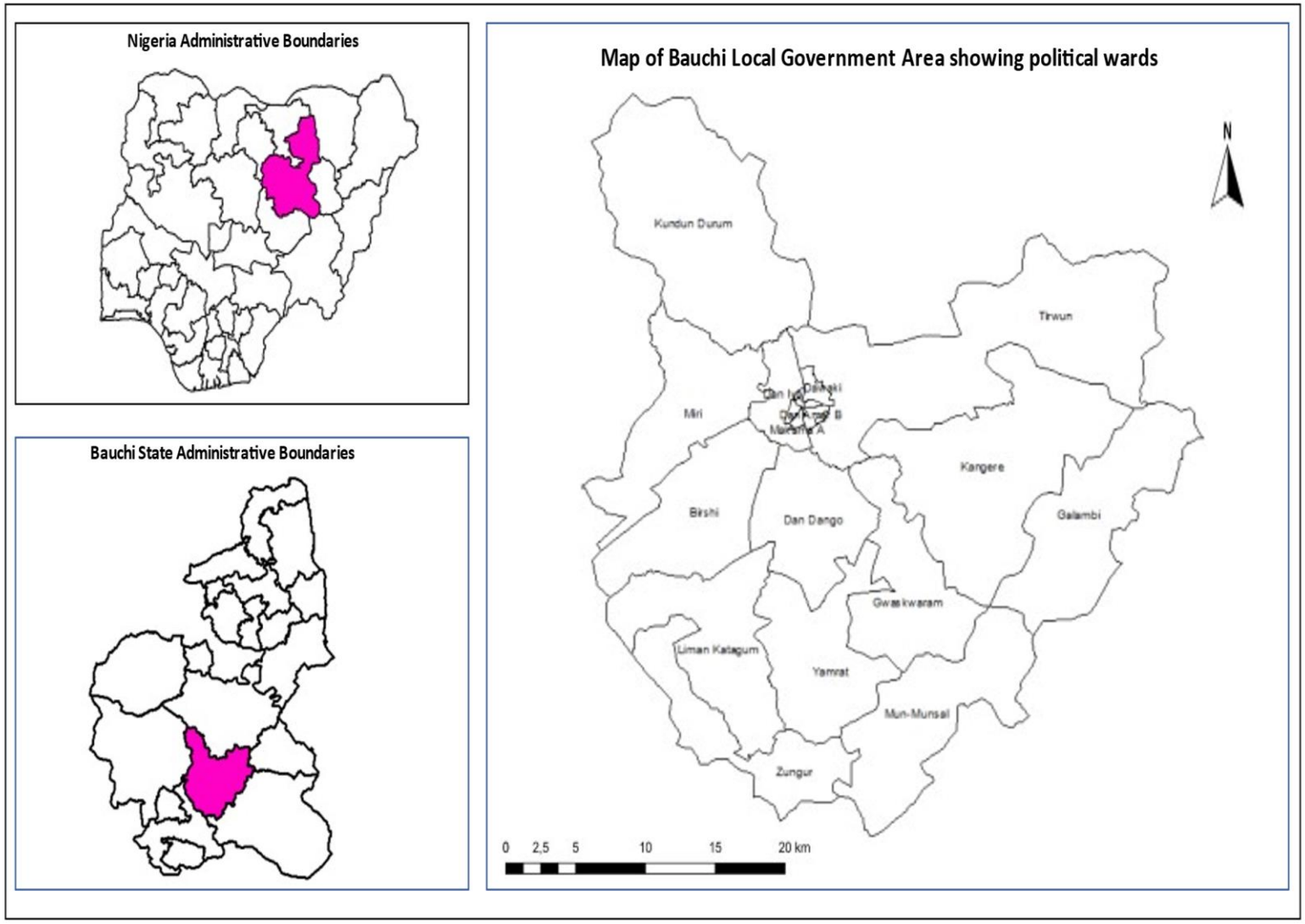


**Figure 1.** Map of the Study Area

## Materials and Methods

Different datasets were collected for the study, including the location of all health facilities, land cover, population data, settlement points, the slope, digital elevation model (DEM), and the road network. The location of health facilities was obtained from GRID3 (https://data.grid3.org/datasets/), and then validated with the ISS data from ODK/ONA (https://analytics.afro.who.int/whonghub/13/829), which was collected during supportive supervision by WHO and government staff. Digital Elevation Model (DEM) with 30m resolution was obtained from the United States Geological Survey (USGS), which was downloaded from the website (https://lpdaac.usgs.gov/products/astgtmv003/) and used to generate the slope. The settlement points and road travel network was also obtained from GRID3 (https://data.grid3.org/datasets/).

Other data sets that contain spatial attributes used for the study were sourced from the Open Street map (OSM), which includes the waterways, road network, and natural features, which may serve as impediments preventing direct access to health facilities in the computation of travel times. The travelling speed used for the study was adopted from published literature, which uses similar patterns and settings based on the range of 2 km/hr to 5 km/hr in urban wards and up to 50 km for rural wards by Lawal, O. & Anim, F.E. (2019). Traveling speeds in different land use types by different means of transportation are indicated in Table 1.

**Table 1.** Travel Scenarios to the Health Facilities

| **Landcover type** | **Travel speeds (km/hr) [10]** | |
|---|---|---|
| | **Scenario 1 (Driving)** | **Scenario 2 (Walking)** |
| Mosaic: Cropland/Shrub and/or Grass Cover | - | 2 |
| Open/Closed Evergreen/Deciduous Shrub Cover | - | 2 |
| Regularly Flooded Shrub and/or Herbaceous | - | 2 |
| Sparse Herbaceous or Shrub Cover | - | 3 |
| Tree Cover: Broadleaved, Deciduous, Open | - | 2 |
| Artificial and Associated Areas | - | 5 |
| Mosaic: Cropland/Tree Cover/Other Natural Vegetation | - | 2 |
| Tree Cover: Needle-leaved, Evergreen | - | 2 |
| Cultivated and Managed Areas | - | 2 |
| Mosaic: Tree Cover/Other Natural Vegetation | - | 2 |
| Water bodies | - | - |
| Tree Cover: Broadleaved, Evergreen | - | 1 |
| Herbaceous Cover, Closed-Open | - | 2 |
| Primary Roads | 50 | 5 |
| Secondary Roads | 30 | 5 |
| Tertiary Roads | 20 | 5 |

ArcGIS Pro was used to conduct spatial analysis with additional licenses for spatial and network license functionality. The service accessibility analysis was conducted using AccessMod (online version), which has a high classification capability and was used to create satellite pictures for land cover categorization.

AccessMod is a World Health Organization (WHO) tool which was developed by the Department of Health Systems Governance and Financing (WHO/HIS/HGF), in consultation

with other departments and educational institutions. The tool was designed primarily for accessibility analysis (physical/spatial accessibility) to healthcare services. It is a free and open-source standalone program used to estimate the portion of the target population that would not receive care despite being physically accessible due to a shortage of capacity in these services (either human or equipment). It measures referral times and distances between health facilities and determines where to locate new health facilities to increase population coverage [29].

The location of health facilities was imported into AccessMod (Online) to generate the accessibility analysis, which is used as an input to further generate the zonal statistics. The main outputs generated are the health facility population coverage table, the travel time analysis for all the health facilities, and the health facility catchment area network. Other outputs generated from the tool are the uncovered population distribution grid and population coverage distribution grid. The health facilities were further analysed using ArcGIS Pro to generate the catchment areas of each health facility through the creation of a 5km buffer at the centroid of each health facility to determine the population coverage of each health facility and find the settlements that are not covered.

In Nigeria, the population coverage of a health facility is defined as the number of people that a health facility serves. The ward minimum health care package stipulates that a health post should cater for 500-person, a health clinic to cover between 2,000 and 5,000 people, and a Primary Healthcare Centre must cover a community with 10,000 and 20,000 residents. Hence, In accordance with the MoH standard that the population should have access to a health centre within an hour of walking, the maximum journey time allowed was set at 60 minutes [30].

Using AccessMod and considering the travel scenarios in table 1. The least-cost path algorithm is used in the computation, which considers the topography of the terrain, landcover, road, and river networks, as well as the associated travel speeds via each of the road and landcover classes. Patients who want to go to the closest primary health centre may encounter obstacles in the form of water bodies. The pace of movement was adjusted to 0 to mark this landcover category as a barrier and prevent catchments from encroaching on these places. The DEM makes it possible to include a slope in the study, which is crucial because the topography of the ground can either increase or decrease travel speed, especially when walking or driving. This model incorporates speed adjustments and Tobler's formula-based slope corrections for both walking and driving [31-32].

In this study, the accessibility analysis considered four scenarios based on the mode of transport used (Walking and Driving).

1. 15 minutes travelling time to the health facility by walking.
2. 30 minutes travelling time to the health facility by walking.
3. 60 minutes travelling time to the health facility by walking.
4. 15 minutes travelling time to the health facility by driving.
5. 30 minutes travelling time to the health facility by driving.
6. 60 minutes travelling time to the health facility by driving.

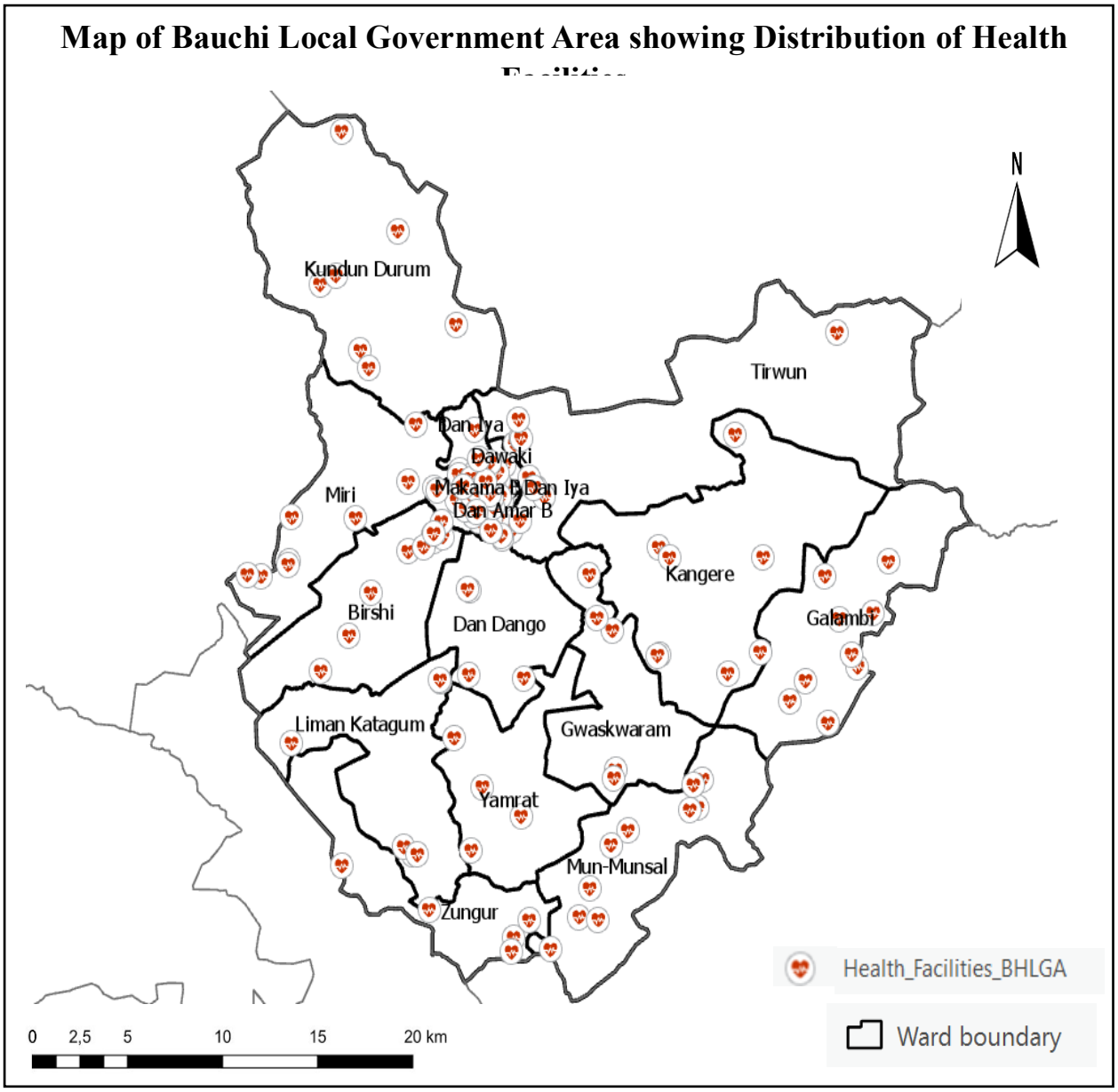


**Figure 2.** Distribution of Health Facilities in the Study Area

## Results

The geographical accessibility analysis to primary health care in the LGA takes into consideration the constraints of landscape, which was then carried out using the two different travel scenarios, summarized in Table 1, and assuming the maximum of 60 minutes of travelling time to any health facility. Figure 3 depicts the accessibility to primary health care in Bauchi local government for the two scenarios. The first scenario (Driving) shows the maximum degree of geographical accessibility in the local government by political ward. There exists a significant increase in accessibility for facilities that are closer to the main roads, with the urban wards having a travel time of fewer than 15 mins. The use of motor vehicles or motorcycle along both the national, province and district roads tend to significantly reduce the travelling distance within the maximum travelling time set for the study. The minimum level of geographical accessibility can be seen in the second scenario (Walking), especially in the rural wards, with little access road, most of the population are either walking or cycling along

the rural/feeder roads, which constitute most of the access road infrastructure in the wards.

Table 2 summarizes the accessibility status of the local government, In the first scenario (Driving), 87% of the population is within 15 minutes of travel time to the health facilities, and almost 100% of the population is within 60minutes of driving time to all health facilities in the local government. However, only 55% of the population is within 15 minutes of travel time using the second scenario (walking), and 91% of the population is within 60 minutes of travel time by walking. From the accessibility analysis, it was observed that 1,641 $km^2$ and 1,153 $km^2$ catchment areas is within 30 minutes of driving time to health facilities representing 886,061 and 652,588 population covered in the first scenario. Moreso, using the second walking scenario, 372,677 and 506,577 people could access health services in the health facilities with 336 $km^2$ and 538 $km^2$ catchment areas, respectively (Table 3; Figure 3).

**Table 2.** Health Facility Accessibility Analysis

| **Scenarios** | **Statistics** | **<15 m** | **15m – 30 m** | **30 m – 45 m** | **45 m – 60 m** | **>=60 m** |
|---|---|---|---|---|---|---|
| Driving | Total Population | 672,540 | 672,540 | 672,540 | 672,540 | 672,540 |
| | Total Covered Population | 586,061 | 652,588 | 668,769 | 672,332 | 672,478 |
| | % Covered Population | 87% | 97% | 99% | 100% | 100% |
| | Catchment area ($km^2$) | 1,645 | 1,153 | 554 | 228 | 107 |
| Walking | Total Population | 672,540 | 672,540 | 672,540 | 672,540 | 672,540 |
| | Total Covered Population | 372,677 | 506,577 | 568,768 | 610,879 | 637,793 |
| | % Covered Population | 55% | 75% | 85% | 91% | 95% |
| | Catchment area ($km^2$) | 336 | 538 | 641 | 591 | 1,581 |

The health facility to population ratio for the local government is 1:4,454, with the minimum being 1:1,220 (Makama A Ward) per population and the maximum being 1:11,949 (Dawaki ward).

The proportion of health facilities to settlement is 21%, while 357 settlements representing 11.2% are outside the 5km buffer of any health facility in the local government (Table 3).

**Table 3.** Health Facilities Analysis Including Under-Served Population, and Population Coverage

| Wards | Total No of HF [N] | Total Settlements [N] | Settlements/HF Ratio [%] | Settlements Under-served (>15km) [N] | Proportion of Under-served Settlements [%] | Total Population (RPE - WorldPop) | HF to Population Ratio (RPE - WorldPop) |
|---|---|---|---|---|---|---|---|
| Birshi | 10 | 259 | 26 | 4 | 1.5 | 76,865 | 1:7,687 |
| Dan Amar A | 4 | 53 | 13 | 0 | 0.0 | 7,741 | 1:1,935 |
| Dan Amar B | 5 | 102 | 20 | 0 | 0.0 | 22,899 | 1:4,580 |
| Dan Dango | 4 | 132 | 33 | 7 | 5.3 | 16,204 | 1:4,051 |
| Dan Iya | 25 | 155 | 6 | 0 | 0.0 | 94,479 | 1:3,779 |
| Dan Kade | 4 | 71 | 18 | 0 | 0.0 | 8,167 | 1:2,042 |
| Dawaki | 3 | 97 | 32 | 0 | 0.0 | 35,848 | 1:11,949 |
| Galambi | 9 | 224 | 25 | 11 | 4.9 | 29,582 | 1:3,287 |
| Gwaskwaram | 5 | 125 | 25 | 24 | 19.2 | 15,472 | 1:3,094 |
| Hardo | 2 | 38 | 19 | 0 | 0.0 | 4,628 | 1:2,314 |
| Kangere | 9 | 300 | 33 | 64 | 21.3 | 38,410 | 1:4,268 |
| Kundun Durum | 7 | 248 | 35 | 42 | 16.9 | 24,850 | 1:3,550 |
| Liman Katagum | 6 | 150 | 25 | 4 | 2.7 | 24,831 | 1:4,139 |
| Makama A | 13 | 91 | 7 | 0 | 0.0 | 15,865 | 1:1,220 |
| Makama B | 7 | 80 | 11 | 0 | 0.0 | 16,013 | 1:2,288 |
| Miri | 7 | 187 | 27 | 12 | 6.4 | 46,961 | 1:6,709 |
| Mun-Munsal | 10 | 166 | 17 | 11 | 6.6 | 28,909 | 1:2,891 |
| Tirwun | 13 | 430 | 33 | 160 | 37.2 | 130,510 | 1:10,039 |
| Yamrat | 4 | 168 | 42 | 10 | 6.0 | 20,819 | 1:5,205 |
| Zungur | 4 | 102 | 26 | 8 | 7.8 | 13,487 | 1:3,372 |
| Grand Total | 151 | 3,178 | 21 | 357 | 11.2 | 672,540 | 1:4,454 |

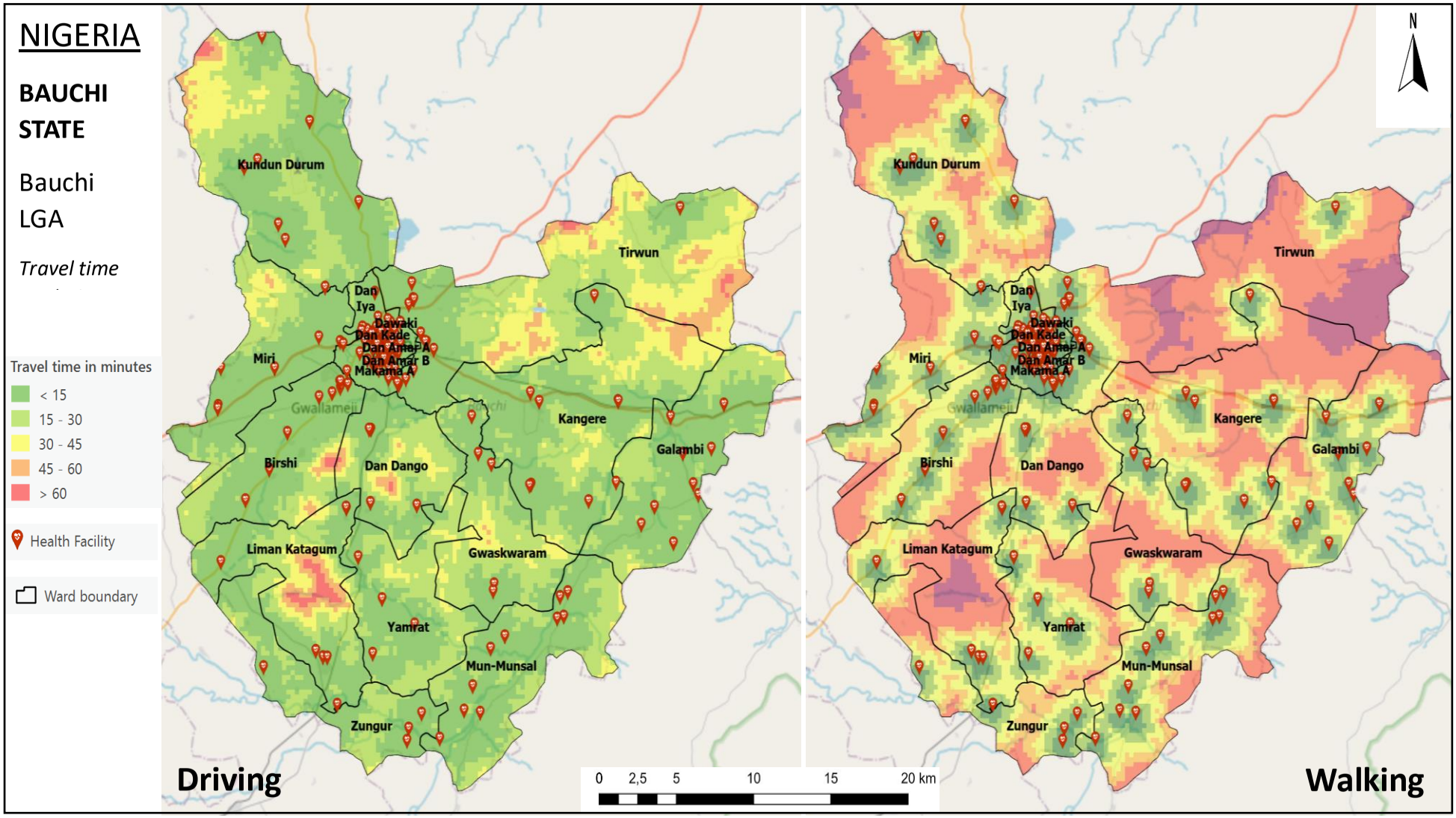


**Figure. 3.** Travel Time Analysis to Nearest Health Facilities

## Discussion

The current study used realistic estimations of the travel times by driving and walking to healthcare facilities to characterize the diversity of healthcare services in the local government. We examined the geographical accessibility and spatial coverage of health care facilities of the Bauchi local government using a maximum traveling time of 60 minutes to the health facilities. The result showed that the second scenario of driving seems to be the best model, with a coverage of 99% of the population, with disparity across the political wards. The result from this study is in harmony with previous studies that relate the maximum travel time to a health facility should be within 60 minutes, where the areas considered with good accessibility are within 30 minutes and those considered under-served have more than 30 minutes [33-35].

The findings from this study demonstrate the travelling time to the nearest primary health facility, which provides a good measure of physical accessibility to health services. The amount of time a patient can spend traveling to a specific primary healthcare center sometimes depends on the severity of the patient's condition and is coupled with the global standard of ensuring that each population should have access to a health service within 60 minutes of walking time [35]. This justifies the reason for considering a maximum of 60 minutes of travel time in this study. The study uses the combination of road networks, topography, different land cover, and the speed of travel in the different categories of roads and land cover. These findings offer a helpful visual summary of the local government's level of accessibility, highlighting areas that are both fully, partially, and in-accessible. The first scenario of driving indicates the highest degree of accessibility as compared to the second scenario of walking.

However, travelling time does not necessarily signify good accessibility as there exist other factors that are associated with health care access, as issues related to the health facility's supply of care or accessibility should be considered in combination with demand and supply measures to better overall causes of poor health system performance [36]. But this study provides a robust and realistic approach, in which it looks at both the accessibility in terms of geographical distance to the health facilities and travel time as compared to other methods that take only one aspect into consideration. This research may help identify potential gaps and foster a deeper understanding of how the health system is performing toward reducing inequality in accessibility. As a result, the findings might be a valuable tool for decision-support in enhancing health planning and developing evidence-based policies to achieve universal health coverage.

It can also be seen from the study that the spatial extent of each health facility catchment area is defined based on the maximum population capacity and/or maximum travel time reached. Therefore, the spatial coverage analysis determines the extension of the health facility catchment area. Most of the health facilities in the urban wards have a good spatial coverage within 60 minutes of both driving and walking, and the population-to-health facility ratio has shown that these wards have the lowest health facility for population ratio, with only Dawaki ward having a higher ratio (Table 3). This also goes on to demonstrate that transportation mode has a significant impact on the population that the health facility serves, which corroborates similar findings [37].

The study equally shows that the urban wards, which are densely populated, are all accessible within 15 to 30 minutes of travel time in both scenarios and have more health facilities when compared to the rural wards (Table 3; Figure 3). Another study indicates similar results, pointing out that the urban population tends to have better accessibility than the population in rural areas [38]. The location of health facilities is disproportionally based on the settlement aggregation level, and hence the need to

prioritize rural and scattered populations in the sighting and locating health facilities to address the inequality in access to health care.

Travel impedance to the nearest health provider has been found to be an accurate measure of spatial accessibility in remote and scattered populations, particularly where the choices are limited, indicating that the population will travel to the closest health facility to seek care [39-40]. This can work effectively in the setting of Bauchi local government, as most of the population lives in rural wards with little or no access to private healthcare services due to their concentration in urban wards.

This type of analysis always comes with some limitations that must be taken into account when evaluating the findings. We assumed that patients would always go to the closest health facility. Going to the closest health facility is still the most typical behavior in the vast majority of cases. However, some people might be persuaded to visit further-flung health facilities that are perceived to offer higher-quality services due to qualified staff and the availability of drugs and staff [41-42]. Another presumption is that the routes of travel are those with the shortest total travel times. Therefore, it is presumed that the predicted travel time is an accurate representation of actual travel timings. But published literature has gone to prove that calculated travel times using GIS estimates are always in harmony with reported times [43]. While certain population members may choose to travel by other routes due to customs, social considerations, environmental and surface conditions, or other reasons, the least expensive option reflects the general way that people prefer to travel [42].

## Conclusion

The geographical access and the spatial coverage modelling generated from this work offer a simple but visually effective tool that may be used to support planning and resource allocation in the local government. Across the two different travel scenarios, the analysis shows considerable spatial disparities in the primary health system's geographic accessibility and spatial coverage. Most of the rural population is outside the standard 30 minutes walking distance to access healthcare, and more than half of the facilities are operating at more than their capacity with a high health facility-to-population ratio. The study shows that inequality exists despite efforts by the government to address primary healthcare issues, a lot needs to be done regarding inequality in access, shortage of staff and infrastructure, and poor quality of care, especially in the remote and rural areas of the local government.

To achieve high quality and cost-effective health system for achieving improved health outcomes requires a strong primary health system that is devoid of inequality. In many low-and-middle-income countries where sizable portions of the population reside in rural areas, physical accessibility to health care remains a problem. Different efficient initiatives are required to expand access to healthcare services and strengthen health systems for the optimal delivery of healthcare. Hence, knowledge and awareness of population distribution and health utilization patterns are essential. Our findings demonstrate the usefulness of GIS to leverage multiple datasets from different sources in a spatial framework to provide support to evidence-based planning and resource allocation decision-making in developing countries. The study area is characterized by different features, such as a combination of both rural and urban settlements that are densely populated, scattered, and geographically isolated, with topographical adversities which affect accessibility. Hence, the study can be generalized to fit into different areas with similar resource settings.

### Authors' Contributions

IMB conceptualized the study, wrote the original draft, and served as the guarantor for the paper. IMB, GUA, CYM, and FS compiled the data sets and did the analysis. KIM and SB

provided comments and edits. All authors contributed to reviewing and editing of the manuscript. All the authors have read and agreed on the final manuscript.

## Funding

None.

## Conflicts of Interest

The author declares that there is no conflicts of interest.

## Ethical Approval

It is not required. This analysis used open-source data, which is publicly available.

## References

[1] M. National Academies of Sciences, Engineering, H. and M. Division, B. on P. H. and P. H. Practice, and C. on C.-B. S. to P. H. E. States, "The Root Causes of Health Inequity," Communities in Action: Pathways to Health Equity, pp. 1–558, Jan. 2017, Doi: 10.17226/24624.

[2] O. Lawal and F. E. Anyiam, "Geo-spatial Information Science Modelling geographic accessibility to Primary Health Care Facilities: combining open data and geospatial analysis Modelling geographic accessibility to Primary Health Care Facilities: combining open data and geospatial an," Geo-spatial Information Science, vol. 22, no. 3, pp. 174–184, 2019, Doi: 10.1080/10095020.2019.1645508.

[3] A. S. Wigley, V. Alegana, A. Carioli, C. W. Ruktanonchai, C. Pezzulo, and Z. Matthews, "Measuring the availability and geographical accessibility of maternal health services across sub-Saharan Africa," pp. 1–10, 2020.

[4] R. Penchansky and J. W. Thomas, "The concept of access: definition and relationship to consumer satisfaction," Medical care, vol. 19, no. 2, pp. 127–140, 1981, Doi: 10.1097/00005650-198102000-00001.

[5] M. E. Cyr, A. G. Etchin, B. J. Guthrie, and J. C. Benneyan, "Access to specialty healthcare in urban versus rural US populations: A systematic literature review," BMC Health Services Research, vol. 19, no. 1, pp. 1–17, Dec. 2019, Doi: 10.1186/S12913-019-4815-5/FIGURES/4.

[6] W. H. Organization, "Gender, Equity, and Human Rights. Making a Difference: Visions, Goals and Strategy," World Health Organization, 2015.

[7] V. D. Pyrialakou, K. Gkritza, and J. D. Fricker, "Accessibility, mobility, and realized travel behavior: Assessing transport disadvantage from a policy perspective," *Journal of Transport Geography*, vol. 51, pp. 252–269, 2016, Doi: https://Doi.org/10.1016/j.jtrangeo.2016.02.001.

[8] A. J. Comber, C. Brunsdon, and R. Radburn, "A spatial analysis of variations in health access: linking geography, socio-economic status and access perceptions," *International Journal of Health Geographics*, vol. 10, no. 1, p. 44, 2011, Doi: 10.1186/1476-072X-10-44.

[9] C. Li and J. Wang, "A hierarchical two-step floating catchment area analysis for high-tier hospital accessibility in an urban agglomeration region," *Journal of Transport Geography*, vol. 102, Jun. 2022, Doi: 10.1016/j.jtrangeo.2022.103369.

[10] O. Lawal and F. E. Anyiam, "Modelling geographic accessibility to Primary Health Care Facilities: combining open data and geospatial analysis," http://www.tandfonline.com/action/journalInformation?show=aimsScope&journalCode=tgsi20#. VsXpLiCLRhE, vol. 22, no. 3, pp. 174–184, 2019, Doi: 10.1080/10095020.2019.1645508.

[11] A. Al-Taiar, A. Clark, J. C. Longenecker, and C. J. M. Whitty, "Physical accessibility and utilization of health services in Yemen," *International Journal of Health Geographics*, vol. 9, Jul. 2010, Doi: 10.1186/1476-072X-9-38.

[12] Steeve Ebener, Z. El Morjani, N. Ray, and M. Black, "Physical Accessibility to health care: From Isotropy to Anisotropy," Geospatial World, 2010. [Online]. Available: https://www.geospatialworld.net/article/physical-accessibility-to-health-care-from-isotropy-to-anisotropy/ [Accessed: 10-Nov-2022].

[13] M. F. Guagliardo, "Spatial accessibility of primary care: Concepts, methods and challenges,"

*International Journal of Health Geographics*, vol. 3, no. 1, pp. 1–13, Feb. 2004, Doi: 10.1186/1476-072X-3-3/FIGURES/3.

[14] R. K. Mallick and J. K. Routray, "Identification and accessibility analysis of rural service centers in Kendrapara District, Orissa, India: a GIS-based application*," International Journal of Applied Earth Observation and Geoinformation*, vol. 3, no. 1, pp. 99–105, 2001, Doi: https://Doi.org/10.1016/S0303-2434(01)85027-3.

[15] S. L. McLafferty and L. Sara, "GIS and health care.," *Annual review of public health*, 2003, Doi: 10.1146/annurev.publhealth.24.012902.141012.

[16] R. Haining, "GIS and public health," *International Journal of Geographical Information Science*, vol. 27, no. 5, pp. 1040–1041, May 2013, Doi: 10.1080/13658816.2012.717629.

[17] A. M. Noor, P. W. Gikandi, S. I. Hay, R. O. Muga, and R. W. Snow, "Creating spatially defined databases for equitable health service planning in low-income countries: the example of Kenya.," Acta tropic, vol. 91, no. 3, pp. 239–251, Aug. 2004, Doi: 10.1016/j.actatropica.2004.05.003.

[18] D. Buor, "Analysing the primacy of distance in the utilization of health services in the Ahafo-Ano South district, Ghana.," *The International Journal of Health Planning and Management*, vol. 18, no. 4, pp. 293–311, 2003, Doi: 10.1002/hpm.729.

[19] D. R. Feikin et al., "The impact of distance of residence from a peripheral health facility on pediatric health utilisation in rural western Kenya.," *Tropical medicine & international health:* TM & IH, vol. 14, no. 1, pp. 54–61, Jan. 2009, Doi: 10.1111/j.1365-3156.2008.02193. x.

[20] J. E. Brustrom, "Going the distance: How far will women travel to undergo free mammography?" Military Medicine, vol. 166, no. 4, pp. 347–349, 2001, Doi: 10.1093/milmed/166.4.347.

[21] M. Black, S. Ebener, P. N. Aguilar, M. Vidaurre, and Z. El Morjani, "Using GIS to measure physical accessibility to health care Using GIS to Measure Physical Accessibility to Health Care," no. November 2004.

[22] W. Luo, "Using a GIS-based floating catchment method to assess areas with a shortage of physicians," Health and Place, vol. 10, no. 1, pp. 1–11, 2004, Doi: 10.1016/s1353-8292(02)00067-9.

[23] M. F. Dulin et al., "Using Geographic Information Systems (GIS) to understand a community's primary care needs.," *Journal of the American Board of Family Medicine:* JABFM, vol. 23, no. 1, pp. 13–21, 2010, Doi: 10.3122/jabfm.2010.01.090135.

[24] F. Parvin, S. A. Ali, S. N. I. Hashmi, and A. Khatoon, "Accessibility and site suitability for healthcare services using GIS-based hybrid decision-making approach: a study in Murshidabad, India.," *Spatial Information Research*, vol. 29, no. 1. pp. 1–18, 2021, Doi: 10.1007/s41324-020-00330-0.

[25] A. Dejen, S. Soni, and F. Semaw, "Spatial accessibility analysis of healthcare service centers in Gamo Gofa Zone, Ethiopia through Geospatial technique," Remote Sensing Applications: Society and Environment, vol. 13, pp. 466–473, Jan. 2019, Doi: 10.1016/J.RSASE.2019.01.004.

[26] R. L. J. Phillips, E. L. Kinman, P. G. Schnitzer, E. J. Lindbloom, and B. Ewigman, "Using geographic information systems to understand health care access.," *Archives of family medicine*, vol. 9, no. 10, pp. 971–978, 2000, Doi: 10.1001/archfami.9.10.971.

[27] N. Khalil, "Primary Health Care Facilities in Kano," vol. 3, no. 1, pp. 458–470, 2017.

[28] M. Abubakar, A. Abdulkadir, A. D. E.- yuguda, T. M. Hamisu, and S. S. Baba, "Sero-Prevalence and Risk Factors Associated with Foot and MouthDisease in Bauchi Local Government Area, Bauchi State Nigeria.," IOSR Journal of Agriculture and Veterinary Science, vol. 10, no. 06, pp. 56–61, Jun. 2017, Doi: 10.9790/2380-1006015661.

[29] WHO AccessMod, "AccessMod 5 | Modelling physical accessibility to health care," 2017. [Online]. Available: https://www.accessmod.org/ [Accessed: 29-Nov-2022].

[30] Nigeria: National Primary Health Care Development Agenc, Ward minimum health care package, 2007-2012. [Abuja, Nigeria: National Primary Health Care Development Agency, 2007.

[31] W. Tobler, "Three presentations on geographical analysis and modeling: National Center for Geographic Information and Analysis.," no. February 1993.

[32] F. Hierink, N. Rodrigues, M. Muñiz, R. Panciera, and N. Ray, "Modelling geographical accessibility to support disaster response and rehabilitation of a healthcare system: an impact analysis of Cyclones Idai and Kenneth in Mozambique," BMJ Open, vol. 10, no. 11, p. e039138, Nov. 2020, Doi: 10.1136/BMJOPEN-2020-039138.

[33] A. dos Anjos Luis and P. Cabral, "Geographic accessibility to primary healthcare centers in Mozambique," *International Journal for Equity in Health*, vol. 15, no. 1, p. 173, 2016, Doi: 10.1186/s12939-016-0455-0.

[34] W. J. Ferguson, K. Kemp, and G. Kost, "Using a geographic information system to enhance patient access to point-of-care diagnostics in a limited-resource setting," *International Journal of Health Geographics*, 2016, Doi: 10.1186/s12942-016-0037-9.

[35] A. Murad, "Using GIS for Determining Variations in Health Access in Jeddah City, Saudi Arabia," *ISPRS International Journal of Geo-Information* 2018, Vol. 7, Page 254, vol. 7, no. 7, p. 254, Jun. 2018, Doi: 10.3390/IJGI7070254.

[36] W. H. O. (WHO), "Background paper for the technical consultation on effective coverage of health systems, 27–29 August 2001, Rio de Janeiro, Brazil. Geneva: WHO; 2001." 2018.

[37] C. Varela, S. Young, N. Mkandawire, R. S. Groen, L. Banza, and A. Viste, "Transportation Barriers to Access Health Care for Surgical Conditions in Malawi a cross-sectional nationwide household survey," BMC Public Health, vol. 19, no. 1, pp. 1–8, Mar. 2019, Doi: 10.1186/S12889-019-6577-8/TABLES/4.

[38] S. Mansour, "Spatial analysis of public health facilities in Riyadh Governorate, Saudi Arabia: a GIS-based study to assess geographic variations of service provision and accessibility," Geo-spatial Information Science, vol. 19, no. 1, pp. 26–38, Jan. 2016, Doi: 10.1080/10095020.2016.1151205.

[39] O. Kotavaara, A. Nivala, T. Lankila, T. Huotari, E. Delmelle, and H. Antikainen, "Geographical accessibility to primary health care in Finland – Grid-based multimodal assessment," Applied Geography, vol. 136, p. 102583, Nov. 2021, Doi: 10.1016/J.APGEOG.2021.102583.

[40] M. Bello, "A Robust Approach to Determining Under-served Settlements for Health Using Geographic and Spatial Coverage Modelling in Bauchi Local Government Area," *Texila International Journal of Public Health*, vol. 10, no. 2, pp. 196–207, 2022, Doi: 10.21522/tijph.2013.10.02.art017.

[41] C. Moïsi et al., "Geographic access to care is not a determinant of child mortality in a rural Kenyan setting with high health facility density," *BMC Public Health*, vol. 10, no. 1, pp. 1–9, 2010.

[42] N. Ray and S. Ebener, "AccessMod 3.0: computing geographic coverage and accessibility to health care services using anisotropic movement of patients," *International Journal of Health Geographics*, vol. 7, no. 1, p. 63, 2008, Doi: 10.1186/1476-072X-7-63.

[43] R. Haynes, A. P. Jones, V. Sauerzapf, and H. Zhao, "Validation of travel times to hospital estimated by GIS.," *International journal of health geographics*, vol. 5, p. 40, Sep. 2006, Doi: 10.1186/1476-072X-5-40.

Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.10.01.Art003

# Covid-19 Psycho-social Impact among United Nations Staff in Burundi

Jean Claude Musengimana[1]*, *Michel Ogou[2], Gisèle Busokoza[2], Rénovate Irambona[2], Ziad Khatib[3], Charles Nsanzabera[4], Evode Uwamungu[5]*
*[1]Department of Public Health, Texila American University, Guyana, Nicaragua*
*[2]Department of Health, UNDP, Burundi*
*[3]Department of Global Health Delivery, University of Global Health Equity, Kigali, Rwanda*
*[4]Department of Public Health, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya*
*[5]Department of Global Health Delivery, University of Global Health Equity, Kigali, Rwanda*

***Abstract***

*The coronavirus (Covid-19) is a pandemic that threatens many people's lives. The objective of this study was to explore the Covid-19 psycho-social impact on Staff working in the United Nations in Burundi from October 2021 to 31st January 2022. This was a cross-sectional study involving 312 study participants. Univariate and bivariate analysis were processed using SPSS 25, and the Chi-square test was calculated with a $p<0.05$. As a result, all psycho-social components assessed were affected by Covid-19. The Staff experienced a very high level of psycho-social impact (very severe) which varied from 31% for being afraid of financial problems and unhappiness due to missing professional support from colleagues to 47% for being afraid of a family member infected by Covid-19. Also, we assessed their particularity of psycho-social impact due to the exposure of being clinical or non-clinical Staff, whereby, clinical Staff had a lower risk of being affected compared to the non-clinical Staff in some components. For instance, clinical Staff was 0.39 times more affected by fear of being infected by Covid-19 compared to non-clinical Staff (CI= (0.23,0.65). Also, there are some components where the impacts were similar for clinical and non-clinical Staff (Chi-square test p-value > 0.05 and CI of odds ratios cross 1). Thus, UN employees were negatively affected by Covid-19 from a psycho-social standpoint. The study recommends UN agencies in Burundi support staff by providing emergency psychological support and, if required to give medical treatment for job optimization. Hence, staff psycho-social status must be constantly checked and kept stable.*

**Keywords**: *Covid-19, Impact, Psycho-social, Staff, United Nations.*

## Introduction

This study focused on Covid-19's psycho-social impact among United Nations staff in Burundi, which is a landlocked country in East Africa. Based on little information on the health workforce and non-clinical Staff, this study aimed to identify the negative psycho-social impact of Covid-19 on Clinical and non-clinical Staff working in the United Nations in Burundi from March 2020 to 31$^{ST}$ January 2022. According to different works of literature, the Covid-19 pandemic has caused severe changes across the world, distressing all areas of life including psycho-social life and time in general. Furthermore, the Covid-19 pandemic has had significant psycho-social effects on the population, including psycho-social stigmatization, complete lockdown in different cities, flight cancelation, closure of different business centers, suspension of common transport, and psycho-social isolation in general [1]. Equally important, psycho-social distance

***Received: 05.12.2022*** ***Accepted: 06.12.2022*** ***Published on: 31.01.2023***
****Corresponding Author: mjc1fr@gmail.com***

and security measures have affected the connection among people and their insight of empathy toward others [2]. From this standpoint, information and technology devices played significant roles in decreasing the undesirable effects of the pandemic [3]. Also, in different institutions, some staff started their retirement early, while others postponed their annual leave and/or started their leave for fear of being contaminated by Covid-19 [3]. Furthermore, in the year 2020 due to Covid-19, many countries suspended most of their airlines, many airports closed their flight trips, or the number of flights was reduced, compared with situations from the previous year, 2019 [4]. Additionally, the Covid-19 pandemic caused different psycho-social problems, including psycho-social distancing, whereby the normal community living with mutual sharing and ceremonies was stopped since then, the lifestyle changed, and some people started to stigmatize others by excluding those who are perceived to be probable sources of disease with the possibility to contaminate others in the society [4]. In the same way, it was highlighted that the stigma was found among the people connected with being an infected patient and having close contact with those infected. Therefore, it was recommended that based on the negative effects of stigma, there is a need to mitigate all possible reasons that may cause stigma, instead of being focused on Covid-19 treatment and prevention [4]. Also, to decrease the spreading of Covid-19, global leaders implemented a lockdown of different societies and activities to protect both workforces and owners around the globe using different changes to protect Staff, including working from home and release from different jobs [5]. More importantly, apart from governments restrictions to protect the population from Covid-19 contamination, different people opted to avoid public transport and shifted to the use of their own cars, bicycle, mobile, teleworking, and online services were used as probable alternative solutions to prevent the spreading of Covid-19 in the society [6].

### Limitations

The study was limited to the Staff of the United Nations in Burundi from 1st March 2020 to 31st January 2022. Also, due to Covid -19 variation or mutation, we were unable to perform interviews and/or focus groups to minimize the spreading of infections.

## Materials and Methods

This research was conducted under a cross-sectional study design and used a self-administered questionnaire to 312 United Nations (UN) Staff that visited the UN Clinic in Burundi during the period of 4 months starting from October 2021 to 31st January 2022. An approval letter was obtained from the UN health Manager in Burundi. The inclusion criteria were being UN staff involved in different working activities during the study period and accepting to participate in the study, and the exclusion criteria were not being UN staff and not accepting to participate in the study. Furthermore, consent forms were signed by participants, and participation was voluntary. Therefore, using systematic random sampling, a sample size of 312 participants from the study population of 1429 staff were included in this study. Univariate and bivariate analysis were processed using SPSS 25, and the Chi-square test was calculated with a $p<0.05$.

For the assessment of the prevalence of psycho-social and social impact due to Covid-19 on UN staff in Burundi, we used a variety of questions translated into English and French for quantitative data collection. Those questionnaires were addressed to UN staff who participated in the study to assess different dimensions of psycho-social impact, whereby 3 nurses and the researcher participated in data collection. Also, we explored the particularity of psycho-social impact due to the exposure of being a clinical or non-clinical department of Staff. Consequently, the dimensions of psycho-social impacts were re-scaled into two levels instead of four, the “None-to-Moderate” level and the “Severe-to-Very-Severe” level, to

compare the variations of high level to the insignificant (low) level and absence of impacts for clinical and non-clinical Staff. A Chi-square test was used to measure the presence of an association between a department as an exposure factor and the psycho-social impact level as an effect of Covid-19 at 5% statistical significance. The odds ratios were also calculated to determine the extent of the association. In the same way, clinical/non-clinical staff exposures were independent variables, while Covid-19 psycho-social negative impact was the dependent variable.

## Results

Regarding the prevalence of psycho-social and social impact due to Covid-19 on UN staff in Burundi, all psycho-social components assessed were affected, including fear of being infected or a member of the family being infected by Covid-19, loneliness due to Covid-19, fear of job loss, etc. Higher proportions of Staff experienced a very high level of psycho-social impact (very severe) which varied from 31% for being afraid of financial problems and being unhappy due to missing professional support from colleagues to 47% for being afraid of a family member being infected by Covid-19. A high level of psycho-social impact (severe) was experienced at proportions varying from 13% for envisaging to leave the job due to Covid-19 as well as being stressed by flight booking cancellations and being stranded abroad to 28% for having frustration caused by the pandemic. Proportions of Staff who experienced a moderate level of psycho-social impact (Moderate) were closer to those of high-level impact and varied from 11% for envisaging leaving the job as well as being stressed by flight booking cancellations and being stranded abroad to 22% for being afraid of financial problems. The range of proportion of Staff who experienced minimal impact varied from 4% for those who were afraid of a family member being infected, those who had an idea to leave their job due to Covid-19, and those who were stressed by flight booking cancellations and stranded abroad to 15% for those who were afraid of death due to the Covid-19. The absence of any psycho-social impact was observed at relatively lower proportions varying from 4% who did not fear a member of the family being infected to 28% who have not had an idea of leaving their job due to Covid-19, except the absence observed at being stressed by flight booking cancellations and stranded abroad where 55% of Staff did not experience a related impact (ref. Table1).

Also, regarding the effect of clinical exposure on the prevalence of psycho-social impact due to Covid-19, this study emphasized on exploring the particularity of psycho-social impact due to the exposure of being a clinical or non-clinical based on the department of Staff. Dimensions of psycho-social impacts were re-scaled into two levels instead of four, the “None-to-Moderate” level and the “Severe-to-Very-Severe” level, to compare the variations of high level to the insignificant (low) level and absence of impacts for clinical and non-clinical Staff. A Chi-square test was used to measure the presence of an association between a department as an exposure factor and the psycho-social impact level as an effect of Covid-19 at 5% statistical significance. The odds ratios were also calculated to determine the extent of the association. The psycho-social components where the department was a risk factor of Covid-19 psycho-social impact include fear of being infected by Covid-19, fear of a family member being infected, loneliness, frustration, feeling of worthless, negative thinking and fear of having health complications due to Covid-19 (p-values $< 0.05$). For all those components, the clinical Staff had a lower risk of being affected compared to the non-clinical Staff. For instance, clinical Staff were 0.39 times more affected by fear of being infected by Covid-19 than non-clinical Staff (CI = (0.23,0.65)), and they were 0.27 times affected by loneliness (CI = (0.16,0.47)).

**Table 1.** Proportions of UN Staff by Levels of Psycho-social Impact due to Covid-19

| No | Psycho-social effect | Number (percentage) per category | | | | |
|---|---|---|---|---|---|---|
| | | **None** | **Minimal** | **Moderate** | **Severe** | **Very severe** |
| 1. | Fear of being infected with Covid-19 | 22 (7%) | 24 (8%) | 60 (19%) | 66 (21%) | 140 (45%) |
| 2. | The fear of having your family members infected with Covid -19 | 14 (4%) | 12 (4%) | 56 (18%) | 82 (26%) | 148 (47%) |
| 3. | Loneliness due to the Covid-19 pandemic | 40 (13%) | 18 (6%) | 58 (19%) | 52 (17%) | 144 (46%) |
| 4. | Fear of losing your job | 62 (20%) | 34 (11%) | 48 (15%) | 60 (19%) | 108 (35%) |
| 5. | Fear of Financial problem | 44 (14%) | 34 (11%) | 68 (22%) | 68 (22%) | 98 (31%) |
| 6. | The frustration caused by the Covid-19 pandemic | 20 (6%) | 36 (12%) | 60 (19%) | 88 (28%) | 108 (35%) |
| 7. | Feeling worthless due to the Covid-19 pandemic | 66 (21%) | 44 (14%) | 60 (19%) | 64 (21%) | 78 (25%) |
| 8. | Negative thoughts related to anything related to the Covid-19 pandemic | 38 (12%) | 44 (14%) | 64 (21%) | 64 (21%) | 102 (33%) |
| 9. | Worry about the future due to the Covid-19 pandemic | 20 (6%) | 28 (9%) | 50 (16%) | 80 (26%) | 134 (43%) |
| 10. | Fear of using public transport due to Covid-19 | 24 (8%) | 24 (8%) | 56 (18%) | 74 (24%) | 134 (43%) |
| 11. | Avoid eating out / having food delivered due to Covid-19 | 46 (15%) | 36 (12%) | 66 (21%) | 62 (20%) | 102 (33%) |
| 12. | Fear of dying from Covid-19 | 36 (12%) | 46 (15%) | 40 (13%) | 62 (20%) | 128 (41%) |
| 13. | Working overtime due to the Covid-19 pandemic | 40 (13%) | 32 (10%) | 52 (17%) | 62 (20%) | 126 (40%) |
| 14. | Have fatigue accentuated by work due to the Covid-19 pandemic | 50 (16%) | 42 (13%) | 46 (15%) | 62 (20%) | 112 (36%) |
| 15. | Fear of developing health complications due to the Covid-19 pandemic | 36 (12%) | 24 (8%) | 42 (13%) | 68 (22%) | 142 (46%) |
| 16. | The thought of giving up your job because of the Covid-19 pandemic | 86 (28%) | 14 (4%) | 34 (11%) | 40 (13%) | 138 (44%) |
| 17. | Feeling Hopeless due to social stigmatization due to the Covid-19 pandemic | 40 (13%) | 32 (10%) | 56 (18%) | 62 (20%) | 122 (39%) |
| 18. | Being stressed by my flight booking cancellations, and being stranded abroad due to Covid-19-related international travel restrictions | 172 (55%) | 14 (4%) | 34 (11%) | 40 (13%) | 52 (17%) |

| | | | | | | |
|---|---|---|---|---|---|---|
| 19. | Being unhappy due to social isolation (Inability to have a good time with family and friends) due to the Covid-19 pandemic | 34 (11%) | 25 (8%) | 46 (15%) | 77 (25%) | 130 (42%) |
| 20. | Feeling unhappy due to my annual leave postponement due to the Covid-19 pandemic | 80 (26%) | 32 (10%) | 38 (12%) | 54 (17%) | 108 (35%) |
| 21. | Feeling unhappy due to missing professional support from my colleagues due to the Covid-19 pandemic | 54 (17%) | 34 (11%) | 58 (19%) | 70 (22%) | 96 (31%) |

**Table 2.** Effect of Clinical Exposure to the Psycho-Social Impact of Covid-19

| **Psycho-social effect** | | **Department** | | **Chi-square test** | | **Odds ratio C/NC on SVS (95% CI)** |
|---|---|---|---|---|---|---|
| | | **Clinical** | **Non-clinical** | **X-squared** | **p-value** | |
| Fear of being infected with Covid-19 | None-to-Moderate | 42 | 64 | 12.201 | 0.0004777 | 0.39 (0.23, 0.65) |
| | Severe-to-Very severe | 42 | 164 | | | |
| The fear of having your family members infected with Covid -19 | None-to-Moderate | 30 | 52 | 4.6331 | 0.03136 | 0.53 (0.31, 0.92) |
| | Severe-to-Very severe | 54 | 176 | | | |
| Loneliness due to the Covid-19 pandemic | None-to-Moderate | 50 | 66 | 23.28 | 1.401e-06 | 0.27 (0.16, 0.47) |
| | Severe-to-Very severe | 34 | 162 | | | |
| Fear of losing your job due to the Covid-19 | None-to-Moderate | 36 | 108 | 0.33755 | 0.5612 | 1.2 (0.72, 1.99) |
| | Severe-to-Very severe | 48 | 120 | | | |
| Fear of Financial problems due to the Covid-19 | None-to-Moderate | 44 | 102 | 1.15 | 0.2836 | 0.74 (0.45, 1.2) |
| | Severe-to-Very severe | 40 | 126 | | | |
| The frustration caused by the Covid-19 pandemic | None-to-Moderate | 42 | 74 | 7.3555 | 0.006686 | 0.48 (0.29, 0.79) |
| | Severe-to-Very severe | 42 | 154 | | | |
| Feeling worthless due to the Covid-19 pandemic | None-to-Moderate | 56 | 114 | 6.2202 | 0.01263 | 0.50 (0.30, 0.84) |
| | Severe-to-Very severe | 28 | 114 | | | |
| Negative thoughts related to anything related to the Covid-19 pandemic | None-to-Moderate | 50 | 96 | 6.7973 | 0.00913 | 0.50 (0.30, 0.82) |
| | Severe-to-Very severe | 34 | 132 | | | |
| Worry about the future due to the Covid-19 pandemic | None-to-Moderate | 28 | 70 | 0.094072 | 0.7591 | 0.89 (0.52, 1.51) |
| | Severe-to-Very severe | 56 | 158 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Fear of using public transport due to Covid-19 | None-to-Moderate | 34 | 70 | 2.2176 | 0.1364 | 0.65 (0.39, 1.09) |
| | Severe-to-Very severe | 50 | 158 | | | |
| Avoid eating out / having food delivered due to Covid-19 | None-to-Moderate | 44 | 104 | 0.87226 | 0.3503 | 0.76 (0.46, 1.26) |
| | Severe-to-Very severe | 40 | 124 | | | |
| Fear of dying from Covid-19 | None-to-Moderate | 34 | 88 | 0.029247 | 0.8642 | 0.92 (0.55, 1.54) |
| | Severe-to-Very severe | 50 | 140 | | | |
| Working overtime due to the Covid-19 | None-to-Moderate | 32 | 92 | 0.053233 | 0.8175 | 1.10 (0.66, 1.84) |
| | Severe-to-Very severe | 52 | 136 | | | |
| Have fatigue accentuated by work due to the Covid-19 pandemic | None-to-Moderate | 36 | 102 | 0.028234 | 0.8666 | 1.079 (0.65, 1.79) |
| | Severe-to-Very severe | 48 | 126 | | | |
| Fear of developing health complications due to the Covid-19 pandemic | None-to-Moderate | 46 | 56 | 24.09 | 9.196e-07 | 0.27 (0.16, 0.45) |
| | Severe-to-Very severe | 38 | 172 | | | |
| The thought of giving up your job because of the Covid-19 pandemic | None-to-Moderate | 44 | 90 | 3.6635 | 0.05562 | 0.59 (0.36, 0.98) |
| | Severe-to-Very severe | 40 | 138 | | | |
| Feeling Hopeless due to social stigmatization due to the Covid-19 pandemic | None-to-Moderate | 42 | 86 | 3.3356 | 0.06779 | 0.61 (0.36, 1.00) |
| | Severe-to-Very severe | 42 | 142 | | | |
| Being unhappy due to social isolation (Inability to have a good time with family and friends) due to the Covid-19 pandemic | None-to-Moderate | 36 | 69 | 3.8147 | 0.05081 | 0.58 (0.35, 0.97) |
| | Severe-to-Very severe | 48 | 159 | | | |
| Feeling unhappy due to my annual leave postponement due to the Covid-19 pandemic | None-to-Moderate | 46 | 104 | 1.7077 | 0.1913 | 0.69 (0.41, 1.14) |
| | Severe-to-Very severe | 38 | 124 | | | |
| Feeling unhappy due to missing professional support from my colleagues due to the Covid-19 pandemic | None-to-Moderate | 44 | 102 | 1.15 | 0.2836 | 0.74 (0.44, 1.21) |
| | Severe-to-Very severe | 40 | 126 | | | |
| Stressed by my flight booking cancellations, and being stranded abroad due to Covid-19-related international travel restrictions | None-to-Moderate | 62 | 158 | 0.40346 | 0.5253 | 0.80 (0.46, 1.40) |
| | Severe-to-Very severe | 22 | 70 | | | |

For other psycho-social components, the staff department was not associated with the psycho-social impacts, implying that the impacts were similar for clinical and non-clinical Staff (Chi-square test p-value > 0.05 and CI of odds ratios cross 1; ref. Table 2).

## Discussion

Based on bivariate analysis, our study results showed that psycho-social stigmatization, psycho-social isolation, and common transport difficulties offered a significant relationship with a high impact grade of C-19 with $X^2$(df):189(12), 242(12), 201(12) and p<0.001, respectively (Table: 2). This goes together with the results of scientists whereby, it was highlighted that based on the prevention measures and health education activities, some people started to have different problems including stigmatization, psycho-social isolation, and common transport difficulties due to the fear of the disease [7]. Again, 42% of our participants were stressed due to social isolation (Inability to have a good time with family and friends) due to the Covid-19 pandemic. This is similar to another study whereby humans tend to distance themselves from those considered a source of hazard (infections), isolation, and others. However, most of the time, this may cause fear and stigmatization, whereby some of them may develop negative reactions and discrimination against people. Thus, stigmas may limit the capability to control diseases and affect psychological well-being, attempt to hide the disease, or misreport signs and symptoms [7]. In the same way, delays in early detection of the problem and treatment, mistrust in public health agencies by those stigmatized, raised depressive indications and suicide, increasing defenselessness to disease, and inconsistent allocation of health resources [7]. Additionally, 46% of our respondents confirmed that they were severely affected by fear of developing health complications due to the Covid-19 pandemic. This is like another study conducted in China whereby more people experienced stigma, and psychological distress, precisely posttraumatic stress disorder at 69.47% (95% confidence interval (CI): 66.81%-72.13%) of the measured Wuhan due to Covid-19 [8]. This looks like another study conducted in Pakistan whereby it was found that 21.8% of healthcare professionals suffered from moderate to severe depression symptoms, 15.5% from moderate to severe anxiety, and 65.5% from moderate symptoms of fear [9]. Also, another study in Chile aiming to determine the variables attributable to the fear of contracting Covid-19 demonstrated that the length of the pandemic has unquestionably affected the behavior of people and has generated fear in many people as there is an intensification in the risk of getting sick, exclusively after morbidity enlarged or one of the family members became ill or died. As a result, 54.6% of respondents had more fear of getting Covid-19, and women's fear was augmented by 89% while men increased by 30% [10].

Also, the bivariate analysis showed that all five variables were significantly associated with the negative psycho-social impact of Covid-19 among United nations employees, p<0.001. In addition, the stigma and psycho-social isolation were 36 times associated with high psycho-social impact, p<0.001. This is like another study conducted in Nepal to assess stigma related to Covid-19 patients among health Care Workers and explore its impact on their professional quality of life during the Covid-19 pandemic, it was revealed that about two-thirds of the study, participants presented a discriminating disrespect to patients with Covid-19 connected with only low satisfaction. Moreover, others demonstrated negative behavior in accepting patients with Covid-19 due to low burnout with fatigue and a discriminatory attitude towards Covid-19 patients, which was associated with only satisfaction. Therefore, it was recommended to establish strategies that may diminish the fear and discrimination against patients with Covid-19 [11]. The results of this study demonstrated that 41% of participants

were severely afraid of dying from Covid-19. This goes together with the International Council for Nurses conducted a study and revealed that 10% of patients contaminated by Covid-19 were health workers, and more than 1000 nurses died due to Covid-19 in different countries. Consequently, 70% and more nurses were discriminated against and isolated, and 60% of them developed mental problems [12].

More importantly, our study results demonstrated that 46% of our respondents were severely affected by loneliness due to the Covid-19 pandemic. This is like another mixture of longitudinal studies aimed to synthesize relevant, high-quality primary studies narratively and statistically, revealed increased loneliness due to the Covid-19 pandemic and prevention measures, including physical distancing confirmed as risk factors for loneliness, even if observed effects were small and heterogeneous, suggesting that the loneliness pandemic is likely excessive and creates a risk for early mortality and mental and physical health [13].

Additionally, our findings revealed that 35% of our respondents were severely frustrated, 25% of them had felt worthless severely, 33% of were severely had negative thoughts related to anything related to the Covid-19 pandemic, 43% were afraid of using public transport, 33% severely avoided eating out / having food delivered due to the Covid-19. This is like another study whereby the stigma associated with Covid-19 caused a negative impact on the lives of healthcare providers, patients, and those recovering from the disease, whereby some attacks on healthcare workers and health facilities were well highlighted. Consequently, harassment, stigmatization, and physical violence, some staff were avoided by their families or the public due to stigma or anxiety, whereby some healthcare workers were excluded from using public transport, disrespected in the street, and expelled from hired apartments [14]. Also, some patients were abandoned by their families and named different names like corona, and some of them were suffering mental stress, and some staff has faced harassment in public places as they were considered as a higher risk source of transmission [15]. Again, in another study, it was revealed that healthcare workers developed mental anxiety. They were disconnected from their families and were unhappy due to the loss of their patients, their co-workers, and their friends [16].

In the same way, in another study, it was well clarified that more factors were identified, including organic illness, gender (female), family problems, worry of infection, shortage of personal protective equipment (PPE), and long exposure to staying with Covid-19 [17]. Furthermore, a significant statistical analysis was well found and confirmed that stigma caused by Covid-19 was well-identified in tertiary hospitals in low-middle-income countries. Therefore, it was recommended to implement different strategies that may help to reduce/ prevent and eliminate the above problem [18].

Equally important, our study revealed that 17% out of 312 participants were severely stressed by flight cancellation (ref. tab 1). This shows that many people were stranded abroad for a long time. This goes together with different studies whereby flight suspension activities were implemented to prevent the spreading of Covid-19. Whereby due to the spread of Covid-19 between March 2020 and May 2020, airlines started to suspend national and international flights. Consequently, the cancellation of flights caused different challenges whereby some family members were living on different planets waiting for the airport to reopen [19]. Another essential point, 39% of our respondents experienced hopelessness severely due to social stigmatization, and 31% were severely unhappy due to missing professional support from my colleagues due to the Covid-19 pandemic. This goes together with another study whereby the world health organization recommended health systems from different countries to provide

psycho-psycho-social support to healthcare workers during and after the management of patients with Covid-19 due to the stress and mental disorders related to Covid-19, isolation, and stigmatization [20]. In the same way, in the study conducted in Hong Kong, it was well clarified that some staff missed work socialization, missed their supervisors, missed support from information technologies Technicians, and had communication barriers [21]. Furthermore, our study revealed that 44% of our study participants severely thought of giving up their job because of the Covid-19 pandemic. This is like another study conducted in Belgium to investigate the expected impact of the Covid-19 crisis on career outcomes and career aspirations revealed that 21% were afraid of losing their jobs, and 14% were worried that they would even lose their jobs soon. Also, 26% expect to miss out on the promotions that they would have acknowledged if the Covid-19 crisis had not occurred [22]. Another essential point is that since the beginning of Covid-19, it was well noted that the global could not afford enough Staff to help patients in clinical institutions as well as in their homes. Consequently, community health workers were the only solution to close the gap by protecting Health care workers, reducing the virus, and continuing the management of other diseases as it was before Covid-19 [23]. Also, in another study, it was well noted that community health workers experienced psycho-social isolation and family stigmatization. Thus, it was recommended to provide more motivation, such as transport, incentives, and others as it has been well fixed in previous pandemics [24].

Equally important, in another study, based on the complications of Covid-19, it was recommended that all states must have the regular maintenance of psycho-social or familial networks [25]. More importantly, the psycho-social distance and the safety measures have affected the relationship among different individuals, families, and their insight of empathy toward others [26]. In the same way, our results were like another study conducted in Saudi Arabia whereby psycho-social aspects impacted more than educational ones, and they confirmed that they have high to moderate levels of agreement perceptions of the positive and negative impact of the Covid-19 pandemic on their lives [27]. In addition, psycho-social distancing, self-isolation, and travel restrictions caused different complications whereby many institutions were reduced worldwide and caused many jobs were lost.

## Conclusion

More than half of United Nations employees in Burundi were severely affected by Covid-19 from the psycho-social perspective. Hence, this study recommends psychological counseling and ensuring psycho-social recovery through combined efforts to improve employee morale and production. Also, the United Nations in Burundi must make sure that clinical/non-clinical Staff have emergency psychological support and if compulsory, have medical treatment since Covid-19 psycho-social problems necessitate specific attention to the psychological well-being of Staff in general for job optimization based on how this pandemic was an extraordinary health condition worldwide. By the end, more studies, including qualitative studies, are recommended to explore more and suggest additional recommendations for staff health safety which should be addressed through different programs.

## Equations

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

n: the sample size

N: the population size

e: the acceptable sampling error

*: 95% confidence level and p = 0.5 are assumed

Using the formula of Yamane (1967), the sample size was calculated as follows: $n=N/1+N(e)^2$; $n=1429/1+1429(0.05)^2=1429/1+3.58$

=1429/4.58= 312.00875= 312 (rounded).

### Theoretical Framework

A descriptive cross-sectional study was conducted on all un staff working in Burundi. in the same way, staff exposure (being a clinical/non-clinical) was the independent variable, then Covid-19 was the intervening variable while the dependent variable was the Covid-19 psycho-social impact.

## Acknowledgment

It is a great pleasure to express my deep sense of gratitude and respect to my guide and co-guide for their valuable advice and suggestions, expert guidance, constructive criticism, and encouragement to complete this work. It is with pride that I express my sincere gratitude to all Staff of Texila American University for their valuable skills, suggestions, and advice. Finally, I must acknowledge the patience and motivated support that I received from my family members all along.

## Conflict of Interest

The authors declare that the research was conducted in the absence of any profitable or financial affairs that could be interpreted as a potential conflict of interest.

## Funding

No funding was received.

## References

[1] Antipova, A. (2021). Psycho-social Sciences & Humanities Open Analysis of the Covid-19 impacts on employment and unemployment across the i-dimensional psycho-social disadvantaged areas. *Psycho-social Sciences & Humanities Open*, *4*(1), 100224. https://doi.org/10.1016/j.ssaho.2021.100224.

[2] Bielecki, M., Patel, D., Hinkelbein, J., Komorowski, M., Kester, J., Ebrahim, S., Rodriguez-morales, A. J., Memish, Z. A., & Schlagenhauf, P. (2021). Air travel and Covid-19 prevention in the pandemic and peri-pandemic period : A narrative review. *Travel Medicine and Infectious Disease*, *39*(November 2020), 101915. https://doi.org/10.1016/j.tmaid.2020.101915.

[3] Saladino, V., Algeri, D., & Auriemma, V. (2020). The Psychological and Psycho-social Impact of Covid-19: New Perspectives of Well-Being. *Frontiers in Psychology*, *11*(October). https://doi.org/10.3389/fpsyg.2020.577684.

[4] Bhanot, D., Singh, T., Verma, S. K., & Sharad, S. (2021). Stigma and Discrimination During Covid-19 Pandemic. *Frontiers in Public Health*, *8*(January), 1–11. https://doi.org/10.3389/fpubh.2020.577018.

[5] Cassiani-Miranda, C. A., Campo-Arias, A., Tirado-Otálvaro, A. F., Botero-Tobón, L. A., Upegui-Arango, L. D., Rodríguez-Verdugo, M. S., Botero-Tobón, M. E., Arismendy-López, Y. A., Robles-Fonnegra, W. A., Niño, L., & Scoppetta, O. (2021). Stigmatisation associated with Covid-19 in the general Colombian population. *International Journal of Psycho-social Psychiatry*, *67*(6), 728–736. https://doi.org/10.1177/0020764020972445.

[6] Lakshmi, B. M. (2020). Impact of Covid 19 on the Transport Industry. *Generic*, *12*(8), 1327–1334.

[7] Van Daalen, K. R., Cobain, M., Franco, O. H., & Chowdhury, R. (2021). Stigma: The psycho-social virus spreading faster than Covid-19. *Journal of Epidemiology and Community Health*, *75*(4), 313–314. https://doi.org/10.1136/jech-2020-214436.

[8] Zhou, M. (2022). Covid-19-related stigma and its impact on psychological distress: A cross-sectional study in Wuhan, China. *Health Science Reports*, *5*(5). https://doi.org/10.1002/hsr2.758.

[9] Ali, S. M., & Nausheen, S. (2022). Psycho-social Impact of Covid-19 on Healthcare Workers. *Sultan Qaboos University Medical Journal [SQUMJ]*, *22*(1), 82–90. https://doi.org/10.18295/squmj.4.2021.067.

[10] Cerda, A. A., & García, L. Y. (2022). Factors explaining the fear of being infected with Covid-19. *Health Expectations*, *25*(2), 506–512. https://doi.org/10.1111/hex.13274.

[11] SINGH, R., Subedi, M., Sunar, C., Pant, S., Singh, B., Shah, B., & Mahato, S. (2021). Association of psycho-social stigma of Covid-19 with work

satisfaction, burnout and fatigue among healthcare workers in Nepal. *Global Psychiatry Archives*, *4*(2), 180–190. https://doi.org/10.52095/gp.2021.3838.1027.

[12] International Council of Nurses. (2020). Protecting nurses from Covid-19 a top priority: A survey of ICN's national nursing associations. Www.Icn.Ch, (September), 1–9. Retrieved from https://www.icn.ch/system/files/documents/2020-09/Analysis_Covid-19-survey-feedback_14.09.2020-EMBARGOED VERSION_0.pdf.

[13] No, I. Z. A. D. P., Lippens, L., Weytjens, J., Sterkens, P., Lippens, L., & Weytjens, J. (2020). *DISCUSSION PAPER SERIES How Do We Think the Covid-19 Crisis Will Affect Our Careers ( If Any Remain )? How Do We Think the Covid-19 Crisis Will Affect Our Careers ( If Any Remain )? 13164.*

[14] Bagcchi, S. (2020). Stigma during the Covid-19 pandemic. *The Lancet. Infectious Diseases*, *20*(7), 782. https://doi.org/10.1016/S1473-3099(20)30498-9.

[15] Chersich, M. F., Gray, G., Fairlie, L., Eichbaum, Q., Mayhew, S., Allwood, B., … Rees, H. (2020). Covid-19 in Africa: Care and protection for frontline healthcare workers. Globalization and Health, 16(1), 1–6. https://doi.org/10.1186/s12992-020-00574-3 (Chersich et al., 2020).

[16] Danet Danet, A. (2021). Psychological impact of Covid-19 pandemic in Western frontline healthcare professionals. A systematic review. Medicina Clinica, 156(9), 449–458. https://doi.org/10.1016/j.medcli.2020.11.009.

[17] Imran, N., Afzal, H., Aamer, I., Hashmi, A., Shabbir, B., Asif, A., & Farooq, S. (2020). Scarlett letter: A study based on the experience of stigma by Covid-19 patients in quarantine. *Pakistan Journal of Medical Sciences*, *36*(7), 1471–1477. https://doi.org/10.12669/pjms.36.7.3606.

[18] Sun, X., Wandelt, S., Zheng, C., & Zhang, A. (2021). Covid-19 pandemic and air transportation: Successfully navigating the paper hurricane. *Journal of Air Transport Management*, *94*, 102062. https://doi.org/10.1016/j.jairtraman.2021.102062

[19] Rodríguez, B. O., & Sánchez, T. L. (2020). The psycho-social impact of Covid-19 on health care workers. International Braz J Urol, 46(Suppl 1), 195–200. https://doi.org/10.1590/S1677-5538.IBJU.2020.S124.

[20] Ballard, M., Bancroft, E., Nesbit, J., Johnson, A., Holeman, I., Foth, J. Palazuelos, D. (2020). Prioritising the role of community health workers in the Covid-19 response. BMJ Global Health, 5(6). https://doi.org/10.1136/bmjgh-2020-002550.

[21] Vyas, L., & Butakhieo, N. (2021). The impact of working from home during Covid-19 on work and life domains : an exploratory study on Hong Kong. Policy Design and Practice, 4(1), 59–76. https://doi.org/10.1080/25741292.2020.1863560.

[22] No, I. Z. A. D. P., Lippens, L., Weytjens, J., Sterkens, P., Lippens, L., & Weytjens, J. (2020). *DISCUSSION PAPER SERIES How Do We Think the Covid-19 Crisis Will Affect Our Careers ( If Any Remain )? How Do We Think the Covid-19 Crisis Will Affect Our Careers ( If Any Remain )? 13164.*

[23] Bhaumik, S., Moola, S., Tyagi, J., Nambiar, D., & Kakoti, M. (2020). Community health workers for pandemic response: a rapid evidence synthesis. MedRxiv, 19. https://doi.org/10.1101/2020.04.28.20082586.

[24] Bhatticharya Sanjay. (2020). The Psycho-social Impact of the Covid-19 Pandemic. Orf, 406, 14.

[25] Chen, W., Ju, Y., Liu, B., Huang, M., Yang, A., Zhou, Y., Wang, M., Liao, M., Shu, K., Liu, J., & Zhang, Y. (2021). Negative Appraisals of the Covid-19 Psycho-social Impact Associated With the Improvement of Depression and Anxiety in Patients After Covid-19 Recovery. Frontiers in Psychiatry, 12(April), 1–8. https://doi.org/10.3389/fpsyt.2021.585537.

[26] (Alghamdi, 2021)Alghamdi, A. A. (2021). Impact of the Covid-19 pandemic on the psycho-social and educational aspects of Saudi university students' lives. PLoS ONE, 16(4 April), 1–18. https://doi.org/10.1371/journal.pone.0250026.

[27] Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (Covid-19): A review. International Journal of Surgery, 78(January), 185–193. https://doi.org/10.1016/j.ijsu.2020.04.018.

Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.10.01.Art004

# Research on the Impact of Covid-19's Purported Impacts on the Prevalence of Stress, Anxiety, and Depression

Babasaheb Ghodke[1*], Prakash Doke[2], Sonika Goel[3]
[1]*Research Scholar, Texila American University George Town, Guyana*
[2]*Professor, Dept of Community Medicine Bharati Vidyapeeth Pune Maharashtra, India*
[3]*Adjunct faculty, dept. of public health, University of limerick, Ireland*

***Abstract***

*The effects of the Covid-19 pandemic on mental health have been apparent from the beginning. Housework and social constraints Implemented an important pandemic issue would be being unprepared. Future physical health and longevity are predicted by mental health. It would portend ongoing pandemic health problems. India has rules about social segregation and lockdowns that affect the economy, the people, and the environment. When the environment is unhealthy, it hurts the economy and people's lives. In May 2021, 1.49 percent of cases in this state ended in death. As of May 2022, there have been 78,77,577 cases in Maharashtra, and 1,47,842 people have died. The present study tried to find out that the Covid-19 pandemic has influenced depression, anxiety, and stress levels in elders. The goal of this study is to find out how Covid-19 affects the amount of stress, anxiety, and depression in the elderly population. Data were collected from rural and urban hospitals by using a questionnaire that captured general information about the participants and a DASS-21 questionnaire. Collected data is calculated using the chi-square test and DASS interpretation is carried out. The current study discovered that a significant proportion of the elderly suffer from stress, anxiety, and depression, symptoms in the geriatric population because of Covid-19 when compared to stress scale or depression in rural & urban areas, in Maharashtra. More research may be carried out to reflect the psychological status of the geriatric population to validate the study's conclusions.*

***Keywords:*** *Anxiety, Covid 19, Depression, Pandemic, Stress.*

## Introduction

Since December 2019, a coronavirus pandemic quickly spreading from China to other regions of the globe, resulting in severe infectious infections [1]. The World Health Organization (WHO) recognized Covid-19 disease, caused by the infectious virus severe acute respiratory syndrome coronavirus, as a worldwide pandemic in March 2020. Covid-19 symptoms were like those seen in a past viral pandemic, SARS, and Middle East Respiratory Syndrome in 2002 and 2012, and included breathing problems, fever, and cough. Despite the severity of the symptoms, no known antiviral medication or vaccine has been licensed for the treatment of Covid-19 [2]. The Covid-19 pandemic has resulted in 1,187 confirmed cases and 11 confirmed fatalities in Maharashtra. Many countries all around the globe have required social and physical distance, in addition to self-quarantining, owing to the disease spreading mostly by direct contact, i.e., droplets dispersed by sneezing or coughing from an infected person [3]. Quarantine is an efficient technique for reducing viral propagation internationally; nonetheless, it has very significant economic, social, and psychological consequences. As a result, several difficulties, and concerns, including psychological

***Received: 21.11.2022*** ***Accepted: 02.01.2023*** ***Published on: 31.01.2023***

****Corresponding Author: bghodke1984@yahoo.co.in***

pressures, have been imposed on individuals [4]. Individuals' mental health is a key health problem that is likely to be disrupted during pandemics, especially the Covid-19 pandemic [5]. Previous studies indicate that during such viral pandemics, there is a considerable rise in the risk of mental health disorders among people, including anxiety, depression, and depression [6]. Individuals in many regions of the globe have reported an increase in stress, anxiety, and depression during the current Covid-19 pandemic. Anxiety and depression have been linked to public events such as pandemics, impacting people's mental health, particularly the elderly. The purpose of this study is to determine the amount of anxiety and depression among older individuals and how it affected people during the Covid-19 pandemic [7].

In the first year of the Covid-19 pandemic, the global prevalence of anxiety and depression increased by a massive 25%, according to a scientific brief released by the World Health Organization (WHO) today [8]. The brief also highlights who has been most affected and summarizes the effect of the pandemic on the availability of mental health services and how this has changed during the pandemic [9].

Pandemics have a significant psycho-social impact. Health anxiety, panic, adjustment disorders, depression, chronic stress, and insomnia are the major offshoots. Misinformation and uncertainty give rise to mass hysteria. Among them, the elderly is especially vulnerable. So far only one paper glances at elderly mental health during these times [10].

It mentions the social isolation of the elderly as a 'serious public health concern' due to their bio-psycho-social vulnerabilities. Social distancing, though a major strategy to fight Covid-19, is also a major cause of loneliness, particularly in settings like nursing care or old-age homes which is an independent risk factor for depression, anxiety disorders, and suicide. Social connectedness is vital during the public health breakdown [11].

Mental health is the cornerstone of public health, more so in the elderly. As the need for a 'viral cure' eclipses the importance of mental health, the global panic only aids in increasing the spread. One key factor for the increase is the extreme stress produced by the pandemic's social exclusion. This was linked to limitations on people's capacity to work, seek help from loved ones, and participate in their community [12].

Isolation, fear of infections, pain, and death for oneself and dear ones, mental health sadness, and financial problems have all been identified as stressors that contribute to anxiety and depression. Exhaustion has been identified as a primary component of suicide attempts among healthcare care professionals. Pandemics have deep psychological consequences [13]. The most prevalent side effects include anxiety disorders, panic attacks, adjustment troubles, depression, extended stress, and sleeplessness. False information and uncertainty are the root causes of panic [14].

The elderly is the most vulnerable. Too little study has been done on the mental health of the elderly at different ages. According to the survey, social isolation is on the increase. The elderly's biopsychosocial weakness renders them a "major problem" for public health. It has been linked to depression, anxiety disorder, and stress, as well as home and elderly care facilities [9].

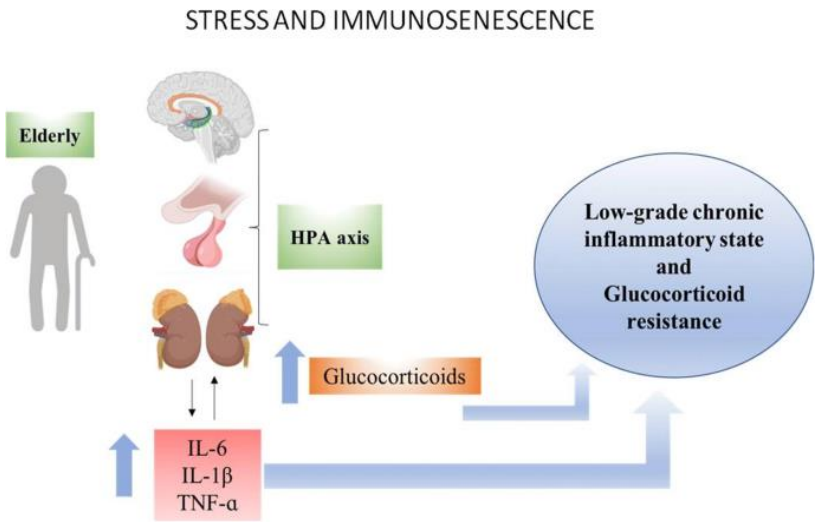


**Figure 1.** Impact of Covid-19 on the Elderly Mental Health (Source:[2])

The quality measures were depression, anxiety, and stress symptoms of mental health. The Depression, Anxiety, and Stress Scale-21 Items (DASS-21) is a collection of three self-report measures that were generated based on previously research to evaluate the emotional states of depression, anxiety, and stress. These studies are often used to analyse complaints and do not immediately suggest that respondents have a specific diagnosis as described in the DSM and classification of diseases and associated health problems (ICD) [15]. However, their primary purpose in this research was to measure the perceived severity of symptoms linked to depression, anxiety, and stress. The purpose of this research was to look at the prevalence of mental health symptoms (anxiety, depression, and stress) in Maharashtra, as well as the factors that contributed to these symptoms during the Covid-19 pandemic This research will be used in the future [16].

The objective of the study "To analyse the impact of Covid-19's purported impacts on the prevalence of stress, anxiety, and depression."

## Literature Review

Shailendra K [17], carried out a study on Current Insights on 2019's an Unusual Coronavirus Disease (Covid-19)" SARS-CoV-2 was certainly a strain of coronavirus that has never previously been identified in humans. As of April 14th, 2020, it has been labelled a pandemic, infected at least 1,844,683 people, and killed 117,021 people. Close contact with an infected individual who produces respiratory droplets results in transmission among individuals. Severe respiratory distress syndrome, also known as cytokine storm, has been seen in patients, the determination The diagnosis is based on the presence of nucleic acid, IgG/IgM antibody, and a chest x-ray in the suspects. SARS-genome CoV-2s are like those in other coronaviruses, including 10" open read frames (ORFs). The spike protein of SARS-CoV-2 binds to ACE2 receptors more strongly than SARS-CoV. Indeed, Covid-19 has been proven to be resistant to favipiravir, remdesivir, chloroquines, & TMPRSS2 trypsin's inhibitor. Personal precautions must be taken to avoid catching SARS-CoV-2. A clinical study of the SARS-CoV-2 vaccine based on mRNA-1273 had also begun. This chapter provides an overview of recent SARS-CoV-2 development infections by highlighting recent findings research and clinical studies [13]. [6] carried done a study on "Mental health for elderly Spanish persons during the Covid-19 epidemic." The researcher wants to look into Emotional symptoms associated with Covid-19, Gender disparities and the link between the elderly's emotional state & environmental factors Researcher performed cross-sectional research

utilizing snowball sampling techniques Based on a countrywide internet survey, on March 29 & April 5, 2020 [18]. [19], conducted research on "Psychological Impact of a Covid-19 Pandemic on Society and Its Influence on Educations." Throughout history, pandemics have happened at different periods. Pandemics are diseases that kill million more people & have a huge negative influence on the mental health of society. Also, it interfered with the educational process of the students. Pandemic Acute respiratory distress syndrome (ARDS), for example, or Middle Eastern Respiratory Syndrome (SARS), & the Spanish's flu that occurred ln the past and harmed people's health also had significant psychological impacts. People are now battling with a Covid-19 epidemic that was detected in Wuhan, China [19]. The psychological repercussions of the Covid-19 epidemic became evident as time went on. It is expected that it was grow effects would result in a number of problems in both the short and long term [20]. Seyyed Mohammad [9], investigated "Covid-19 & Its Psychological Impacts on the Elder Population" Coronaviruses (CoV) is There is in fact a wide viral family which causes diseases ranges from the average cold to much more serious problems A brand-new coronavirus (nCoV) had been in fact a strain of coronavirus that had never existed before. found in humans [9]. The following suggestions for future intervention are made in this letter More attention should be required to pay to vulnerable team members, particularly the elderly populations' relationships with medical resources & or National strategic planning & coordination for psychological health must be enhanced & improve, particularly after analyzing the first person's coping & management of a Covid-19 pandemic health support services;1st aid all through significant disaster, potentially delivered through the telemedicine, must be established an emergency response plan must be formed [9]. [10], did a study on "the influence of the "Impact of the Covid-19 pandemic on mental health for the elderly" For the previous two months, the globe has faced a worldwide danger from the Coronavirus disease 2019, (Covid-19), caused by SARS-CoV-2. It just took a month for this to spread from the Wuhan area of China to the rest of the world. Covid-19 has attacked the fundamental foundation of life, taking the lives of approximately 260,000 people worldwide and causing universal terror and hysteria1. Mild symptoms include scratchy coughing, sore throat, fever, lethargy, and tiredness.

## Materials and Methods

In this research used sampling methods during the Covid-19 pandemic; in our case, distributed the survey link (containing the questionnaire) via various online platforms (WhatsApp, Facebook, and email) and asked respondents to share the link to the online questionnaire with other adults (age 60 years or elder). Respondents granted permission to willingly engage in the survey before accessing the survey. Participants were only permitted to reply once by enabling the function that blocks multiple responses, and their emails and other contact information were auto anonymized (without identifying their emails or other contact information). data collection, respondents selected for data analysis above age 60 years old. In this paper, study concentrated on objectives as well as hypotheses.

### Tool for Mental Health Evaluation

### DASS-21 Questionnaire

The DASS questionnaire assesses key symptoms of depression, anxiety, and stress and it also has been used to evaluate patient reaction to treatment. The questionnaire has been proven to have adequate psychometric properties and is equivalent to other accurate scales. The DASS-21 is the short form and findings from studies support its validity as an approved instrument for measuring adverse mental states and depression, anxiety, and stress in adults (patients and non-patients). The 21 items on the questionnaire comprise a set of 3 self-reported scales designed

to assess DASS. The 7 elements on the scales are graded on a Likert scale from 0 to 3 (0: "Did not apply to me at all," 1: "Applied to me to some degree or some of the time," 2: "Applied to me to a considerable degree or a good part of the time," and 3: "Applied to me very much or most of the time"). Depression, anxiety, and stress scores are measured by summarizing the scores of the related items. Because the DASS-21 is a shorter version of the 42-item original DASS, the score for each subscale must be multiplied by 2 to calculate the final score. According to the manual, the resulting ratings then are classified as: "normal, mild, moderate, severe, or extremely severe".

Study instrument: The DASS-21scale, as indicated in the introduction, asked respondents to answer 21 items about symptoms of depression, anxiety, and stress in the previous week. Participants were given four answer options: 0 for never, 1 for sometimes, 2 for a lot of the time, and 3 for most or all the time. To interpret results on the same scale as the DASS-21, total scores for each sub-scale are multiplied by two. Better answer values and scores imply a higher degree of experience with the condition being assessed.

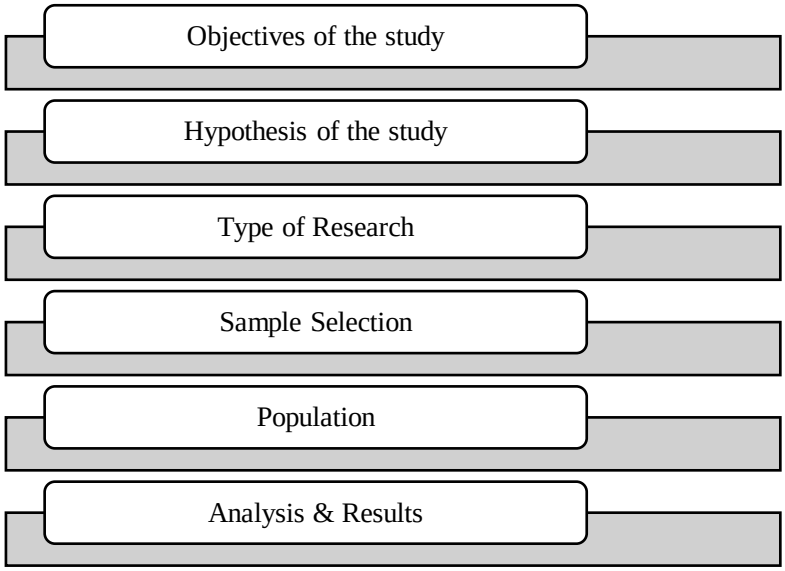


**Figure 2.** Methodology Process (Source: Self-study)

## Research Design

It is a comprehensive plan for performing research. In this study, descriptive & exploratory research designs were utilized. A study that attempts to explain a trend methodically and gives data on preferences toward that problem.

Inclusion criteria include,

1. Patients diagnosed with Covid-19.
2. Patients of age above 60 years,
3. No previous history of psychiatric conditions; and
4. No history of psychotropic or psychoactive drug use.

Exclusion criteria include,

Patients below 60 years of age. Patients presenting with comorbidity of chronic diseases such as cancer, multiple sclerosis, renal failure, neurologic diseases & any psychiatric illness (depression, anxiety, and perceived stress) developing before Covid 19.

### Sample Area

The data was collected from different hospitals in rural & urban region in Maharashtra, India. From Covid 19 was allocated, and a government/non-government healthcare center/hospital was selected for study in various

locations of Maharashtra. According to the records, the most recent patients was considered for study and data gathered and analysis. To conduct the survey, all essential data was gathered, and a questionnaire was created. The total sample size for this study was 135.

## Data Analysis

Data for this research was gathered using both a primary and secondary survey. Validity, Descriptive statistics, Frequency Test, One Sample T- test, Chi square Frequency distribution, Reliability, was be used to analyse the data.

## Primary Data

Data Gathered by a researcher, including surveys, interviews, & experiments, are intended to assist the researcher in resolving the issue under investigation. Primary data is information acquired directly by the researcher.

**Source:** Surveys, observations, experiments, questionnaires, personal interviews, etc.

## Results

In this research involved 135 elderly from both rural and urban areas. This study indicates the prevalence of anxiety, stress, and depression because of Covid-19 among the elderly in rural and urban areas. The socio-demographic profile of participants is shown in Table 1. Most of the elderly participants in this study were male (68.1%). About 49.6% were between the ages of 60 and 70. mostly residing in rural and urban areas.

**Table 1.** Demographic Variables

| Socio-demographic profile of respondents (n = 135) | | | | |
|---|---|---|---|---|
| **Variables** | **Frequency** | **Percent** | **Chi-Square** | **Asymp. Sig** |
| **Age** | | | | |
| 60-65 | 13 | 9.6 | 107.089[a] | .000 |
| 66-70 | 67 | 49.6 | | |
| 71-75 | 18 | 13.3 | | |
| 76-80 | 13 | 9.6 | | |
| 81-85 | 10 | 7.4 | | |
| 86+ | 14 | 10.4 | | |
| **Gender** | | | | |
| Male | 92 | 68.1 | 17.785[b] | .000 |
| Female | 43 | 31.9 | | |
| **Education /Qualification** | | | | |
| Graduate | 33 | 24.4 | 61.333[c] | .000 |
| Undergraduate | 33 | 24.4 | | |
| Post-Graduate | 55 | 40.7 | | |
| Illiterate | 7 | 5.2 | | |
| None of these | 7 | 5.2 | | |
| **Occupation** | | | | |
| Retired | 39 | 28.9 | 4.044[d] | .132 |
| Home Maker | 40 | 29.6 | | |
| Professional/own Business | 56 | 41.5 | | |
| **Marital status** | | | | |
| Married | 31 | 23.0 | 63.726[e] | .000 |
| Unmarried | 11 | 8.1 | | |
| Widow | 72 | 53.3 | | |

| | | | | |
|---|---|---|---|---|
| Divorcee | 21 | 15.6 | | |
| Total | 135 | 100.0 | | |
| **Financial condition** | | | | |
| Weak | 37 | 27.4 | 27.733[d] | .000 |
| Strong | 73 | 54.1 | | |
| Moderate | 25 | 18.5 | | |
| **Leaving condition** | | | | |
| Joint family | 95 | 70.4 | 150.363[e] | .000 |
| Nuclear | 7 | 5.2 | | |
| Leaving alone | 19 | 14.1 | | |
| Because your children stay in a different city | 14 | 10.4 | | |
| **Chronic Illness** | | | | |
| Present | 93 | 68.9 | 19.267[b] | .000 |
| Absent | 42 | 31.1 | | |

(Source: By primary data)

About 40.7% of participants were Postgraduates, 24.4% were Graduates, 24.4% were Non graduates, and 5.2% were Illiterate. Most elderly people, 41.5%, were professionals or business owners. The majority of 53.3% were widows, while 8.1% were single. As demonstrated in the study data on financial status, the Strong category comprises 54.1%. 70.4% of respondents are classified as belonging to a joint family, whereas 5.2% belong to a nuclear family. According to 135 total responders, 68.9% suffering from Chronic Illness.

**Table 2.** DASS-21

| DASS 21 | Median | Mean | Standard Deviation |
|---|---|---|---|
| Anxiety | 11 | 10.90 | 2.80 |
| Stress Scale | 12 | 11.59 | 2.47 |
| Depression | 11.16 | 11.33 | 3.06 |

(Source: By primary data)

Table 2 shows the DASS-21 Median, Mean, and Standard Deviation as described. The prevalence of stress, anxiety, and depression in the elderly was identified in this study. The first element to emerge was all items from the anxiety level Mean for this anxiety level 10.90. The Stress Scale for this study was 11.59, and the Depression score was 11.33.

**Table 3: DASS 21 Severity Ratings Score**

| Symptoms | Scores | Severity |
|---|---|---|
| Anxiety | 22 | Extremely Severe |
| Stress Scale | 23 | Moderate |
| Depression | 23 | Severe |

(Source: By primary data)

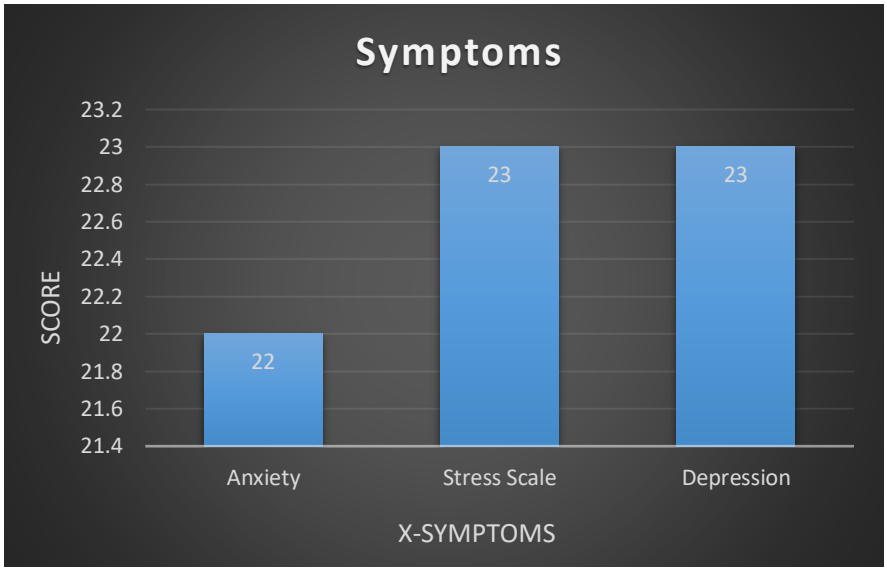


**Figure 3.** DASS 21 Severity Ratings Score

(Source: By primary data)

As illustrated in Graph 1, the X-Axis indicates the symptoms of Anxiety, Stress scale, and Depression, whereas the Y-Axis represents the scores for each. The prevalence of anxiety and stress among the elderly was 22% and 23%, respectively. However, 23 of 135 older adults suffered from severe depression.

Table 3 shows the severity ratings score for the DASS-21 as explained. The prevalence of stress, anxiety, and depression in adults is seen. The proportion of depression was determined to be 23%, with the majority suffering from severe depression. The prevalence of anxiety and stress among elderly people was 22% for anxiety and 23% for stress. However, 23 persons out of 135 older people experienced severe depression.

## Discussion

In this research, a total of 135 elderly people were from both urban and rural areas. According to the findings of this research, aged people in both rural and urban regions are more likely to suffer from anxiety, stress, and depression as a direct consequence of Covid-19. the socio-demographic profiles of the people included were the study. Most of the participants in this research that were in their elderly were men (68.1%). About 49.6% of the population was between the ages of 60 and 70, and the majority lived in rural and urban regions respectively. It was estimated that around 40.7% of participants had postgraduate, 24.4% had undergraduate degrees, 24.4% did not graduate, and 5.2% were illiterate. 41.5% of elderly people were either professionals or company owners, making up most of this age group. Widows make up most of the people at 53.3%, while just 8.1% of the people were single.

According to the findings of the research on the company's financial health, the Strong category accounts for 54.1% of the total only 5.2% of respondents are from nuclear families, in comparison to the 70.4% of respondents who is classed as belonging to mixed families. According to the responses of 135 people in total, 68.9% are afflicted with Chronic Illness. The study displayed DASS-21 Median, Mean, and Standard Deviation, exactly as indicated.

This research found that older people were at a much higher risk of experiencing stress, anxiety, and depression than youths. The first data point that became clear concerned all the components from the anxiety level Mean for this anxiety level 10.90. The average score on the Stress Scale for this research was 11.59, while the average score on the Depression Scale was 11.33. The severity ratings score for the DASS-21 along with its description. People are faced

with high levels of stress, anxiety, and depression. It was found that 23% of adults suffer from depression, with most of them experiencing severe depression. The proportion of elderly adults reported experiencing anxiety was 22%, while the percentage reported experiencing stress was 23%. On the other hand, 23 of the 135 elderly adults surveyed were suffering from serious depression.

This study was the first one to do an evaluation and analysis of the prevalence of stress, anxiety, and depression in the elderly aged population over the course of the Covid-19 pandemic. In this work, appropriate data analysis approaches, including DASS21, were used to conduct an analysis of associated research activities. Our research indicates that the prevalence of stress, anxiety, and depression among elderly as a direct effect of the pandemic are, respectively, 23%, 22, and 23%. elderly People across the globe are feeling more worried because of the rapid spread of Covid-19, which is leading to worries about adult mental health.

Our findings will provide vital guidance for the development of a psychological support strategy and areas to prioritize in Maharashtra and other places which are affected by the epidemic. This study has some limitations. Given the limited resources available and time-sensitivity of the Covid-19 outbreak. Another limitation is that self-reported levels of psychological impact, anxiety, depression, and stress may not always be aligned with assessment by mental health professionals. Similarly, respondents might have provided socially desirable responses in terms of satisfaction with the health information received and precautionary measures. Importantly, our outcomes directly advise the development of psychological intervention that can minimalize psychological impact, anxiety, depression, and stress and deliver a baseline for assessing prevention, control, and treatment efforts through the rest of the Covid-19 epidemic.

## Conclusion

The outcome of the study shows that a significant proportion of the elderly suffer from stress, anxiety, and depression, indicating the need for prompt assistance for mental health problems. Both rural and urban areas in Maharashtra should have access to adult counseling services. Future study is required to identify socio demographic variables and other elements connected with rural and urban curriculum so that remedial actions may be implemented as soon as possible; otherwise as a whole society will lose.

## Conflict of Interest

I declare that there is no conflict of interest regarding the publication of this paper.

## Acknowledgment

I would like to express my very great appreciation to Dr. Prakash Doke & Sonika Goel for their valuable and constructive suggestions during the planning and development of this research work.

## References

[1] J. Riou and C. L. Althaus, “Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020,” Eurosurveillance, vol. 25, no. 4, pp. 1–5, 2020, Doi: 10.2807/1560-7917.ES.2020.

[2] R. E. Grolli et al., “Impact of Covid-19 in Mental Health in Elderly: Psychological and Biological Updates,” Mol. Neurobiol., vol. 58, no. 5, pp. 1905–1916, 2021, Doi: 10.1007/s12035-020-02249-x..25.4.2000058.

[3] A. Joshi, “Covid-19 pandemic in India: through psycho-social lens,” J. Soc. Econ. Dev., vol. 23, no. S2, pp. 414–437, 2021, Doi: 10.1007/s40847-020-00136-8.

[4] G. Maggi et al., “Mental health status of Italian elderly subjects during and after quarantine for the Covid-19 pandemic: a cross-sectional and

longitudinal study," Psychogeriatrics, vol. 21, no. 4, pp. 540–551, 2021, Doi: 10.1111/psyg.12703.

[5] N. Salari et al., "Prevalence of stress, anxiety, depression among the general population during the Covid-19 pandemic: a systematic review and meta-analysis," Global. Health, vol. 16, no. 1, pp. 1–11, 2020.

[6] L. García-Fernández, V. Romero-Ferreiro, P. D. López-Roldán, S. Padilla, and R. Rodriguez-Jimenez, "Mental Health in Elderly Spanish People in Times of Covid-19 Outbreak," Am. J. Geriatr. Psychiatry, vol. 28, no. 10, pp. 1040–1045, 2020, Doi: 10.1016/j.jagp.2020.06.027.

[7] S. M. H. Javadi and N. Nateghi, "Covid-19 and Its Psychological Effects on the Elderly Population," *Disaster Med. Public Health Prep.*, vol. 14, no. 3, pp. e40–e41, 2020, Doi: 10.1017/dmp.2020.245.

[8] R. B. Hirst et al., "The 5-HTTLPR long allele predicts two-year longitudinal increases in cortisol and declines in verbal memory in older adults," *Int. J. Geriatr. Psychiatry*, vol. 35, no. 9, pp. 982–988, 2020, Doi: 10.1002/gps.5319.

[9] C. B. Cunha and S. M. Opal, "Middle East respiratory syndrome (MERS): A new zoonotic viral pneumonia," Virulence, vol. 5, no. 6, pp. 650–654, 2014, Doi: 10.4161/viru.32077.

[10] T. P. S. Oei, S. Sawang, Y. W. Goh, and F. Mukhtar, "Using the Depression Anxiety Stress Scale 21 (DASS-21) across cultures," *Int. J. Psychol.*, vol. 48, no. 6, pp. 1018–1029, 2013, Doi: 10.1080/00207594.2012.755535.

[11] D. S. Hui, E. I. Azhar, Z. A. Memish, and A. Zumla, "Human Coronavirus Infections—severe acute respiratory syndrome (SARS), Middle East Respiratory Syndrome (MERS), and SARS-CoV-2," *Encycl. Respir. Med.*, no. January, pp. 146–161, 2022, Doi: 10.1016/b978-0-12-801238-3.11634-4.

[12] L. A. Eaton and S. C. Kalichman, "Social and behavioral health responses to Covid-19: lessons learned from four decades of an HIV pandemic," *J. Behav. Med.*, vol. 43, no. 3, pp. 341–345, 2020, Doi: 10.1007/s10865-020-00157-y.

[13] S. Lin, R. Kantor, and E. Clark, Coronavirus Disease 2019, vol. 37, no. 4. 2021. Doi: 10.1016/j.cger.2021.05.001.

[14] M. A.-K. Karataş, "Covid - 19 Pandemisinin Toplum Psikolojisine Etkileri ve Eğitime Yansımaları," *J. Turkish Stud.*, vol. Volume 15, no. Volume 15 Issue 4, pp. 1–13, 2020, Doi: 10.7827/turkishstudies.44336.

[15] J. Roy, R. Jain, R. Golamari, R. Vunnam, and N. Sahu, "Covid-19 in the geriatric population," *Int. J. Geriatr. Psychiatry*, vol. 35, no. 12, pp. 1437–1441, 2020, Doi: 10.1002/gps.5389.

[16] J. Gustavsson and L. Beckman, "Compliance to recommendations and mental health consequences among elderly in sweden during the initial phase of the Covid-19 pandemic—a cross sectional online survey," *Int. J. Environ. Res. Public Health*, vol. 17, no. 15, pp. 1–10, 2020, Doi: 10.3390/ijerph17155380.

[17] K. Lee, G. C. Jeong, and J. Yim, "Consideration of the psychological and mental health of the elderly during Covid-19: A theoretical review," *Int. J. Environ. Res. Public Health*, vol. 17, no. 21, pp. 1–11, 2020, Doi: 10.3390/ijerph17218098.

[18] M. Sabe, N. Zhao, and S. Kaiser, "A systematic review and meta-analysis of the prevalence of cocaine-induced psychosis in cocaine users," Prog. Neuro-Psychopharmacology Biol. Psychiatry, vol. 109, no. January 2021, Doi: 10.1016/j.pnpbp.2021.110263.

[19] A. Barone et al., "The effects of sustained Covid-19 emergency and restrictions on the mental health of subjects with serious mental illness: A prospective study," *J. Community Psychol.*, no. April, pp. 1–14, 2022, Doi: 10.1002/jcop.22886.

[20] B. Lábadi et al., "Psychological well-being and coping strategies of elderly people during the Covid-19 pandemic in Hungary," *Aging Ment. Heal.*, vol. 26, no. 3, pp. 570–577, 2022, Doi: 10.1080/13607863.2021.1902469.

Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.10.01.Art005

# Role of *NOS3* 894G>T Gene Polymorphism in Traumatic Cerebral Hemorrhagic Contusion Khartoum, Sudan, 2020-2021

Samah Abdelrahman Hassan Ibrahim[1]*, Zeinab Swar Eldahab[2]
[1]*Department of Medical Microbiology and Immunology, College of Medicine, Almugtaribeen University, Khartoum, Sudan*
[2]*Department of Community Medicine, Faculty of medicine, university of Khartoum, Khartoum, Sudan*

***Abstract***

*The nitric oxide produced by the endothelial nitric synthase (NOS3) gene helps to maintain cerebral blood flow (CBF) after traumatic brain injuries (TBI). The aim is to determine the prognostic role of NOS3 894 G>T gene in traumatic hemorrhagic contusion and outcome. A cross-sectional study was conducted for 90 patients who attended the National Centre for Neurological Sciences, Khartoum, Sudan. Non-Sudanese patients, hemorrhagic contusions associated with other types of brain bleeding, and patients with chronic disease were excluded. An initial CT scan was used upon admission to detect brain edema, anatomical site, and the number of contusions. The Glasgow coma scale (GCS) was used upon admission to assess the trauma severity. The Glasgow outcomes scale (GOS) was used upon discharge to assess the outcome. Polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) was used for NOS3 genotyping. The result shows that 93.3% of patients were male, while 32.2% of them were female. It further indicates that 58.9 % had a mild injury; 60% of the patients were presented with frontal lobe injury, 14.4% had multiple sites injury, and 22.2% had brain edema. The number of deaths was 8 (8.9%). The genotyping of NOS3 revealed that 94.4% of patients had homozygous GG and 5.6% heterozygous GT. G allele represented 97.2% of NOS3 alleles. NOS3 894 G>T genotypes were not significantly associated with patients, linguistic afflation' and outcome. The study concluded that NOS3 894G>T gene has no prognostic role in traumatic hemorrhagic contusion and outcome.*

***Keywords:*** *Nitric oxide synthase gene, Traumatic brain injury, Glasgow coma scale, Glasgow outcomes scale.*

## Introduction

Traumatic brain injury (TBI) is a frequent cause of death and disability. It often leads to lifelong physical, cognitive, behavioural, and emotional impairments [1]. Damage of cerebral tissues following head trauma is determined by the primary injury plus secondary injury responses that are almost irreversible and worsen the primary injury [2]. A cerebral hemorrhagic contusion is a primary injury and often progresses during the first several hours after impact leading to either expanding or development of new non-contiguous hemorrhagic lesions [2]. Previous studies among Sudanese patients demonstrated that many factors were contributed to the progress of cerebral hemorrhagic contusion, including the genetic markers [3-5].

Nitric oxide (NO) plays a key role in the regulation of vascular homeostasis [6].

***Received: 27.12.2022*** ***Accepted: 09.01.2023*** ***Published on: 31.01.2023***
****Corresponding Author: ibrahimsamah9@gmail.com***

Three main nitric oxide synthase (NOS) isoforms catalyzing the formation of NO have been well characterized. This family includes NOS1, NOS2 and NOS3, which are encoded by *NOS1*, *NOS2* and *NOS3* genes respectively [7, 8]. The inducible NOS (iNOS) produced by the *NOS2* gene lead to generating a high amount of NO to combat environmental insults. While neuronal NOS (nNOS) produced by *NOS1* gene and endothelial NOS (eNOS) produced by *NOS3* gene control a fluctuating low level of NO to perform normal physiological functions in neurons and vascular endothelial cells [9].

The Human Nitric oxide synthase (*NOS3*) gene mapped to the chromosomal locus 7q35-36 contains 26 exons that span 21 kb and encode a 135 KD, a protein containing 1203 amino acids [10]. *NOS3* gene has been determined for three allelic polymorphisms (- 786 C >T in the 5-flanking region, a 27-bp deletion(a)/insertion(b) in intron 4, and 894 G>T in exon 7) implicated in cardiovascular and cerebrovascular disorders [11]. The 894 G>T variant located in exon 7 is the most described one and has been suggested to be responsible for reduced NO synthesis [12, 13]. Trials propose that nitric oxide (NO) produced by *NOS3* gene participates in the regulation of cerebral blood flow (CBF) after TBI [14]. The observed reduction of NO in the injured brain results in lower CBF, hypo-perfusion, hypoxia, and an increase in intracranial pressure (ICP), therefore, associated with neurological deteriorations and poor clinical prognosis [14]. *NOS3* variants increase the ability of the injured brain to maintain an adequate CBF after TBI and may be associated with prognosis and outcome [14].

Accordingly, the timely determination of dependable prognostic factors for TBI patients is important for both neurosurgeon and clinical researchers. The potential to expect outcomes can be valuable in risk evaluation depending on the laboratory examinations and clinical features of the patients. A cerebral hemorrhagic contusion is a primary injury and can expand, leading to the delayed neurological deterioration [15].

The aim of this study is to investigate whether the *NOS3* 894 G>T gene polymorphism plays a role in the outcomes of traumatic cerebral hemorrhagic contusion. And to determine the genotyping distribution and allelic frequency for the *NOS3* gene among different Study participants.

## Materials and Methods

### Study Populations

A cross-sectional study was conducted at the National Center for Neurological Sciences (NCNS) from December 2015 to 2018. Ninety Sudanese patients who attended the emergency department at NCNS and were diagnosed with traumatic cerebral hemorrhagic contusion were included. Non-Sudanese patients, hemorrhagic contusions associated with other types of brain bleeding, and patients with chronic disease were excluded. An initial computed tomography scan (CT scan) was used upon admission to detect brain edema, anatomical site for contusion, and number of contusions. Glasgow coma scale (GCS) was used upon admission to assess trauma severity. The Glasgow outcomes scale (GOS) was used upon discharge to assess the outcome. Ethical approval was obtained from the Ethical Review Board of NCNS.

### Data Collection and Genotyping

Blood samples were collected from all participants in an ethylene diamine tetraacetic acid (EDTA) tube. DNA was extracted from whole blood using QIAGEN® commercial DNA extraction kits (vacuum protocol)[16] attached was added ref No 16 DNA quantity and quality were

measured using Nano-drop spectrophotometer and gel electrophoresis. The following primers were used to amplify 894G>T region in *NOS3* gene (5'-CATGAGGCTC AGCCCC AGAAC-3) forward and (5'-AGTCAATCCCTTTGGTGCTCAC-3') reverse.

Polymerase chain reaction (PCR) was conducted into 20 µl reaction volume that contains 4 µl of 5X Firepol® master mix, 1 µl forward primer, 1 µl reveres primer, 1 µl DNA, and 13 µl distill water. PCR condition includes (Initial denaturation 95 C°/5 minutes, denaturation 95 C°/30 minutes, annealing 62 C°/30 minutes, extension 72 C°/30 minutes, and final extension 72 C°/10 minutes for 37 cycles). PCR product was loaded in 2 % agarose gel electrophoresis and visualized under UV light. PCR product 207bp was digested with MboI restriction enzyme obtained from *NEW ENGLAND BioLabs* ®, in 25 µl total reaction (1 µl of MboI restriction enzyme+ PCR product+ NEB buffer + $H_2O$). The mixture was incubated overnight at 37 C°, and then inactivated at 65C° for 20 minutes. The digested product was separated into 2% agarose gel electrophoresis stained with ethidium bromide and visualized under ultraviolet light (UV light). Demographic and clinical data were collected from patients' records.

The Glasgow coma scale (GCS) was used upon admission to assess the trauma severity. The Glasgow outcomes scale (GOS) was used upon discharge to assess the outcome.

### Statistical Analysis

Data analysis was carried out using Statistical Package for Social Sciences (SPSS) version 19. The data were described as frequency and percent, while quantitative data was described as (mean ± standard deviation). The chi-square test for independence was used to test the relations between qualitative nominal variables, while the Pearson correlation test was used to test quantitative variables. The independent sample T-test was used to test the difference between the two groups, and ANOVA was used in the case of three groups.

## Results

In this study, 93.3% of the patients were male. The age of the most (32.2%) patients was 25 to 44 years. 67.8 % of the patients were affiliated to Afro-Asiatic tribes. The initial results of the computed tomography scan (CT scan) reflected that 60% of the patients were presented with frontal lobe injury,14.4% had multiple injured sites, and 22.2 % had brain edema. According to the GCS score, the majority (58.9 %) of the patients had a mild brain injury. According to GOS score, the number of deaths was 8 (8.9%). One patient died as a complication of severe pneumonia. The other seven died mostly of the primary insult.

*NOS3* 894 G>T gene showed two genotypes the homozygous GG represents 94.4% of the patients, and the heterozygous GT represents 5.6% of the patients. The most common allele of *NOS3* gene was G allele representing 97.2% of the alleles.

**Table 1.** Basic Characteristics of Patients on Admission

| **Variables** | **Frequency** | **%** |
|---|---|---|
| **Gender** | | |
| Male | 84 | 93.3% |
| Female | 6 | 6.7% |
| **Age** | | |
| 5-14 | 19 | 21.1 % |

| | | |
|---|---|---|
| 15-24 | 23 | 25.6 % |
| 25-44 | 29 | 32.2 % |
| 45-65 | 14 | 15.6 % |
| Over 65 | 5 | 5.6 % |
| **Linguistic family** | | |
| Afro-asiatic | 61 | 67.8 % |
| Nilo-Saharan | 21 | 23.3 % |
| Niger-Congo | 8 | 8.9 % |
| ***GCS** | | |
| Mild injury (13-15) | 53 | 58.9 % |
| Moderate injury (8-12) | 27 | 30.0 % |
| Sever injury (<8) | 10 | 11.1 % |
| **Anatomical site of trauma** | | |
| Frontal lobe | 54 | 60.0 % |
| Temporal lobe | 6 | 6.7 % |
| Parietal lobe | 13 | 14.4 % |
| Biofrontal lobe | 3 | 3.3 % |
| Occipital lobe | 1 | 1.1 % |
| Others | 13 | 14.4 % |
| **Number of injured site/s** | | |
| Single | 77 | 85.6 % |
| Multiple | 13 | 14.4 % |
| **Brain edema** | | |
| Yes | 20 | 22.2 % |
| No | 70 | 77.8 % |
| ***GOS** | | |
| Death | 8 | 8.9 % |
| Neuro-vegetative state | 0 | 0.0% |
| Sever disability | 4 | 4.4% |
| Moderate disability | 16 | 17.8% |
| Good recovery | 62 | 68.9% |

*GCS Glasgow coma scale *GOS Glasgow outcome scale

**Table 2.** Distribution of NOS3 894G>T Genotype and Allele Frequencies among Patients

| ***NOS3* 894G>T genotypes** | **Frequancy** | **%** |
|---|---|---|
| GG | 85 | 94.4% |
| GT | 5 | 5.6% |
| TT | 0 | 0.0% |
| Total | 90 | 100% |
| **Allele frequencies of NOS3 894G>T gene** | | |
| G (Wild allele) | 175 | 97.2% |
| T (Resistive allele) | 5 | 3.8% |
| Total | 180 | 100% |

*NOS3 Endothelial cell nitric oxide-3 gene. G Guanine nucleotide. T Thymine nucleotide.

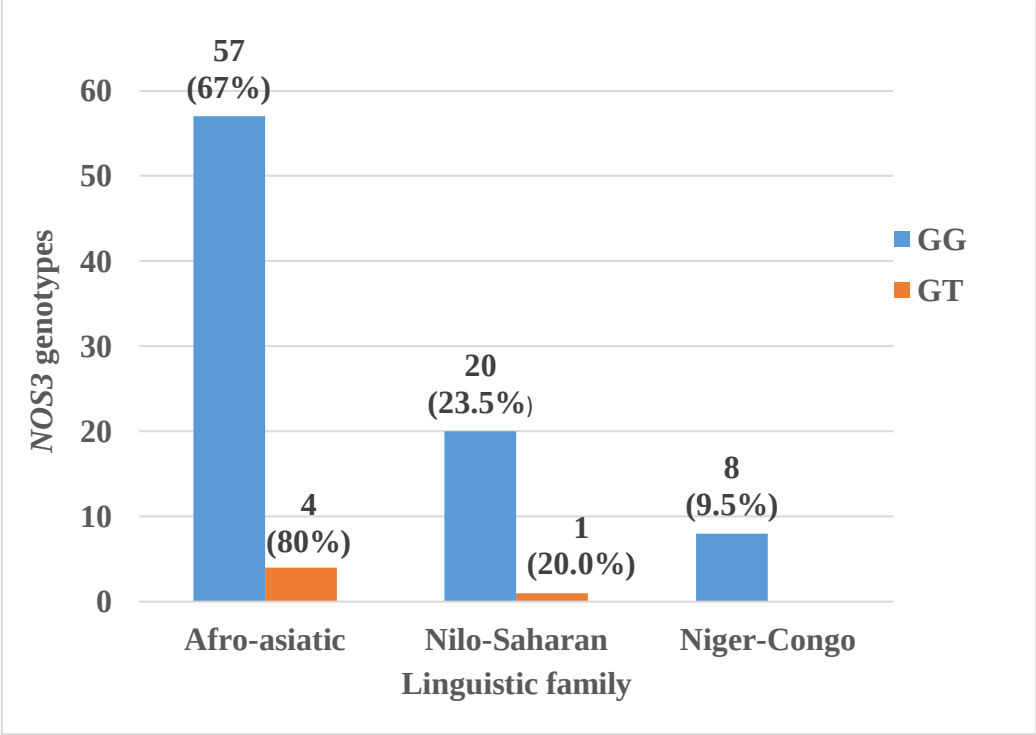


**Figure 1.** Association between NOS3 894G>T Genotypes Linguistic Family P value = 0.772

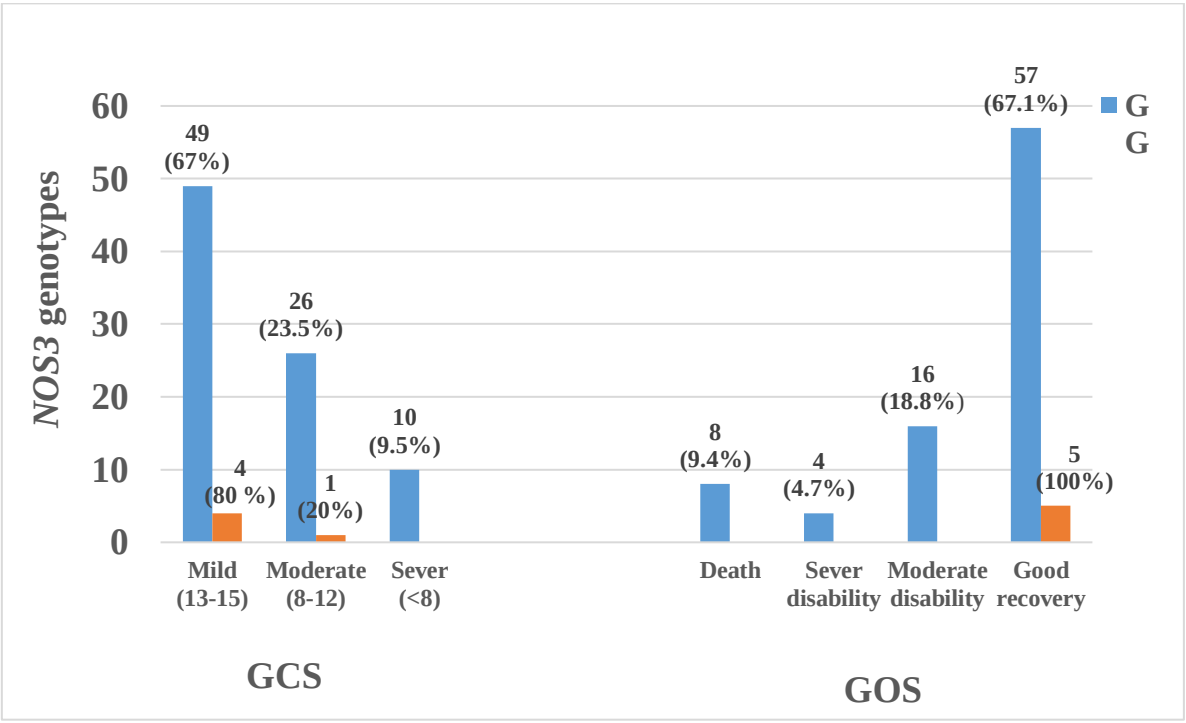


**Figure 2.** Association between NOS3 894G>T Genotypes with GCS and GOS

## Discussion

[11]. studied three *NOS3* gene polymorphisms (-786 T>C, 894 G>T, and 27-bp VNTR) among severe TBI populations. They found a non-significant association between two Single nucleotide polymorphisms (SNPs) 894G>T and 27-bp VNTR with either mortality or CBF. Whereas -786 C allele was associated with low CBF and mortality [11]. Similarly, our findings confirm non-significant differences

between *NOS3* gene 894 G>T polymorphism with clinical features or death, but all the patients carrying T allele show good outcomes. The conflict of the results between the different studies can be attributed to the variability of the sample size or to the ethnic differences regarding the distribution of this pattern of polymorphism. Moreover, genetic association studies require biological evidence and functional significance that the risk variant is implicated in the pathogenesis of the disease [17, 18].

Some racial differences in the distribution of *NOS3* variants have been described that 894T allele was significantly more common in Caucasians than in African- Americans or Asians [19]. In the present study no significant distribution of *NOS3* variants among different Sudanese linguistic afflations while GT heterozygous allele was more common among Afro-asiatic participants. However, the sample size was too small to adequately assess this issue. No significant race/ethnicity differences in the distribution of the *NOS3* gene variants among American TBI victims [11]. Therefore, the genotypic and phenotypic studies should include larger sample sizes to determine how ethnic diversity may play a role in disease occurrence and disease outcome. However, further studies are needed since the predicting outcome following TBI is challenging and cannot be made based solely on clinical presentation, and radiological findings since patients with comparable injuries may have variable outcomes [20].

## Conclusions

The study concluded that *NOS3* 894G>T gene polymorphism has no prognostic role in traumatic cerebral hemorrhagic contusion, clinical features, and outcome.

## Recommendation

A national program targeting the young population for the prevention and management of traumatic injury should be in place.

A large-scale study is needed to explain some of the variability in outcomes that occur following traumatic cerebral hemorrhage.

## Conflict of Interest

We declared no conflict of interest in this article.


## Acknowledgment

The authors acknowledge the staff of the National Center for Neurological Sciences, Ibrahim Malik Teaching Hospital, Khartoum, Sudan for their assistance.


## References


[1] Alahmadi, H., Vachhrajani, S., and Cusimano M., 2010, The natural history of brain contusion: an analysis of radiological and clinical progression. J Neurosurg,112(5),1139-1145, https://doi.org/10.3171/2009.5.JNS081369.

[2] Kurland, D., Hong, C., Aarabi, B., Gerzanich, V., and Simard, J. M., 2012, Hemorrhagic Progression of a Contusion after Traumatic Brain Injury: *A Review. J Neurotrauma*,29(1),19-31, https://www.liebertpub.com/doi/10.1089/neu.2011.2122.

[3] Hassan, S. A., Gassoum, A.F., Aldeaf, S.A., Arbab, M.A., and Musa, H. H., 2020, Association between Acute Inflammatory Cells and Mutation in ICAM-1 gene with Injury Severity and Outcome among Traumatic Cerebral Hemorrhagic Contusion. *J Acute Med* ,10(1),1-8, https://pubmed.ncbi.nlm.nih.gov/32995149/.

[4] Hassan, S.A., Arbab, M.A., and Musa, H.H., 2020, Association of *RETN* -420 C/G genotypes with CRP, Brain edema, GCS, and GOS among Traumatic Cerebral Hemorrhagic Contusion. *J Emerg Med*

*Trauma Acute Care*,2020(1), https://doi.org/10.5339/jemtac.2020.4.

[5] Hassan, S.A., Arbab, M.A., Abdelrahman, S.F., Aldeaf, S.A., Gassoum, A.F.,and Musa, H.H, 2020, The significance of mutation in IL-1B gene and circulatory level for prediction of trauma severity and outcome in Traumatic Cerebral Hemorrhagic Contusion. *J Acute* Med,10(2),70-76, https://pubmed.ncbi.nlm.nih.gov/32995158/.

[6] Kondkar, A.A., Azad, T.A., Sultan, T., Osman, E.A., Almobarak, F.A., Al-Obeidan, S.A., 2020, Association of endothelial nitric oxide synthase (NOS3) gene polymorphisms with primary open-angle glaucoma in a Saudi cohort. *Plos One*,15(1),e0227417,https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0227417

[7] Geller, D.A., Lowenstein, C.J., Shapiro, R.A., Nussler, A.K., Di Silvio, M., Wang, S.C., Nakayama, D. K., Simmons, R.L., Snyder, S.H., and Billiar, T.R., 1993, Molecular cloning and expression of inducible nitric oxide synthase from human hepatocytes. PNAS, 90(8),34913495,https://doi.org/10.1073/pnas.90.8.3491.

[8] Nasyrova, R.F., Moskaleva, P.V., Vaiman, E.E., Shnayder, N.A., Blatt, N.L.,and Rizvanov, A.A., 2020, Genetic Factors of Nitric Oxide's System in Psychoneurologic Disorders. *Int J Mol Sci*,21(5),1604,https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7084194/.

[9] Hancock, D.B., Martin, E.R., Vance, J.M.,and Scott, W.K., 2008, Nitric oxide synthase genes and their interactions with environmental factors in Parkinson's disease. *Neurogenetics*, 9(4), 249–262, https://link.springer.com/article/10.1007/s10048-008-0137-1.

[10] Marsden, P.A., Heng, H.H., Scherer, S.W., Stewart, R.J., Hall, A.V., Shi, X.M., Tsui, L.C., and Schappert, T.K., 1993, Structure and chromosomal localization of the human constitutive endothelial nitric oxide synthase gene. *J Biol Chem*, 268(23),17478-17488, https://pubmed.ncbi.nlm.nih.gov/7688726/.

[11] Robertson, C.S., Gopinath, S.P., Valadka, A.B., Van, M., Swank, P.R., and Goodman, J.C., 2011, Variants of the Endothelial Nitric Oxide Gene and Cerebral Blood Flow after Severe Traumatic Brain *Injury. J Neurotruma,* 28(5),727-737, https://pubmed.ncbi.nlm.nih.gov/21332418/.

[12] Nassereddine, S., Idrissi, H.H., Habbal, R., Abouelfath, R., Korch, F., Haraka. M., Karkar, A., and Nadifi, S., 2018, The polymorphism G894 T of endothelial nitric oxide synthase (eNOS) gene is associated with susceptibility to essential hypertension (EH) in Morocco. *BMC Medical Genetics*, 19(1),127. https://bmcmedgenet.biomedcentral.com/articles/10.1186/s12881-018-0638-1.

[13] Luo, Z., Jia, A., Lu, Z., Muhammad, I., and Adenrele, A., Song, Y., 2019, Associations of the *NOS3* rs1799983 polymorphism with circulating nitric oxide and lipid levels: a systematic review and meta-analysis. *Postgrad Med J*, 95(1125), 361-371, https://pmj.bmj.com/content/95/1125/361.

[14] Ahn, M.J., Sherwood, E.R., Prough, D.S., Lin, C.Y., and DeWitt, D.S., 2004, The effects of traumatic brain injury on cerebral blood flow and brain tissue nitric oxide levels and cytokine expression. *J Neurotrauma*,21(10),1431-1442, https://www.liebertpub.com/doi/10.1089/neu.2004.21.1431.

[15] Harish, G., Mahadevan, A., Pruthi, N., Sreenivasamurthy, S., Puttamallesh, V., Prasad, T. S., Shankar, S. K., and Bharath, M., 2015, Characterizations of traumatic brain injury in human brains reveals distinct cellular and molecular changes in contusion and per contusion. *J Neurochemistry*, 134(1), 156-172, https://onlinelibrary.wiley.com/doi/abs/10.1111/jnc.13082.

[16] https://www.qiagen.com/us/products/discovery-and-translational-research/dna-rna-purification/dnapurification/genomic-dna/qiawave-dna-kits/

[17] Veenith, T., Goon, S.H., and Burnstein, R.M., 2009, Molecular mechanisms of traumatic brain injury: the missing link in management. *World J Emerg Surg* , 4(1), 7-10, https://wjes.biomedcentral.com/articles/10.1186/1749-7922-4-7.

[18] Dardiotis, E., Foutas, K.N., Dardioti, M., Xiromerisiou, G., Kapsalaki, E., Tasiou, A., and

Hadjigeorgiou, G. M.,2010, Genetic association studies in patients with traumatic brain injury. Neurosurg Focus, 28 (1), E 9, https://doi.org/10.3171/2009.10.FOCUS09215.

[19] Tanus-Santos, J.E., Desai, M., and Flockhart, D.A., 2001, Effects of ethnicity on the distribution of clinically relevant endothelial nitric oxide variants. Pharmacogenetics, 11(8), 719-725, https://pubmed.ncbi.nlm.nih.gov/11692081/.

[20] Davidson, J, Cusimano, M. D., and Bendena, W,G., 2015, Post-Traumatic Brain Injury: Genetic Susceptibility to Outcome. Neuroscientist, 21(4), 424-41, https://pubmed.ncbi.nlm.nih.gov/25059577/.

Texila International Journal of Academic Research
ISSN: 2520-3088
DOI: 10.21522/TIJAR.2014.10.01.Art006

# Prevalence of Cervical Cancer and Associating Factors among HIV Infected Women of Omaruru District in Namibia

Tshipamba Njila Sebastien
*Medical Doctor, Nankudu Hospital, Nkurenkuru Health District, Kavango West Region Namibia*

***Abstract***

*In 2015 Namibia reported 55 deaths due to cervical cancer, and the prevalence of HIV was 13,3% among adults aged between 15 -49. There is an increased risk of cervical cancer among women living with HIV, the prevalence of this type of cancer and the association with risk factors is unknown at the Omaruru Hospital. High prevalence of HPV infection, advanced HIV disease, tobacco, multiple sexual partners, parity, and poor socio-economic conditions are listed among contributing factors that increase morbidity and mortality of cervical cancer, which can be controlled & cured if diagnosed early. This research aimed to determine the prevalence of cervical Cancer among HIV-positive women on ARVs and assess the risk factors contributing to the emergence of cervix cancer in this population. The approach methodologic used was a retrospective cross-sectional of 49 women randomly selected among those who were done pap smears at the Omaruru ART clinic between August 2016 to August 2017. There was no positive result for cervical cancers found. Hence, the prevalence of HPV was found to be 16,32%, with Cervical dysplasia 3 cases of CIN I and 5 cases of CIN II with no association established with risk factors, and a case of CIN II in a primigravida with multiple sexual partners were found. To conclude, a meaningful analysis with STATA 14 revealed no positive results for cervical cancer from the 49 cases with no risk factors association established,30.61% of negative HPV (30 - 39 years;28.57% (40-50 years), CIN II aged 30 to 39 years (4%);4% (40- 50 years) 2% above 50 years old. The HPV prevalence (16,32%,),3 cases of CIN 1, and 5 cases of CIN II are indicators that more efforts need to be made.*

***Keywords:*** *Cervical cancer prevalence, Cervical cancer screening, HPV prevalence, HIV women on antiretroviral treatment, primigravida, multiple sexual partners.*

## Introduction

Cervical cancer is one of the commonest types of cancerous disease affecting the reproductive system of women and threatening their lives worldwide. Human Papillomavirus has been proven to be the major cause of invasive cancer in addition to others associated factors. High HIV prevalence and poor socio-economic conditions in Sub-Saharan Africa has worsened the quality of women's reproductive health and productivity in society. In 2015 it was reported that the cancer of cervix caused 55 deaths in Namibia, 101 in Botswana, 3478 in South Africa, the prevalence of HIV was 13,3 among adult aged between 15-49 years in Namibia, estimated at 19,2% in South Africa and 21,9% in Botswana [1]. The importance of this study is to establish the prevalence of cervical cancer and the association between exposure to risk factors and the occurrence of cervical cancer among HIV infected women on ART at the Omaruru Health District of Namibia and determine the prevalence. Beside the fact that HIV treatment has widely improved the chance of survival by prolonging the life of people

***Received: 05.01.2023*** ***Accepted: 26.01.2023*** ***Published on: 31.01.2023***
***Corresponding Author: sebnjila@gmail.com***

living with HIV, cervical cancer caused by human papillomavirus still and remains one of the sexual transmitted diseases which hinders females patients' quality reproductive health status. The morbidity and mortality of cervical cancer is increased due to the immuno suppression caused by HIV infection which exposed woman to be more vulnerable to this cancer which can be controlled if early diagnosed [2].

It is estimated that more than 530,000 women are diagnosed with Cervical Cancer in the world each and every year. More than 85 % of them are from low- and middle-income countries with high mortality in sub-Saharan African countries in addition to its existing high HIV prevalence, morbidity, and mortality [3]. In 2016, the United States of America recorded 12990 new cases of Cervical uterine Cancer and 4120 deaths [4] while 3126 new cases and 890 deaths were reported in the United Kingdom in 2015 [5].It is estimated that only 19% of women from developing countries have access to Cervical Cancer screening, and more than 60% of women from developed countries have been screened on a regular basis [6]. Furthermore, WHO stressed that around 99 038 new cases of uterine cancer are being diagnosed every year in Africa, with close to 60 098 deaths [7].

Cervical and breast cancers are the top leading causes of death related to cancer among women worldwide and out of 20,000,000 of women who died each year in the world from cancer related diseases, cervical cancer is on the lead among all other types of cancers and around 13% of all cancer diseases diagnosed to women are attributed to cervical cancer in the world. [1, 2, 8]. On the other hand, Cervical Cancer is considered as AIDS defining disease, therefore there is increased number of women affected with this type of cancer in region with high burden of HIV and low socio-economic standard. CDC stated that around 23 women die from cancer of cervix in a population of 100,000 in Sub Saharan African region while it only 3 who die in North America for the same population [1]. Cervical cancer was found to be the most devastating type of cancer affecting women in Tanzania and increased in proportion by HIV prevalence and WHO reported that out of 5,743 cases of Cervical cancer diagnosed in the world, there was 3000 women who lost their life in South Africa in 2010 [9, 10].

In 2015, found that 60% of 5.7 million of HIV positive people in South Africa are women, and Human Papilloma Virus is among the factors that highly contribute to acquire HIV infection and offers a greater chance of progression to invasive cervical cancer and it was found that poor socio-economic status and living standards of life have increases the number of the victim from this deadliest cancer illness but preventable through regular screening of cervix and early management of pre-cancerous lesions [11, 12].

Data from the Namibian National Cancer registry reported that from 2010 to 2014, the total number of all types of cancers cases was 11248 with a proportion of 54,4 % for females and 45,6 % for Males and 3.3 % of this case were children under 15 years for a total population of 2,3 Million. Breast Cancer was the most commonest type of cancer for that specific period, 1579 cases reported or 27,4 % of all types of Cancers diagnosed in female while Cervical Cancer is on second place with 19,4 % or 1118 cases with an estimated incidence of 27,2 per 100.000 which far very high from the incidence of 15,6 per 100.000 reported during the previous 5 years report. Cancer of the Cervix annual incidence increases with age in Namibia, for women of age between 20 -24 the value is 0,2 /100000 with a pic of 122,4/100.0000 for women aged between 72-79 years. Cervical cancer is among the top three types of Cancers diseases diagnosed among women of all ethnic in the country and remain the leading cancer of female in all regions of Namibia [13].

A comparison of the epidemiological situation of cancer of the cervix in developing countries and countries from the Sub-Saharan region reveals that there are many challenges in the screening process, except the availability of

required resources to offer adequate, efficient, and sustainable management of diagnosed cases in developed countries [14]. Developed countries have low HIV prevalence and better socio-economic living conditions with good health systems but have not successfully contained or fully controlled the pandemic of cervical cancer, and most countries in Sub Saharan area account for 70% of HIV cases diagnosed in the world and have limited resources in term of Cervical Cancer screening, Vaccination and Management of cases due to poor governance system, poverty, lack of knowledge, low literacy rate and bad socio-economic living standard [15].

Considering the major role that HPV plays in generating cervical cancer in addition to other predisposing factors, it is mandatory that preventive efforts are focused on regular screening for HPV through pap Smear or Visual inspection with acetic Acid (VIA), avail vaccination and reduce exposure to predisposing factors [10]. Early treatment should be offered to all women with abnormal Pap smear results or Cervical Intraepithelial dysplasia. Regular screening, early initiation of anti-cancerous management, and anti-retroviral treatment is encouraged to all women diagnosed HIV positives and their partners [15, 16]. Moreover, there is a need to integrate HIV services with other reproductive health programs, including cervical cancer screening and treatment, family planning, STI screening and treatment, and Voluntary Male Circumcision.

The WHO recommends that both developed and developing nations should strengthen preventive efforts and control measures for invasive cancer to all eligible women. Ever said that women of reproductive age and menopausal stage should be aware of predisposing factors and methodology for early diagnosis of cervical cancer [14].

Based on World Health recommendation HPV vaccine should be offered to girls of 9-13 years to prevent HPV infection, HPV test should be used to screen women of the reproductive , menopausal period and this information should widely be spread to all the people so that all population of the world should access to basic health services including Cervical cancer screening (preventive care), curative services and palliative care without discrimination [16]. As part of preventive measures to mitigate this cancer, vaccination and regular screening are keys strategies that can prevent morbidity among HIV positives women since it boosts their immunity against HPV infection and encourage them to adhere well on anti-retroviral treatment.

In Namibia, Access to Health Services is available to all citizens for free of charge in all Health state facilities. Cervical cancer screening is available to eligible clients. A comprehensive national assessment of cervical cancer done in Namibia in 2012 revealed that 59 women died every year [17]. The fight against cancer of the cervix in Namibia has involved a multisector team including the Ministries of Health and Gender, Namibian Cancer Association, ITECH, and other stakeholders. There is a need to reinforce the existing referral System in place whenever dealing with clients with abnormal Pap smear results or CIN for early management to expect better outcomes. As for now, Pap smear remains the commonest screening method used in most of the health facilities in the country while VIAC is still in the pilot stage [17].

This type of cancer can also affect men, but it is widely spread among women due to their anatomic features, and HPV remains the causal agent. Any person who is sexually active is at risk of HPV regardless of their gender they can acquire such infection via vaginal, anal, and oral sex and such infection expose them to the risk of cancer and genital wart in the further. Therefore vaccination is encouraged to all of them [14]. The relevance of this statement is justified by the fact that HPV infection types 16 and 18 are the major factors accounting to most cervical cancer cases [16].There are various challenges reported during pap smear screening due to cultural beliefs and stigma about Cancer (People are very much afraid to be diagnosed with cancer and

some women are not comfortable to be screened by male nurses).In 2016 the importance of addressing stigma as a key element in the promotion of Uterine cancer screening in Sub-Saharan Africa was reported [18]. The major impact in the population should, in the one hand, be materialized by reducing the morbidity and mortality related to this type of cancer and availing preventive, curative, integrated, and palliative services to needy populations. On the other hand, to strengthen awareness campaigns on risk factors to minimize the incidence and promote regular cervical cancer screening [19].

The Ministry of Health and Social Services of Namibia has introduced cervical Cancer screening (pap smear) as an indicator of HIV quality improvement care; therefore, there is a need of integration of ART services and Females Reproductive services offered to all ART clinic in Namibia, and Pap smear services are also offered to all Primary Health Clinics and Private Health Facilities [20].

In 2017), it was reported that the integration of ART services with reproduction program is a good step toward the achievement of the 90%-90%-90% UNAIDS targets goals in Namibia [21].

AIDSMAP reported invasive cervical cancer in people living with HIV is an indicator of advanced disease or simply considered as an AIDS-defining Illness therefore associated with a high mortality rate [22]. Early and regular screening for HPV infection of HIV-positive females can prevent unnecessary death of these vulnerable women who are already immunocompromised in addition to low CD4 count, while the Ministry of Health Namibia has opted for yearly cervical cancer screening of all women living with HIV [19, 23].

Since cervical cancer is the second most dangerous type of cancer among women in Namibia, there is a need to identify contributing factors that influence its prevalence and incidence among women affected by HIV. Moreover, health education about cervical cancer screening and the availability of such services to primary Health clinics and ART Clinics are key components the fight against cervical Cancer in Namibia [19]. The Knowledge of the commonest public health issue by the population offers a high chance of public health interventions to succeed and control the epidemic in that environment and population [19], and I am of on the opinion that availing information about cervical Cancer in Omaruru District in Namibia can easily influence the attitude, behaviour, and care of both clients and Health care providers which will result in the reduction of both Morbidity and Mortality related to the disease.

Purposefully this study is aimed to determine the existing prevalence of cervical Cancer among HIV-positive patients enrolled in care at the Omaruru State Hospital. In addition to that, I would like to identify the major contributing factors to the incidence and prevalence of this cancerous disease for the defined population.

The outcomes of this research will identify existing gaps in service delivery within the concerned population of the study in line with cervical cancer and the population. Such route causes analysis exercise can avail recommendations, suggestions, and evidence-based findings that can positively influence all efforts in the fight against cervical cancer by involving all stakeholders and the patients themselves.

Cervical cancer is a preventable, curable, and deadly depending on the knowledge of the people at risk, exposure to risk factors, availability of Health services, and the time for the diagnosis. The National Health Service in the UK argued that Uterine Cancer might not be completely prevented however encourages safer sex practices, Cervical Cancer vaccination, regular screening, and avoiding smoking to reduce the risk [5].

In 2014, it was reported that cervical cancer seems to be a silent killer in the sense that close to 500,000 women are being diagnosed every day in the world, and 32% of those diagnosed die in five years in the United States [24].

Suggestions from this analysis will contribute to improving the care and control of this type of cancer in the Omaruru Community. On the hand, evidence from this study should clarify the association between the degree of HIV infection, risk factors, and prevalence of Human Papilloma Virus in the Namibian context. A report from Tanzania in 2011 revealed that the prevalence and incidence of cervical cancer is highly associated with HPV and worse with high HIV prevalence in Tanzania and concluded on the need to strengthen awareness and Health Education in the population [25]. Since the literature search reveals that there is no much publication done about cancer of cervix in Omaruru Health District of Namibia. The outcomes of this study will offer information that will contextualize the epidemic of cervical cancer and it is associated factors in the Omaruru Health District of Namibia. Furthermore, targeted preventives and curative measures can be applied based on the recommendation to ensure morbidity and mortality are on the lower side.

Purposefully this study is interested in determining the existing prevalence of Cervical Cancer among HIV-positive patients enrolled in care at the Omaruru State Hospital. In addition to that, we would like to identify the major contributing factors to the incidence and prevalence of this cancerous disease on the defined population.

The outcomes of this research will avail recommendations, suggestions and evidence-based findings that can positively influence all efforts in the fight against cervical cancer by involving all stakeholders and the patients themselves.

In Africa, although there are some inconsistency and limitation of data, it is reported that women with HIV/AIDS have an increased chance of developing cervical cancer [26]. In contrast to Western Europe and in the United States of America where there are accurate data, it is, however reported that HIV positives women with low CD4 stand a very high rate of developing cancer of the cervix in comparison to HIV-negative women [27].

The mortality and morbidity rate related to cancer of the cervix is high in low-income countries due to the inaccessibility of well-organized screening services, lack of HPV vaccination, and poor service delivery [12]. The incidence of Invasive Cervical Cancer in Zambia is the second highest in the world, with most of the cases identified among HIV positives women, while in Sub-Saharan Africa, invasive Cervical Cancer is the commonest type of cancer, accounting for many deaths related to cancer among women [28, 29].

It was reported in 2010 more than 3000 deaths were caused by cervical cancer out of 5,743 cases diagnosed in South Africa in 2009. With a crude incidence of 11,1 per 100,000 for cervical Cancer, Namibia is ranked number 5 in Southern Africa after Swaziland, Lesotho, South Africa, and Botswana [10, 30].

The greatest number of victims of cervical cancer are women living in poor-income countries with poor socio-economic status, and there are numerous factors associated with the incidence of cervical cancer, such as Human Papillomavirus Infection, and other socio-economic and cultural factors such as early marriages, high parity, and polygamy are blamed for the increased rate of cervical Cancer in Sub Saharan Africa due to poor living standards of the population. He also stressed out that polygamy increases the risk of cervical cancer by two-fold [12, 31]. In addition, it was reported in 2011 in South Africa that combined contraceptive pills use for more than five years increases the development of cervical cancer by three-fold [32]. Namibia being a neighbouring country to South Africa is, shares many of mentioned risk factors. Therefore understanding research studies done on cervical Cancer in South Africa could bring to light an understanding of the situation in the Namibia context. According to WHO 2010, it was reported more than 3000 deaths were caused by cervical cancer out of 5,743 cases diagnosed in

South Africa in 2009. With a crude incidence of 11,1 per 100,000 for cervical Cancer, Namibia is ranked number 5 in Southern Africa after Swaziland, Lesotho, South Africa, and Botswana [10, 30].

A study from Tanzania in 2015 reported that Cervical Cancer is the deadliest cancer among all types of Cancers that affect women living in Tanzania [9]. The combination of HIV and Cervical cancer is putting women's lives at risk, and the two diseases are inextricably linked with women living with HIV up to five times more likely to develop cervical cancer. As mentioned earlier, HPV, the agent contributing to the genesis of cervical cancer, could be reduced if wide-scale vaccination is done for eligible people and should be coupled with regular screening and early referral of cervical dysplasia for specialized care to reduce morbidity and mortality. Hence, HIV care and such screening services should be under one roof to detect and effectively manage these two deadly conditions. Clifford. Furthermore, I t reported that the prevalence of pre-cancerous cervical lesions (CIN) was 10.3% among HIV-infected women living in the Northern part of Namibia. Severe Immuno suppression expressed by CD4 lower than 200 was associated with a higher risk of CIN in comparison to women with CD4 higher than 200 [23]. On the other hand, in a similar study done in Tanzania reported that HIV-positive women have a higher prevalence of invasive cervical cancer in comparison to other women of the general population. The incidence and prevalence also increase with the severity of immuno suppression [33].

It appears like the greatest number of victims of cervical cancer are women living in poor-income countries; with poor socio-economic status reported that both HIV and Cervical cancer are preventable if all preventive measures are effectively applied at an early stage, and such interventions can prevent the high number of costly interventions such as the removal of pre-cancerous lesion that may cost up to 25 US dollars per clients while HIV treatment may require up to 100 U$ per person in a month [12, 30]. There is a link between Cervical Cancer and poverty since the social determinant of the poor population exposes them to an increased risk of acquiring HIV, HPV, and other Sexual Transmitted Diseases. Various studies done in African countries and other low-income countries reveals that women living with HIV have a high risk of developing Cancer of the Cervix, and the prevalence of cervical cancer is the same among HIV-positive and HIV-negative in Romania, implying there is no increased risk cervical cancer in HIV positive people [31, 25]. The infection with HPV type 16 and 18 is the main agents contributing to the genesis of cervical cancer that could be reduced if wide scale vaccination is done for eligible people and coupled with regular screening and early referral of cervical dysplasia for specialize care to reduce morbidity and mortality [16]. There is a need to clearly understand the existing policies, and strategies for services delivery aimed at cervical cancer management in developed countries and low-income settings to propose interventions accordingly.

A cross-sectional study done in 2015 in Brazil reported a great association between HPV, HIV-positive status, cervical dysplasia, and high risk of progression to invasive cervical cancer, especially among HIV-positive women with very low CD4 count or advanced HIV immunosuppression [34].On the other hand, in South African settings, 60% of the 5,7 million HIV-positive people are women exposed to HPV, which is a potting factor in acquiring HIV Infection and increases the chance for progression from pre-cancerous cervical lesions to Invasive Cancer of the cervix [11]. It was estimated in 2013 that 771,887 women aged between 14-49 years had cervical cancer, with an annual estimation of 59 deaths per year and 132 new cases (Namibia fact sheet, 2014). therefore there is a need to encourage regular screening and awareness and anticipate early management of abnormal cervical abnormalities [31].

The association between HIV and HPV, Pre-cancerous lesions in HIV-positive women, the degree of Immunity and the possibility of Disease progression were mentioned in various articles reviewed as the leading factors contributing to acquiring cervical cancer in both HIV-negative and HIV-positive women. Neoplasm such as Kaposi Sarcoma, Non-Hodgkin Lymphomas, and Invasive Cervical Cancer are AIDS-defining illnesses. Such conditions are seen in people with advanced disease stages; therefore, Cancer of the Cervix is usually seen in women with weakened immunity systems.

This association between the degree of immunity and the incidence or prevalence of Cervical Cancer in HIV positive has attracted the interest of most articles reviewed. Also, to note that there was a mutual risk of disease progression between HIV/AIDS and Invasive Cervical Cancer [29, 32].

Another aspect of this topic which was explored by WHO in 2017, was the evaluation on the nature of service deliveries and disease burden in rich countries and poor countries. In the European context, it was reported that the incidence of cervical cancer among HIV positives women was not correlated with the background risk of invasive Cervical Cancer in the general population of women [16, 32].

With relevance to this study, there is a special interest to know if cervical cancer associating factors mentioned by these authors are also applicable in the key population of Omaruru Health District in Namibia. Furthermore, I will also avail the non-existing data of cervical cancer to the scientific world and the selected community with the aim of controlling this deadly disease in this environment.

CDC reported 2013, 4,217 deaths occurred globally from women of reproductive period out of 11,955 females confirmed cases of Cervical Cancer [33]. Most authors reviewed during the literature search did not talk much about other associating factors of CIN among HIV women apart from the degree of Immunosuppression, and they did not specify the best screening test for CIN that can be used in HIV-positive people, Visual Inspection with Acetic Acid (VIA) and Papanicolaou (pap smear) methods are the two methods available (explore on the high sensitivity of VIA compare to Pap smear also cheap, short turn around, time screen and treat advantage) [35, 36]. The search did not come across many articles reporting on the impact of cervical vaccine and its impact on the control of this cervical cancer prevalence.

As there is no much data reported from this search about the association of risk factors such as HIV Viral Load Level, Smoking, age, alcohol parity, and cervical Cancer in the Namibian context. On the hand, there is no available data on the prevalence of cervical cancer among HIV positives women living in Namibia [19].

The Objectives of the research paper were to determine the prevalence of Cervical Cancer among women living with HIV in the health of the District of Omaruru in Namibia and to identify contributing factors.

## Materials and Methods

Both HIV-positive and Negative women are vulnerable to invasive cervical cancer even though the incidence risk is different. The same principle applies to the environment and countries where this woman is residing. Women from developed countries are lucky to benefit from a well-organized Health service in an environment with low HIV prevalence. This study was conducted at Omaruru District Hospital of Namibia among women enrolled at the ART clinic and screened for cervical cancer for the period of August 2016 to August 2017.

The collection of data was done by using a designed questionnaire has limited option in gathering information associated to risk factors since not all the needed data were not captured in the Electronic Patient Care Monitoring system (EPMS), cervical cancer register, patient's care booklet.

In addition to that, missing results were traced at the Omaruru District Hospital Laboratory

Department (Namibian National Institute of Pathology) by using the reference number of the patient.

## Method

A retrospective cross-sectional study of 49 HIV-infected women randomly selected among those who were done pap smear screening at the Omaruru ART-clinic between August 2016 to August 2017 Female HIV positive patients enrolled in care at the Omaruru Health District (Namibia) for more than a 1year, from the age of 16 years and above and this population was estimated at 700.

The sample size was determined by using epi-info software, and the parameters selected for the calculation were cervical cancer prevalence of 24% (from South Africa) with a confidence level of 95 % (1-Alpha), power or chance of detecting of 80% (1-beta) that lead to sample size of 49.

Secondary data were extracted from the EPMS and Cervical cancer register using a designed questionnaire. This process will be done through a random selection of cases from the mentioned sources. There was no possibility of directly contacting all patients with missing vital data in the database (EPMS and cervical cancer Register), and there was no possibility to directly contact all the patients.

This study is susceptible to some bias likely to affect the internal validity of the findings as the cross-sectional study itself is a major limitation since the cause and effect limits the interference between different variables and cervical cancer outcomes. We are aware that many factors may influence the data, like independent variables such as age, number of partners, male circumcision, HIV-positive status, etc. Bias is minimized, and confounding factors will have controlled through stratification of the risk and linear regression.

Since the study is descriptive in nature, given the fact that the sample size was somewhat small, means could be compared using ANOVA. Graphs were also used to draw and represent data and compare the binary Yes/No as given by the presence or absence of requested information.

To ensure the validity of the study, we ensured that the process of data collection and analysis was done in a rigorous way with frequent verification and ensured a clean transferability process was done by avoiding errors. In addition to that, we ensured that the information collected about risk factors was true (verification in Booklet)) and results from the laboratory (Biopsy results, Pap smear results, CD4, Viral Load) are a true reflection of the patient clinical condition.

***Variable:*** Age, Tabaco usage, age of first sexual intercourse, parity, number of partners, date of pap smear screening, CD4 count, viral load, oral contraceptive use, pap smear results, duration of ART Treatment, marital status, Circumcised partner, STI, employment status.

***Data analysis tool****:* Through inferential statistics, collected data were analyzed through descriptive statistics with multiple comparisons to determine the prevalence and establish the significance between selected variables and cervical cancer/HPV by using the STATA 14 software.

STATA 14 software was used to analyse codes from an excel sheet. Descriptive statistics such as frequency, standard deviation, and mean were used. Then the summary of derived data is presented in the form of tables and graphs. With regards to inferential statistics, the significance test with a p-value of 0.05 is used as well.

***Research Ethics****:* Approval from the Permanent Secretary of the Ministry of Health and Social Services of Namibia was granted before data collection, and an authorization for reach document was presented to the Medical Superintend of the Omaruru District Hospital before the data collection process. All data collected were kept in a safe place where no other person could access and those kept on the laptop require a password. To ensure confidentiality and anonymity, the patients were identified by their unique number instead of the names.

## Results

Data presentation and analysis concerned a set of narrative and interpretive techniques. All answered questions were coded. Data were synthesized and broken down into manageable units, and patterns or themes were identified to make it possible for meaningful analysis.

As depicted in Table 1, the mean age of respondents is 2.7 with a standard deviation of 0.89; the Parity mean of respondents is 2.04 with a standard deviation of 0.84; the mean of the number of sexual partners is 2.4 with a standard deviation of 0.6; the mean respondents of marital status is 0.1 with a standard deviation of 0.3; the respondents mean with regards to employment status is 0.3 with a standard deviation of 0.4; and the mean of respondents with regards to the number of the circumcised partner is 0.3 with a standard deviation of 0.4.

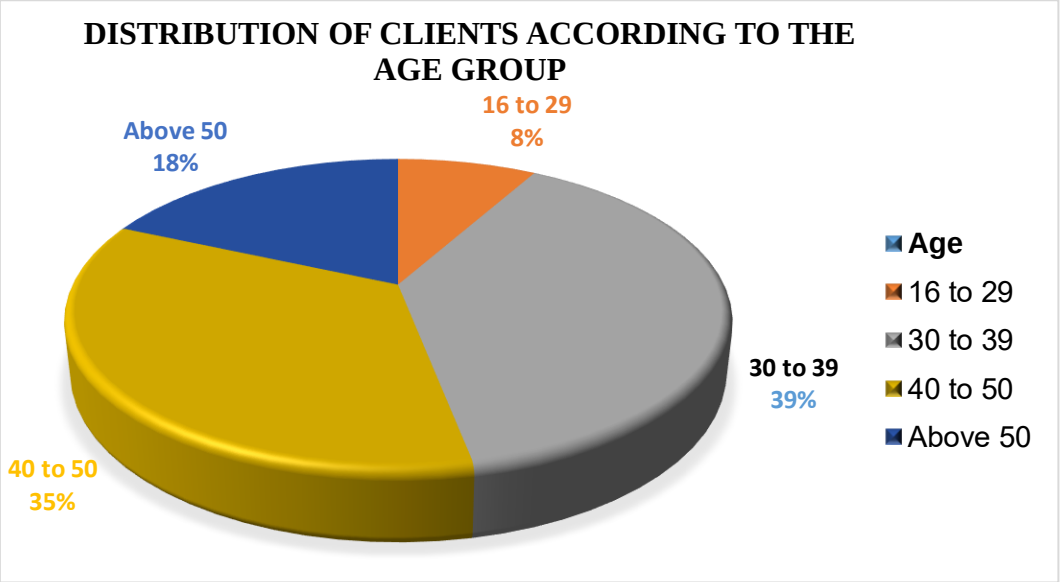


**Figure 1.** Distribution of Clients according to the Age Group

**Table 1.** Observations of Participants with Regards to Means and Standard Deviation

| Variables | Observation | Mean | Std. Deviation | Min | Max |
|---|---|---|---|---|---|
| Age | 49 | 41.367 | 9.263 | 26 | 60 |
| Parity | 49 | 2.75 | 1.407 | 0 | 5 |
| Number of Sexual Partners | 49 | 5.429 | 1.696 | 3 | 9 |
| CD4 Count | 49 | 215.204 | 143.7806 | 18 | 765 |
| Viral Load | 49 | 2977.673 | 20017.33 | 20 | 140231 |
| Pap Smear | 49 | .2653061 | .6382107 | 0 | 2 |

As depicted in Table 2, Pap smear/HPV status has been found negative, with 30.61% among young women ranging from 30 to 39 years old and 28.57% among those ranging from 40 to 50 years old. CIN II has been found among women ranging from 30 to 39, with 4% and 4% among 40 to 50 years old and only 2% among women above 50 years old. The prevalence was not conclusive as there was no positive result among all our participants.

**Table 2.** Observations of Participants with Regard to Pap Smear and Age

| Pap Smear/ HPV Status | Age in years | | | | |
|---|---|---|---|---|---|
| | 16 to 29 | 30 to 39 | 40 to 50 | >50 | Total |
| Negative | 4 | 15 | 14 | 8 | 41 |

| | | | | | |
|---|---|---|---|---|---|
| | 9.76 | 36.59 | 34.15 | 19.51 | 100.00 |
| | 100.00 | 78.95 | 82.35 | 88.89 | 83.67 |
| | 8.16 | 30.61 | 28.57 | 16.33 | 83.67 |
| CIN I | 0 | 2 | 1 | 0 | 3 |
| | 0.00 | 66.67 | 33.33 | 0.00 | 100.00 |
| | 0.00 | 10.53 | 5.88 | 0.00 | 6.12 |
| | 0.00 | 4.08 | 2.04 | 0.00 | 6.12 |
| CIN II | 0 | 2 | 2 | 1 | 5 |
| | 0.00 | 40.00 | 40.00 | 20.00 | 100.00 |
| | 0.00 | 10.53 | 11.76 | 11.11 | 10.20 |
| | 0.00 | 4.08 | 4.08 | 2.04 | 10.20 |
| Total | 4 | 19 | 17 | 9 | 49 |
| | 8.16 | 38.78 | 34.69 | 18.37 | 100.00 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| | 8.16 | 38.78 | 34.69 | 18.37 | 100.00 |

As depicted in Table 3, Pap smear/HPV is 83.6% negative among all the parity, with a high yield of 40% among multiparous. CIN II has been found among primigravida and multiparous for 4%, respectively, and 2% among grand multiparous.

**Table 3.** Observations of Participants with Regard to Pap Smear and Parity

| **Pap Smear/ HPV Status** | **Parity** | | | | |
|---|---|---|---|---|---|
| | **Nulliparous** | **Primigravida** | **Multiparous** | **Grand multiparous** | **Total** |
| Negative | 3 | 4 | 20 | 14 | 41 |
| | 7.32 | 9.76 | 48.78 | 34.15 | 100.00 |
| | 100.00 | 57.14 | 83.33 | 93.33 | 83.67 |
| | 6.12 | 8.16 | 40.82 | 28.57 | 83.67 |
| CIN I | 0 | 1 | 2 | 0 | 3 |
| | 0.00 | 33.33 | 66.67 | 0.00 | 100.00 |
| | 0.00 | 14.29 | 8.33 | 0.00 | 10.20 |
| | 0.00 | 2.04 | 4.08 | 0.00 | 10.20 |
| CIN II | 0 | 2 | 2 | 1 | 5 |
| | 0.00 | 40.00 | 40.00 | 20.00 | 100.00 |
| | 0.00 | 28.57 | 8.33 | 6.67 | 10.20 |
| | 0.00 | 4.08 | 4.08 | 2.04 | 10.20 |
| Total | 3 | 7 | 24 | 15 | 49 |
| | 6.12 | 14.29 | 48.98 | 30.61 | 100.00 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| | 6.12 | 14.29 | 48.98 | 30.61 | 100.00 |

As depicted in Table 4, Pap smear is found negative among clients with target not detected at about 57.1% and the total percentage of negative tests of 83.67%. Only 4% and 10.2% of the client with CIN I and CIN II, respectively, with target not detected.

**Table 4.** Observations of Participants with Regard to Pap Smear and Viral Load

| Pap Smear/ HPV Status | Viral Load in RNA/ml | | | | |
|---|---|---|---|---|---|
| | **TND** | **31 to 99** | **100 to 999** | **from 1,000 above** | **Total** |
| Negative | 28 | 3 | 9 | 1 | 41 |
| | 68.29 | 7.32 | 21.95 | 2.44 | 100.00 |
| | 80.00 | 100.00 | 90.00 | 100.00 | 83.67 |
| | 57.14 | 6.12 | 18.37 | 2.04 | 83.67 |
| CIN I | 2 | 0 | 1 | 0 | 3 |
| | 66.67 | 0.00 | 33.33 | 0.00 | 100.00 |
| | 5.71 | 0.00 | 10.00 | 0.00 | 6.12 |
| | 4.08 | 0.00 | 2.04 | 0.00 | 6.12 |
| CIN II | 5 | 0 | 0 | 0 | 5 |
| | 100.00 | 0.00 | 0.00 | 0.00 | 100.00 |
| | 14.29 | 0.00 | 0.00 | 0.00 | 10.20 |
| | 10.20 | 0.00 | 0.00 | 0.00 | 10.20 |
| Total | 35 | 3 | 10 | 1 | 49 |
| | 71.43 | 6.12 | 20.41 | 2.04 | 100.00 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| | 71.43 | 6.12 | 20.41 | 2.04 | 100.00 |

As depicted in Table 5, 10% of participants who developed CIN II have more than 5 partners followed by 6.12% of those who developed CIN I have 3 to 5 partners.

**Table 5.** Observations of Participants with Regard to Pap Smear and Number of Sexual Partners

| Pap Smear/ HPV Status | Number of sexual partners | | | | |
|---|---|---|---|---|---|
| | **No Partner** | **1 to 2 partners** | **3 to 5 partners** | **Above 5 partners** | **Total** |
| Negative | 1 | 0 | 23 | 17 | 41 |
| | 2.44 | 0.00 | 56.10 | 41.46 | 100.00 |
| | 100.00 | 0.00 | 88.46 | 77.27 | 83.67 |
| | 2.04 | 0.00 | 46.94 | 34.69 | 83.67 |
| CIN I | 0 | 0 | 3 | 0 | 3 |
| | 0.00 | 0.00 | 100.00 | 0.00 | 100.00 |
| | 0.00 | 0.00 | 11.54 | 0.00 | 6.12 |
| | 0.00 | 0.00 | 6.12 | 0.00 | 6.12 |
| CIN II | 0 | 0 | 0 | 5 | 5 |
| | 0.00 | 0.00 | 0.00 | 100.00 | 100.00 |
| | 0.00 | 0.00 | 0.00 | 22.73 | 10.20 |
| | 0.00 | 0.00 | 0.00 | 10.20 | 10.20 |
| Total | 1 | 0 | 26 | 22 | 49 |
| | 2.04 | 0.00 | 53.06 | 44.90 | 100.00 |
| | 100.00 | 0.00 | 100.00 | 100.00 | 100.00 |
| | 2.04 | 0.00 | 53.06 | 44.90 | 100.00 |

As depicted in Table 6; 83.6% of negative result has been found among women having circumcised and not circumcised partners. CIN I was found in 4.08 % among those having not

circumcised partners, and 6.12% was found in CIN II for the same social group. As depicted in Table 7; CIN II is found among 10.2% of participants not on contraception and 4% of participants with CIN I.

**Table 6.** Observations of Participants with Regard to Pap Smear and Circumcised Partners

| **Pap Smear/ HPV Status** | **Circumcised partner** | | |
|---|---|---|---|
| | **Not circumcised** | **Circumcised** | **Total** |
| Negative | 26 | 15 | 41 |
| | 63.41 | 36.59 | 100.00 |
| | 83.87 | 83.33 | 83.67 |
| | 53.06 | 30.61 | 83.67 |
| CIN I | 2 | 1 | 3 |
| | 66.67 | 33.33 | 100.00 |
| | 6.45 | 5.56 | 6.12 |
| | 4.08 | 2.04 | 6.12 |
| CIN II | 3 | 2 | 5 |
| | 60.00 | 40.00 | 100.00 |
| | 9.68 | 11.11 | 10.20 |
| | 6.12 | 4.08 | 10.20 |
| Total | 31 | 18 | 49 |
| | 63.27 | 36.73 | 100.00 |
| | 100.00 | 100.00 | 100.00 |
| | 63.27 | 36.73 | 100.00 |

**Table 7.** Observations of Participants with Regard to Pap Smear and Oral Contraception

| **Pap Smear/ HPV Status** | **Not on contraception** | **On contraception** | **Total** |
|---|---|---|---|
| Negative | 38 | 3 | 41 |
| | 92.68 | 7.32 | 100.00 |
| | 84.44 | 75.00 | 83.67 |
| | 77.55 | 6.12 | 83.67 |
| CIN I | 2 | 1 | 3 |
| | 66.67 | 33.33 | 100.00 |
| | 4.44 | 25.00 | 6.12 |
| | 4.08 | 2.04 | 6.12 |
| CIN II | 5 | 0 | 5 |
| | 100.00 | 0.00 | 100.00 |
| | 11.11 | 0.00 | 10.20 |
| | 10.20 | 0.00 | 10.20 |
| Total | 45 | 4 | 49 |
| | 91.84 | 8.16 | 100.00 |
| | 100.00 | 100.00 | 100.00 |
| | 91.84 | 8.16 | 100.00 |

As depicted in Table 8; CIN II has been observed among no employed participants with 4% versus 6.12% of employed participants. And 4% of CIN among employed participants versus 2% of non-employed.

**Table 8.** Observations of Participants with Regards to Pap Smear and Employment Status

| **Pap Smear/ HPV Status** | **Employment Status** | | |
|---|---|---|---|
| | **Not employed** | **Employed** | **Total** |
| Negative | 28 | 13 | 41 |
| | 68.29 | 31.71 | 100.00 |
| | 87.50 | 76.47 | 83.67 |
| | 57.14 | 26.53 | 83.67 |
| CIN I | 2 | 1 | 3 |
| | 66.67 | 33.33 | 100.00 |
| | 6.25 | 5.88 | 6.12 |
| | 4.08 | 2.04 | 6.12 |
| CIN II | 2 | 3 | 5 |
| | 40.00 | 60.00 | 100.00 |
| | 6.25 | 17.65 | 10.20 |
| | 4.08 | 6.12 | 10.20 |
| Total | 32 | 17 | 49 |
| | 65.31 | 34.69 | 100.00 |
| | 100.00 | 100.00 | 100.00 |
| | 65.31 | 34.69 | 100.00 |

As depicted in Table 9; there are 10.2% of CIN II and 6.82% of CIN I among non-married women, with a total of 83.67% of negative among both married and non-married.

**Table 9.** Observations of Participants with Regard to Pap smear and Marital Status

| **Pap Smear/ HPV Status** | **Marital Status** | | |
|---|---|---|---|
| | **Non-married** | **Married** | **Total** |
| Negative | 36 | 5 | 41 |
| | 87.80 | 12.20 | 100.00 |
| | 81.82 | 100.00 | 83.67 |
| | 73.47 | 10.20 | 83.67 |
| CIN I | 3 | 0 | 3 |
| | 100.00 | 0.00 | 100.00 |
| | 6.82 | 0.00 | 6.82 |
| | 6.82 | 0.00 | 6.82 |
| CIN II | 5 | 0 | 5 |
| | 100.00 | 0.00 | 100.00 |
| | 11.36 | 0.00 | 11.36 |
| | 10.20 | 0.00 | 10.20 |
| Total | 44 | 5 | 49 |
| | 89.80 | 10.20 | 100.00 |
| | 100.00 | 100.00 | 100.00 |
| | 89.80 | 10.20 | 100.00 |

Interpretation: It is stipulated that the hypothesis of no difference between pap smear and HPV status, we can conclude that there is no association between Pap smear and marital status (P-value: 0.3318) with Fisher test of 0.96 and alpha = 5%. With $r^2$ =0.02, the variation in marital status accounts 2% to Pap smears (Table 10).

**Table 10.** Test of Homogeneity and Association between Pap Smear/HPV and Marital Status

| **Pap Smear/HPV Status** | **Coef.** | **Std. Err** | **t** | **p> \|t\|** | **[95% Conf. Interval]** |
|---|---|---|---|---|---|
| Marital Status | -.2954545 | .3013181 | -0.98 | 0.332 | -.9016284 .3107193 |
| | .2954545 | .0962525 | 3.07 | 0.004 | .1018194 .4890897 |

- Ho: diff = 0;
- Ha: diff < 0 Ha: diff ≠ 0 - Ha: diff > 0
- Number of obs = 49 - R-squared = 0.0200
- F (1, 47) = 0.96 - Adj R-squared = -0.0008
- Prob > F = 0.3318 - Root MSE = .63847

Interpretation: Considering the hypothesis of no difference between pap-smear and HPV status, we can conclude that there is no association between Pap smear and marital status (P-value: 0.2270) with a Fisher test of 1.5 and alpha = 5%. With $r^2$ = 0.0309, the variation in the viral load accounts for 3.09 % to Pap smear (Table 11).

**Table 11.** Test of Homogeneity and Association between Pap Smear/HPV and Viral Load

| **Pap Smear/HPV Status** | **Coef.** | **Std. Err** | **t** | **p> \|t\|** | **[95% Conf. Interval]** |
|---|---|---|---|---|---|
| Viral Load | -.1170213 | .0955849 | -1.22 | 0.227 | -.3093133 .0752707 |
| | .3297872 | .1048859 | 3.14 | 0.003 | .1187839 .5407905 |

- Ho: diff = 0;
- Ha: diff < 0 Ha: diff ≠ 0 - Ha: diff > 0
- Number of obs = 49 - R-squared = 0.0309
- F (1, 47) = 1.50 - Adj R-squared = -0.0103
- Prob > F = 0.2270 - Root MSE = .63492

Interpretation: based on the hypothesis of no difference between pap-smear and HPV status, we can conclude that there is no association between Pap smear/HPV smear and Oral contraceptive pills in 5 years (P-value: 0.9607) with Fisher test of 0.00 and alpha = 5%. With $r^2$ = 0.0001, the variation in oral contraceptives and pills in 5 years status accounts for 0.01% of Pap smear (Table 12).

**Table 12.** Test of Homogeneity and Association between Pap Smear/HPV and Oral Contraception in 5 years

| **Pap Smear/ HPV Status** | **Coef.** | **Std. Err** | **T** | **p> \|t\|** | **[95% Conf. Interval]** |
|---|---|---|---|---|---|
| Oral contraceptive pills in 5 years | -.0166667 | .3365009 | -0.05 | 0.961 | -.6936192 .6602858 |
| | .2666667 | .0961431 | 2.77 | 0.008 | .0732517 .4600817 |

- Ho: diff = 0;
- Ha: diff < 0 Ha: diff ≠ 0 - Ha: diff > 0

- Number of obs = 49
- F (1, 47) = 0.00
- Prob > F = 0.9607
- R-squared = 0.0001
- Adj R-squared = -0.0212
- Root MSE = .64495

Interpretation: Knowing the hypothesis of no difference between pap-smear and HPV status, we can conclude that there is no association between Pap smear and Circumcised Partners status (P-value: 0.9183) with Fisher test of 0.96 and alpha = 5%. With $r^2$ =0.0002, the variation in circumcised and partners' status accounts for 0.02% to Pap smear. With $r^2$ = 0.0002, the variation in marital status accounts for 0.02% to Pap smear (Table 13).

**Table 13.** Test of Homogeneity and Association between Pap smear/HPV and Circumcised Partners

| **Pap Smear/ HPV Status** | **Coef.** | **Std. Err** | **T** | **p> \|t\|** | **[95% Conf. Interval]** |
|---|---|---|---|---|---|
| Circumcised Partners status | .0197133 | .191103 | 0.10 | 0.918 | -.3647364 .404163 |
| | .2580645 | .1158259 | 2.23 | 0.031 | .0250528 .4910762 |

- Number of obs = 49
- F(1, 47) = 0.01
- Prob > F = 0.9183
- R-squared = 0.0002
- Adj R-squared = -0.0210
- Root MSE = .64489

Interpretation: based on the hypothesis of no difference between pap-smear and HPV status, we can conclude that there is no association between Pap smear and Tobacco consumption (P-value: 0.4486) with Fisher test of 0.58 and alpha = 5%. With $r^2$ =0.0123, the variation in Tobacco consumption accounts for 1.23% to Pap smear (Table 14).

**Table 14.** Test of Homogeneity and Association between Pap Smear/HPV and Tobacco Consumption

| **Pap Smear/ HPV Status** | **Coef.** | **Std. Err** | **T** | **p> \|t\|** | **[95% Conf. Interval]** |
|---|---|---|---|---|---|
| Tobacco consumption | .2555556 | .3344387 | 0.76 | 0.449 | -.4172483 .9283594 |
| | .2444444 | .0955539 | 2.56 | 0.014 | .0522148 .4366741 |

- Number of obs = 49
- F(1, 47) = 0.58
- Prob > F = 0.4486
- R-squared = 0.0123
- Adj R-squared = -0.0087
- Root MSE = .641

Interpretation: based on the hypothesis of no difference between pap-smear and HPV status, we can conclude that there is no association between Pap smear and Employment Status (P-value: 0.2457) with Fisher test of 1.38 and alpha = 5%. With $r^2$ = 0.0286, the variation in employment status accounts for 2.86% to Pap smear (Table 15).

**Table 15.** Test of Homogeneity and Association between Pap Smear/HPV and Employment Status

| **Pap Smear/ HPV Status** | **Coef.** | **Std. Err** | **T** | **p> \|t\|** | **[95% Conf. Interval]** |
|---|---|---|---|---|---|
| Employment Status | .2242647 | .1907842 | 1.18 | 0.246 | -.1595436 .608073 |
| | .1875 | .1123748 | 1.67 | 0.102 | -.0385689 .4135689 |

- Number of obs = 49
- F(1, 47) = 1.38
- Prob > F = 0.2457
- R-squared = 0.0286
- Adj R-squared = -0.0079
- Root MSE = .63569

Interpretation: In regard of the hypothesis of no difference between pap smear and HPV status, we can conclude that there is no association between Pap smear and age (P-value: 0.8449) with Fisher test of 0.8449 and alpha=5%. With $r^2$ =0.0008, the variation in age accounts for 0.08% to Pap smear (Table 16).

**Table 16.** Test of Homogeneity and Association between Pap smear/HPV and Age

| Pap Smear/ HPV Status | Coef. | Std. Err | t | p> \|t\| | [95% Conf. Interval] |
|---|---|---|---|---|---|
| Age | .0207424 | .1054368 | 0.20 | 0.845 | -.1913692 .2328539 |
| | .2106987 | .292459 | 0.72 | 0.475 | -.3776529 .7990503 |

- Number of obs = 49
- F(1, 47) = 0.04
- Prob > F = 0.8449
- R-squared = 0.0008
- Adj R-squared = -0.0204
- Root MSE = .6447

Interpretation: based on the hypothesis of no difference between pap smear and HPV status, we can conclude that there is no association between Pap smear and CD4 Count (P-value: 0.6378) with Fisher test of 0.22 and alpha=5%. With $r^2$ =0.0048, the variation in CD4 count accounts for 0.48% to Pap smear (Table 17).

**Table 17.** Test of Homogeneity and Association between Pap smear/HPV and CD4 Count

| Pap Smear/ HPV Status | Coef. | Std. Err | t | p> \|t\| | [95% Conf. Interval] |
|---|---|---|---|---|---|
| CD4 Count | -.1167665 | .2464483 | -0.47 | 0.638 | -.6125566 .3790237 |
| | .3892216 | .2772195 | 1.40 | 0.167 | -.1684721 .9469152 |

- Number of obs = 49
- F(1, 47) = 0.22
- Prob > F = 0.6378
- R-squared = 0.0048
- Adj R-squared = -0.0164
- Root MSE = .64343

## Discussion

### Prevalence of Cervical Cancer & Human Papilloma and Risk Evaluation among HIV Positives Women

The finding of this study could not identify patient with positive cervical cancer results among the 8 cases with Cervical Dysplasia from our sample size of 49 analysed. This situation is justified by some raisons such as long waiting time from Pap smear to diagnosis of cervical cancer estimate to range between 8 months to 13 months in the Namibian setting [19] In addition to high number patients lost for follow up due the long waiting period to have final diagnosis and treatment.

The prevalence of cervical cancer could not be determined in this study since there were no case of cervical cancer identified from our sample which is also small to accurately avail such result in the context of our selected environment. Hence, the prevalence of Human Papilloma virus (HPV) infection from this study is 16.32% (Table 2).

There was no possibility to compare the prevalence of Cancer among HIV patient with severely compromised immunity and those with improved immune status since our results are inconclusive about the prevalence in this research. Yet, with the calculated prevalence Human Papilloma (HPV) of 16.32% percentage, the proportion of patients tested Negative for Human Papilloma Virus (HPV) is 83.67%. Only 4% and 10.2% of client with CIN I and CIN II respectively with suppressed Viral Load or target not detected (Table 4).

## Linkage of Risks Factors of Cervical Cancer & Human Papilloma (HPV) and Incidence among People Living with HIV

### Age

The incidence of Human Papilloma infection and cervical cancer is very rare in women below the age of 20 years, irrespective of their HIV positive. Most women with pre-cancerous lesions or CIN from this sample are between the age of 30 to 49 years (Table 2), with an increased incidence rate among women older than 65 years, accounting for more than 15% of new cases [35]. According to our findings, 30.6% of women between the age of 30 to 39 years had negative results for Human Papilloma Virus, ad those between the age of 40 to 50 years represented 28.5% of negatives cases, while those with CIN II represented 4% of women between the of 30 to 39years and 4% of women between 40 to 50 years and those above 50 years represented 2%. Despite the small size of our sample, the median age for HPV is around 40 years (table 2), and the estimated median age for HPV is generally estimated around 49 years [16]. Unfortunately, it was not possible to estimate the median age for cervical form this study due the unavailability of positive cases of invasive cancer from this sample. Pap smear screening is not recommended among HIV negative women of less than twenty years due to low incidence of Human Papilloma Virus incidence and cervical cancer; however, HIV positive patients should under cervical screening every year [19]. According to the analysis (Table 2), none of the women below 20 years had a positive Human Papilloma Virus Infection; therefore I support the practice of discouraging pap smear screening in women of less than 20 years unless those with positive HIV status.

### Tobacco

According to the Cancer Research of the United Kingdom, people who smoke stand a greater chance of developing cancer of several organs such as the lungs, uterus, and oral cavity. The risk increases proportionally to the duration of the smoking habit and the daily quantity of cigarette sticks taken [5]. The analysis of that collected in this study reveals that there were very few smokers in our sample, with a mean of 0.81 (Table 1). Only 4 women were smokers among the cases selected for our sample. Out of the four, it was also noted that only one of them had positive results for Human Papilloma Virus. From this finding, it is difficult to conclude that HIV-positive women who smoke have a greater chance of developing Human Papilloma and Cancer of the cervix virus in the Health District of Namibia.

### Parity

The risk of acquiring Cervical Cancer is increased in women with high parity (multiparous); therefore, women who only have one child(primigravida) and Nulliparous stand a very low chance of acquiring Human Papilloma Virus and uterine Cancer [5]. According to Table 3, most women who tested Negative for Human Papilloma Virus infection are multiparous, representing 40%. It was noted that 2% of multiparous had CIN II, and 4% of them were primigravida. Based on our findings, it is not possible to conclude that multiparous stand an elevated risk of developing cervical cancer since the prevalence is zero and many of them had negative Human Papilloma Virus results. However, primigravida also stands a chance of developing CIN II and represents 4% of all CIN II cases.

### Multiple Sexual Partners and Sexual Transmitted Infection

Women who are involved in unprotected sexual intercourse with multiple partners can easily contract HIV and various Sexual transmitted diseases such as syphilis, gonorrhoea, chlamydia, Herpes simplex, genital ulcers, and Human Papilloma Virus infection that can further progress to uterine cancer [14]. The results from (Table 5) reveal that most of the women who developed CIN II had more than 5

partners, and 6.12% of those who had CIN I had a number of partners ranging from 3 to 5. These results clearly attest that people who have more Sexual partners are on the risk of developing Human Papilloma Virus infection that can eventually progress to invasive cervical cancer.

**Uncircumcised Sexual Partner**

According to UNAIDS, the man who are circumcised have a reduced risk of acquiring HIV by 60% and reduces the risk of their female sexual partner acquiring Human Papilloma Virus infection and develops cancer of the cervix [42]. Based on results from table 4.6, 83,6% of women who had negative results for pap smear had circumcised sexual partners, while 6,12% of those who had CIN II and 4,08% of those with CIN I had uncircumcised sexual partners. These results match with the above conclusion from UNAIDS.

**Oral Contraceptive**

There is an increased chance of developing Cervical Cancer among those on oral contraceptives for ten years [5]. Our analysis found that 10,2% of women who had CIN II were smokers, while 4% of those with CIN I were also smoking.

**Poor Socio-economic Status**

Women with poor socio-economic status are on higher risk of acquiring Human Papilloma Virus infection and cancer of the uterus at later stage [14]. The selected variable that helped us to level the economic status was the employment status, considering that employed women have a better socio-economic status than the unemployed since there are very few married women in this sample. According to Table 8, it was noted that 4% of women with CIN II were unemployed versus 6,12% of employed while 4% of those with CIN I were employed versus 2% of employed.

## Marital Status

Single women have higher number of sexual partners in comparison to married women who mostly stick to one partner, and therefore, they have a reduced chance of acquiring HIV, HPV, and other STIs [14]. According to Table 4.9, there are 10,2% of CIN II and 6,82% of CIN I among non-married women, while 83,67 % represent the group of married and non-married women. The results concur with the fact that women with multiple partners are at high of HPV and Cervical Cancer; therefore, married women have reduced of Cancer and HPV.

**Interpretation of the Findings**

With a sample of 49 participants, it was discovered that no women were tested positive for cervical cancer. Therefore, determining the prevalence of Cervical Cancer among female HIV positive at Omaruru Health District in Namibia was found not to be conclusive. In this analysis of 49 people.

The undetermined prevalence from this study is due to the sample size, which appear to be small especially in Namibian context were the time from the date of pap smear to the date of release of biopsy result and access to treatment is around 8 to 13 months. In addition, this research was a cross-sectional study, which simply means it was just a snapshot of the selected population. Although there was no positive result for Cervical cancer among the 49 women screened for pap smear, however it was discovered that 8 participants had Cervical Dysplasia (CIN) or positive result of Human Papilloma Virus (HPV) well known has man agent that causes invasive Cervical cancer. The prevalence of Human Papilloma Virus was 16,32 and proportion for Cervical dysplasia was 3 cases of CIN I and 5 cases of CIN II. From our literature review, it was noted that all risk factors considered as variables in our analysis were not linked to increased chance of Human Papilloma virus and Cervical Cancer. Hence, the results of this study did not conclude that multiparous have an increases risk chance of acquiring HPV but reveal that it also possible to have cervical dysplasia (CIN II) in primigravida. Furthermore, this research did not reach a conclusive opinion

with regard chance of HPV and invasive cervical cancer among women who smoke in Omaruru Health District of Namibia.

### Limitation of the Study

This study could not identify positive cases of cervical Cancer among HIV-positive women who were randomly selected to form our sample of 49. This difficulty could not allow the calculation of the cervical cancer prevalence on the selected population and establish the risk association linkage the factors. However, we managed to calculate the HPV prevalence and establish it association with the risk factors. The size of the sample (small), the type of the study in line with the type of frame of the research, and the timeline for cervical cancer results could not help establish a clear associative relation of the factors and cervical cancer. The data collection source doesn't capture indicators of the environment like rural and urban area of residence.

### Implication of the Findings on Public Health

Discovering that there was no case of cervical cancer among 49 HIV positive patient on treatment after being screen with Pap smear, it shows that there is a need to intensify cervical cancer screening on this population group and reduce the time for diagnostic due their vulnerability. Another screening method which are more sensitive and specific than pap smears such as VIA or HPV testing would reinforce this process of case detection in Namibia. Since anti-retroviral treatment reduces the chance of acquiring cancer of the cervix [16], healthcare workers and people living in HIV are encouraged to strictly adhere well to their medication to ensure viral load suppression as noted among women who formed our sample. The degree of association between selected risk factors and the incidence of HPV can clearly tell that the public should consider implementing all precautions and measures to reduce exposure to such factors.

## Conclusion

To conclude, this research was not able to determine the prevalence of cervical cancer among HIV positives women on treatment at the Omaruru District Hospital in Namibia with a sample size of 49 patients randomly selected from the pap smear register. Without the said prevalence, it was also impossible to establish the risk association between selected risk factors and the prevalence we do not have after data analysis.

The size of the sample and the long timeframe to access cervical cancer results may be considered as the major contributing elements that did not let us reach a conclusive outcome in line with the study's objectives. Nevertheless, these limiting factors could not stop the calculation on the prevalence of Human Papilloma Virus and elaborate the risk associated with the influencing factors. After saying that, it was noted that most of the patients from our sample were doing well on anti-retroviral treatment based on viral load suppression indicators. Data analysis revealed that the prevalence of Human Papilloma Virus was estimated at 16.3%. There is an increased risk of acquiring the Human Papilloma Virus in people among women of more than 40 years and a very low chance for those under 20 years. According to the WHO report of 2017 there is an elevated risk of pre-cancerous lesions of cervical cancer among women aged between 30 years and 49 years. It is recommended to conduct yearly screening with visual inspection with acetic acid (VIA) [16].

The said risk is found to be high among women who have elevated viral load, those with uncircumcised sexual partners, using oral family planning, multiple sexual partners and unmarried, and those unemployed. However, the few smokers from this sample did not show to have an increased chance of HPV, and the same applied to multiparous women. Hence, it was discovered that some primigravida also stands a chance of developing grade two cervical dysplasia (CIN II), which is very unusual.

Employment status appears to be a confounding variable even though it was used as an indicator of social-economic status since some clients may be employed with very low income and poor socio-economic living status.

### Recommendation

The Ministry of Health of Namibia should strengthen cervical cancer screening among HIV positives women since it appears like that this screening is not constantly facility like Omaruru District Hospital, and there is no proper mechanism to ensure that results of pap smear are availed on time close monitoring of patients with cervical dysplasia. As illustrated in our data analysis, none of the 8 women with CIN was referred for colposcopy or biopsy to confirm the diagnosis of cervical cancer. I would also recommend that workers from the laboratory consider all cases of CIN as a special case by urgently reporting to clinicians. From pap, there are more vulnerable to Human Papilloma Virus infection that can easily progress to invasive cancer of the cervix. There is a need to reduce the timeframe between pap smear and colposcopy or biopsy results to facilitate early diagnosis and anticipate treatment. Adopting a more sensitive and specific screening method, such as Visual Inspection with Acetic Acid (VIA) the management of the patient with abnormal results. Implementing this great intervention will require the change of policy by replacing pap smear with VIA as first-line screening test for cervical cancer.

Furthermore, healthcare workers are encouraged to screen all HIV-positive women for Human Papilloma Virus irrespective of their parity, age, and socio-economic background. With a prevalence of 16,38% for a small sample of 49 people (Table 2), it is alarming and requires improvement in spreading awareness messages about risk factors in the general population.

As a preventive measure to mitigate the incidence of cervical cancer in the general population would highly recommend the ministry of health of Namibia to adopt cervical cancer vaccination as part of the routine immunization calendar to all Namibian women. According to the World Health Organization report of 2017, cervical cancer vaccination should be offered to girls of age between 8 and 13years [16].

Since this study could not offer an answer to the research question, I would advocate that another research could be done at the Omaruru state Hospital of Namibia by other researchers with the same topic, considering a bigger sample with well-updated data collection sources considering a period longer than 13 months. I would also suggest that a prospective study to be conducted in the same environment or elsewhere in Namibia by using more sensitive and specific cervical cancer screening methods such as VIA or HPV tests. VIA and HPV tests are more preferred tests than Pap Smear due to their sensitivity and specificity rate, therefore, VIA is the best method that can be used to screen and immediately treat abnormal lesions on the cervix on the same day [16].

## Conflict of Interest

There is no conflict of interest with the content of this research paper.


## Acknowledgements

I would like to acknowledge Dr. Tolu Osoba, Dr. Honore Mitonga, Dr. Mangoya and Dr. Jonathan Tshimwangana for their support, contribution, and technical expertise in data analysis and write-up of this research. In addition to that, I recognize Ms. Feni Kandalama, Ms. Helini Nangolo, Mr. Leon Feya, and the Staff working at the Omaruru ART clinic for their collaboration in the data collection process.

## References


[1] Center of Control Diseases (CD, 2016). Cervical Cancer. Available at: https://www.cdc.gov/cancer/cancer. Access date (20/12/2017).

[2] Odendal L. (2011). Anti-retroviral therapy reduces the risk of progression to cervical cancer in women with HIV. Available at: http://www.aidsmap.com/Cervical-cancer-in-women-with-HIV/page/1669155/data. Access data (23/02/2018).

[3] Center of Disease Control (CDC,2015). Global Statistics. Available at: https://www.hiv.gov/overview/data-and-trends/global-statistics. Access date (20/02/2018).

[4] Siegel RL, Miller KD and Jemal. A (2016). Cancer statistics. Cervical cancer screening and prevention. Available at: contemporaryobgyn.modernmedecine.com/contemporary-obgyn/news/. Access date (20/02/2018).

[5] Cancer Research UK (2017). Publications. Available at https://publications.cancerresearchuk.org. Access date (23/02/2018).

[6] Global Cancer Statistics (2017). CANSA. Available at: www.cansa.org.za/global-cancer-statistics. Access date (23/02/2018).

[7] World Health Organization (WHO,2012). Human Papillomavirus (HPV) and Cervical Cancer. Available at: https://www.who.int/mediazantre/factsheets/fs380. Access date (19/02/2018).

[8] Scott Dryden-Peterson, Memory Bvochora-Nsingo, Gita Suneja, Jason A. Efstathiou, Surbhi Grover, Sebathu Chiyapo, Doreen Romagola-Masire, Malebogo Kebabonye-Pusoentsi, Rebecca Clayman, Abigail C. Mapes, Neo Tapea, Aida Asmelash, Heluf Medhin, Akila N. Viswanathan, Anthony H. Russel, Lilie L. Lin, Mukendi Kss.A. Kayembe, Mompati Mmalane, Thomas C. Randall, Bruce Chabner and Shahin Lockman (2016). Journal of Clinical Oncology: HIV infection and survival among women with Cervical Cancer. Available at http://ascopubs.org/doi/abs/10.1200/JCO.2016.67.9613?journalCode=jco (Access date 24/05/2017).

[9] Ramadhani S. Chambuso, Stephen Shadrack, Salum J. Lidenge, Ntoli Mwakibete and Rui M. MedeirosShowMore. Influence of Hiv/AIDS on Cervical Cancer (2015). A Retrospective Study from Tanzania. Available at: https://ascopubs.org/doi/abs/10.12oo/JGO.2015.002964. Access date (12/12/20117).

[10] Center of Disease Control (2010). Cervical Cancer Screening for Wh017o women attends STD Clinic. Available at: http://wwwcdc.gov/sts/treatment/2010/cc-screening.htm.Accessdate .05/06/2.

[11] Contemporaryobgyn.modernmedecine.com/contemporary-obgyn/news/. Access date (20/02/2018). Division of STD Prevention (1999). Prevention of genital HPV infection and sequelae: report of an external consultants' meeting. Atlanta, GA: Centers for Disease Control and Prevention. Retrieved December.

[12] Anorlu RI. Cervical cancer: the sub-Saharan African perspective. 2008;16(32):41–9. *Available at* https://www.cdc.gov/vitalsigns/pdf/2014-11-vitalsigns.pdf(accessed *date 06/06/2017).*

[13] National Cancer Institute (2016). HIV and Cervical Cancer Risk. Available at :http://journal.waocp.org/article_47592_359eb14730d5a9bd14e2b38745e045a4.pdf. Access date (12/12/2017).

[14] Center of Disease Control (CDC,2017). Cervical cancer screening recommendation and considerations. Available at: https://www.cdc.gov/cancer/knowledge/provider-education/cervical/recommendations.htm .Access date (19/02/2018).

[15] CDC (2014).VitalSigns - Cervical Cancer is Preventable Available at https://www.cdc.gov/vitalsigns/pdf/2014-11-vitalsigns.pdf(accessed date 06/06/2017*).*

[16] World Health Organization (WHO,2017). Guideline for screening and treatment of pre-cancerous lesion for cervical cancer prevention. Available at :http://apps.who.int/iris/bitstream/handle/10665/94830/9789241548694_eng.pdf;sequence=1.Access date (24/03/2017).

[17] Namibia Human Papilloma virus and Related Cancers, Fact Sheet. 2014; [online] [cited available http://www.hpvcentre.net/statistics/reports/NAM_FS .pdf.(Access date 28/10/2017).

[18] Rosser (2016). Less than half of cervical cancer patients receive standard of care. Available at: Scott Dryden-Peterson, Memory Bvochora-Nsingo, Gita Suneja, Jason A. Efstathiou, Surbhi Grover, Sebathu Chiyapo, Doreen Romagola-Masire, Malebogo Kebabonye-Pusoentsi, Rebecca Clayman, Abigail C. Mapes, Neo Tapea, Aida Asmelash, Heluf Medhin, Akila N. Viswanathan, Anthony H. Russel, Lilie L. Lin, Mukendi K.A. Kayembe, Mompati Mmalane, Thomas C. Randall, Bruce Chabner and Shahin Lockman (2016). *Journal of Clinical Oncology*: HIV infection and survival among the woman with Cervical Cancer. Available at http://ascopubs.org/doi/abs/10.1200/JCO.2016.67.9613?journalCode=jco (Access date 24/05/2017).

[19] Namibia Cancer Registry (2015). Namibia cancer association available at: http://www.can.org.na/cancer-registery/.Access date (09/02/2018).

[20] United Nations AIDS(UNAIDS,2010). Voluntary Medical Male Circumcision for HIV prevention. Available at: https://www.avert.org/professionals/hiv-programming/prevention/voluntary-medical-male-circumcision. Access date (10/03/2017).

[21] Zapata JM, Shabaik, A, .Gascoyne R. (2017). Cervical cancer is the most common gynecological malignancy. Available at: onlinelibrary.wiley.com/doi/10.1002/cam4.994/full. Access date (22/02/2018).

[22] AIDSMAP (2015). Cervical cancer in women with HIV. Available at http://www.aidsmap.com/Cervical-cancer-in women-with-HIV/page/1669155/ (Access date 24/05/2017).

[23] Clifford G; Franceschi S, Diaz M, Munoza N, V illa LL(2006). HPV type-distribution in women with and without cervical neoplastic Diseases. Available at: https://www.ncbi.nlm.nih.gov/pubmed/16950015. Access date (26/10/2017).

[24] Gilmore T. (2014). Cervical Cancer, Cervical polyp and cervicitis. Available at: https://www.healthgrades.com/physician/dr-tedra-gilmore-yhhwh .Access date (09/02/2018)

[25] Urasa and Darj (2011).Knowledge of cervical cancer and screening practices of nurses at a regional Hospital in Tanzania. *Available at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3092321/(accessed *date 05/06/2017).*

[26] Mbulaiteye SM, Katabira ET, Wabinga H, et al. Spectrum of cancers among HIV-infected persons in Africa: the Uganda AIDS-Cancer Registry Match Study. *Int J Cancer*. 2006;118(4):985-990. Available at: http://www.ncbi.nlm.nih.gov/pubmed/16106415.

[27] Frisch M, Biggar RJ, Goedert JJ. Human papillomavirus-associated cancers in patients with human immunodeficiency virus infection and acquired immunodeficiency syndrome. *J Natl Cancer Inst.* 2000;92(18):1500-1510. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10995805. Access date (19/04/2018).

[28] Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. Int J Cancer. 2010;127(12):2893–917. View Article PubMed Google Scholar.

[29] De Vuyst H, Alemany L, Lacey C, Chibwesha CJ, Sahasrabuddhe V, Banura C, et al. The burden of human papillomavirus infections and related diseases in sub-Saharan Africa. Vaccine. 2013;31 Suppl 5:F32–46.View ArticlePubMed Central.Access date(23/02/2018)

[30] UNAIDS (2014).Africa Cervical Cancer Incidence & Mortality Multi Indicator ... *Available at* http://www.who.int/pmnch/media/events/2014/africa_cancer_mortality.pdf(accessed date 06/06/2017) United Nat.

[31] Namibia Fact Sheet. (2014). Millennium challenges account Namibia. Available at http://www.mcanamibia.org/files/files/Zambesi%20FactSheet%202014Final.pdf (Access date 21/12/2017).

[32] Serraino Diego;Dal Maso Luigino;La Vecchia Carlo; Franceschi; Silvia (2003).Invasive Cervical cancer as an AIDS-defining illness in Europe. Available at : https://www.bing.com/search?q=SERRAINO+2003%2C+CERVICAL+CANCER+AND+HIV&qs=n&f

orm=QBRE&sp=-1&pq=serraino+2003%2C+cervical+cancer+and+hiv&sc=0-38&sk=&cvid=C2DF915056A14BD3B7D9819F7C3344A5.Access date(14/04/2018).

[33] CDC (2013). Cervical Cancer Statistics. Available at https:// www.cdc.gov/cancer/cervical/statictiss/ (Access date 07/06/2017).

[34] Chatterjee (2014). A Cross Sectional Study on Knowledge, Attitude and Practice related to Human Papillomavirus Vaccination for Cervical Cancer Prevention between Medical and Non-Medical Students in Hong Kong.

[35] Every woman Counts (2017). Cervical Cancer prevention information. Available at: http://www.dhcs.ca.gov/services/Cancer/ewc/Pages/default.aspx. Access date (13/03/2018).

[36] United Nation AIDS (UNAIDS, 2007). Male circumcision. Available at http://data.unaids.org/pub/report/2007/jc1360_male_circumcision_en.pdf. Access date (02/02/2018).

TEXILA INTERNATIONAL JOURNAL

ejournal.assist@tau.edu.gy

www.texilajournal.com