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2. **Dimkpa U**, Ezeike CC, Maduka SO, Ukoha UU, Anikeh LC, Uchefuna RC. Sex differences in heart rate responses to sub-maximal exercise in young adults. *Comparative Exerc Physiol*, 2015; 11(1): 9-16. <https://doi.org/10.1007/s00109011021>
3. Ogunbosi BO, Alao MA, Ibrahim OR, Ayuk AC, Ibraheem RM, Odimegwu CL, et al. COVID-19 vaccine hesitancy in six geopolitical zones in Nigeria: a cross-sectional survey. *Pan Afr Med J* 20 2 2 ; 4 2 (1 7 9) . <https://doi.org/10.11604/pamj.2022.42.179.34135>

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- Hirsch IH. Male Hypogonadism. In *Male Reproductive Endocrinology and Related Disorders*. MSD Manual, 2019. Available at <https://www.msmanuals.com/en-pt/professional/genitourinary-disorders/male-reproductive-endocrinology-and-related-disorders/male-hypogonadism>. Accessed on 2nd September, 2020

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CONTENTS

EDITORIAL TEAM	I
AUTHOR'S GUIDELINES	iii
CONTENTS	vii
ANTIMICROBIAL ACTIVITIES OF AQUEOUS EXTRACT OF RIPE <i>ANNONA MURICATA</i> LINN. (SOORSOP) FRUIT PULPON CLINICAL ISOLATES	1 8
ASSESSMENT OF BIOMARKERS OF RENAL FUNCTION IN LEPROSY PATIENTS IN OSSIOMO – OGAN, EDO STATE, NIGERIA	9 19
ATTITUDE, PERCEPTION AND PRACTICE AND BARRIERS OF PHYSIOTHERAPISTS TOWARDS THE ASSESSMENT AND MANAGEMENT OF RISK FACTORS OF LIFESTYLE-RELATED DISEASES: A CROSS-SECTIONAL SURVEY	20 28
BACTERIAL CONTAMINATION AND ANTIBIOGRAM OF ISOLATES FROM THE HANDS OF UNDERGRADUATE STUDENTS AND FOMITES AT NNAMDI AZIKIWE UNIVERSITY NNEWI CAMPUS ANAMBRA STATE	29 32
ELEVATED INTER-ARM BLOOD PRESSURE DIFFERENCE: LEVELS AND CORRELATES AMONG STROKE SURVIVORS	33 39
MOLECULAR DETECTION OF CEFOTAXIMASE MUTANT (CTX-M) RESISTANT <i>ACINETOBACTER BAUMANNII</i> IN A TERTIARY CARE HOSPITAL IN SOUTHEAST NIGERIA	40 46
SOCIO-ECONOMIC STATUS OF STROKE SURVIVORS AND PEOPLE LIVING WITH OSTEOARTHRITIS IN PORT HARCOURT METROPOLIS, RIVERS STATE	47 52
THE PREVALENCE OF INTESTINAL PARASITES AND IMPACT OF CRYPTOSPORIDIUM INFECTION AMONG DIARRHOEAL - INFECTED HIV PATIENTS VISITING THE SPECIALIST HOSPITAL, BENIN-CITY, EDO STATE, NIGERIA	53 62
THE USE OF GENE XPERT MTB/MTB RIF ASSAY IN THE DIAGNOSIS OF EXTRA-PULMONARY TUBERCULOSIS AT NAUTH, NNEWI	63 69
KNOWLEDGE AND PERCEPTION OF PRE-AND POST-OPERATIVE PHYSIOTHERAPY INTERVENTIONS AMONG MEDICAL DOCTORS IN TERTIARY HOSPITALS IN ANAMBRA STATE	70 80
JOB SATISFACTION AMONG NURSES IN TERTIARY HEALTH INSTITUTIONS IN EDO STATE NIGERIA	81 99

ANTIMICROBIAL ACTIVITIES OF AQUEOUS EXTRACT OF RIPE *ANNONA MURICATA* LINN. (SOURSOP) FRUIT PULP ON CLINICAL ISOLATES

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Abstract

Introduction: Antimicrobial resistance poses a great challenge and so is of great public health concern. Traditional healers employ a variety of medicinal plants, including *Annona muricata* Linn., to treat infectious diseases, especially those caused by multidrug resistant microorganisms.

Aim: To assess the antimicrobial properties of ripe *Annona muricata* Linn. fruit pulp against some clinical isolates.

Materials and Methods: Ripe *Annona muricata* Linn. fruit pulp, distilled water, and clinical isolates were used in this study. *Annona muricata* fruits was obtained from Nnewi, Anambra State, Nigeria. The in-vitro antibacterial and anti-fungal activities of aqueous extracts of ripe *Annona muricata* Linn. fruit pulp was determined using the agar disc diffusion technique. This investigation relied on use of both bacterial and fungal isolates. The organisms were collected from Nnamdi Azikiwe University Teaching Hospital Nnewi's stock culture. Cultures were transported to the laboratory by resuscitating them in peptone water, then sub culturing them into a nutrient agar medium and incubating them at 37°C for 24 hours. Data was presented using frequency counts.

Results: Aqueous extracts of ripe *Annona muricata* fruit pulp showed antibacterial and anti-fungal activity, with zones of inhibition diameter as large as 36mm for *Staphylococcus aureus* and 30mm for *Proteus spp.*, *Klebsiella spp.* (33mm), *Pseudomonas aeruginosa* (20mm), *E. coli* (24mm), *Candida albicans* (30mm) and *Aspergillus spp.* (30mm) all demonstrated considerable susceptibility to the ripe *Annona muricata* Linn. fruit pulp extracts.

Conclusion: The study concluded that the aqueous extracts of ripe *Annona muricata* Linn. fruit pulp exhibited some antimicrobial activity to both clinical bacterial and fungal isolates, which may explain why it is used locally to treat diarrhoea and other illnesses.

Keywords: *antimicrobial activity, Annona muricata, clinical isolates, aqueous extract*

Introduction

Antimicrobial resistance is increasing on a daily basis, necessitating the creation of novel antimicrobials¹. More so, hospital acquired infections have grown to a larger extent across the globe affecting humanity in the development of ailments as well as developing high resistance to drugs². Multidrug resistance is an important public health issue; importantly, the formation of multidrug resistant microorganisms is an evolutionary process based on selection for organisms with increased resistance to antibiotic dosages^{3,4}.

Because of the growing failure of chemotherapeutic agents and development of antibiotic resistance in pathogenic microorganisms⁵, which pose a critical public health challenge across the globe⁴; the quick emergence of bacteria resistance that occurs globally tends to endanger antibiotic efficacy⁶⁻⁸. Scientists are increasingly focusing on plant medicine, which entails screening a variety of medicinal plants for antimicrobial activity in search for breakthroughs to have better medications against microbial illnesses and its resistance^{9,10}.

Plants have gained significance in the treatments of various ailments globally, which results from their bioactive contents present^{11,12}. However, their pharmacological activities are linked to their secondary active metabolites present, such as terpenoids, flavonoids, saponins, etc, amongst others^{12,13}. *Annona muricata* L. is a medicinal plant of high significance, which has gained several pharmacological importance in scientific researches because of their secondary metabolite such as saponins, terpenoids, flavonoids, glycosides Etc.^{14,15}. Several pharmacological impact of the plants especially the fruits have been used to combat arthritis, diarrhea, and neuronal diseases¹⁴.

A report showed that the leaf and fruit skin of *A. muricata* possess remarkable activity with 15 – 17 mm inhibition diameter (DIH) against the test organisms¹⁶. Abdulsalami et al. indicated a significant inhibition against *S. aureus* and *S. typhi* following aqueous and ethanolic leaf extract of *Annona muricata*¹⁷. However, there are limited literatures following the antimicrobial impact of aqueous extract of ripe fruit of *Annona muricata* Linn. against some clinical isolates of bacteria pathogens, which the study investigates.

Materials And Methods
Plant collection and Identification: Ripe *Annona muricata* Linn. fruits were purchased from Nkwo market, Nnewi, Anambra State and were identified and authenticated by a Taxonomist in the Department of Botany, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria and was assigned a herbarium number (NAUH4^A) which was deposited in the herbarium catalogue.

Materials: The materials employed in the study were ripe fruits of *Annona muricata* Linn., electronic blender (QLINK Multifunction food processor, QMFP-128, Turinar Corp., Shang-Hai, China), Whatman filter paper (*Sigma Aldrich, WHA1001040, USA*), Wistar rats (*Rattus norvegicus*), rotatory evaporator (*Digital TT-52, Techmel & Techmel, USA*), thermostat oven (DHG-9023A PEC MEDICAL USA), incubator, autoclave, refrigerator (*100L NX150C, Nexus, Hong Kong*), measuring cylinder, beaker, Petri dishes, forceps, laboratory oven, Bunsen burner, wire loop, Nutrient agar (FLUMEDIA/HI FLOWN GLOBAL RESOURCES LTD), Sabouraud dextrose agar (SDA), clinical isolates of bacteria and fungi, and personal protective equipment (PPE).

Ethical Approval: Ethical approval was obtained from Faculty of Health Sciences and Technology, Nnamdi Azikiwe University, Nnewi campus, Nnewi Ethics Committee with reference number: NAU/FHST/2021/MLS66.

Extract Preparation

Ripe fruit of *Annona muricata* Linn, (soursop) was purchased from Eke Amobi market at Okofia community, Nnewi North Local Government Area, Anambra State, washed in running tap water to remove dirt and air-dried under ambient temperature. The ripe fruit of *Annona muricata* Linn. was cut open with a kitchen knife exposing the pulp and the seeds were removed. Two hundred and fifty gram (250g) of the fruit pulp was milled using an electronic blender in 400mls of lukewarm distilled water for 48hours. It was filtered using a clean handkerchief and further filtration was done using Whatman No.1 filter paper into a clean glass beaker.

The residue was weighed after filtering and the liquid was measured. The filtrate was concentrated using a thermostat oven (DHG-9023A PEC MEDICAL USA) at 45°C into a thick concentrate. The aqueous extract was preserved in airtight container and kept in a refrigerator at 4°C for further usage. The extraction method was done with modifications as described according to the method employed by Al-Attar and Abu Zeid¹⁸.

Samples collection of Clinical Isolates: Bacterial isolates from clinical samples (urine, HVS) were used for this study. The organisms were obtained from the stock culture of Nnamdi Azikiwe University Teaching Hospital Nnewi. Cultures were brought to the laboratory conditions by resuscitating the organisms in peptone water and thereafter sub-cultured into nutrient agar and Sabouraud Dextrose Agar (SDA) medium and incubated at 37°C for 24 hours and 2 weeks respectively. Pure cultures of bacteria and fungi from clinical samples were made on fresh media by repeated subculture on sterilized nutrient agar using streak plating techniques. Purified colonies were stored in slants of Bijou bottle at 4°C for 24 hours, and was characterized and identified using the standard taxonomic schemes of Cowen¹⁹.

Isolation and identification of organisms: After a proper culture of an organism, bacterial colonies were selected using their morphological characteristics (size, pigmentation, elevation, consistency)¹⁹. Fungi isolates was established after growth has been confirmed, where subcultures **were prepared using inocula from different** organisms in the mixed cultures to obtain a pure culture. It was done by transferring hyphal tips from the colony edge of the mixed cultures to fresh plates of SDA using flamed sterilized blades. After sub-culturing, the plates were incubated at 25°C until pure cultures were obtained. The Petri dishes of pure cultures of the test fungi were sealed tightly to prevent contamination. The resulting pure cultures were used for characterization, and subsequent identification of the fungi isolates with the aid of a compound microscope and identification guides²⁰.

Antimicrobial Activity and Quality Control: Agar disc diffusion method was used to determine the in-vitro antimicrobial activity of aqueous extracts of ripe *Annona muricata* Linn. Fruit pulp Nutrient Agar media for bacteria was prepared according to manufacturer's instruction (FLUMEDIA/HI FLOWN GLOBAL RESOURCES LTD).

Sabouraud Dextrose Agar(SDA) for fungal isolate was done according to the manufacturer's instructions (HIMEDIA/HiMedia Laboratories PVT. LTD India). The antibacterial activity was performed by filter paper disc diffusion technique²¹.

Filter paper disc (Whatman No.1,6mm diameter) was placed in glass Petri dishes and sterilized in hot air oven. The media (10g nutrient agar in 200ml distilled water, autoclaved at 115°C for 30 minutes) cooled to 50°C. The sterile nutrient agar medium was poured into the sterile Petri dishes and allowed to solidify. Pure bacterial isolate was swabbed with a sterile wire loop. Each 6mm diameter disc was impregnated with 0.2ml of aqueous plant extracts. The disc was used after drying them in an incubator at 40°C to remove any trace of solvent. Discs were introduced onto the surface of the medium using sterile forceps. The plates were incubated at 37°C for 24 hours to obtain zones of inhibition.

The study quality control (QC) was done by using standard operational procedure for laboratory investigation and media preparation. Sample collection were carried out using aseptic technique and the samples labeled properly. Cultures and isolation were done under aseptic conditions.

Data presentation: Tables and figures were used for data presentation. Table was used for presenting zone of inhibition diameter (mm) as observed for different microbial isolates against the aqueous extract of ripe *Annona muricata* Linn. fruit pulp, whereas the antimicrobial sensitivity plates for both bacterial and fungal isolates were presented as figures.

Results

Table 1: Anti-microbial activities of aqueous extracts of ripe *Annona muricata* Linn. fruit pulp at concentration of 0.2ml per 6mm diameter filter paper disc.

Micro organisms	Zone of Inhibition diameter (mm)for <i>Annona muricata</i> Linn. fruit pulp
	Aqueous Extract
<i>Staphylococcus aureus</i>	36
<i>Klebsiella spp.</i>	15
<i>Pseudomonas aeruginosa</i>	20
<i>Escherichia coli</i>	35
<i>Proteus spp.</i>	38
<i>Candida albicans</i>	24
<i>Aspergillus spp.</i>	25

KEY:

Zone of inhibition Diameter (mm)

< 14 - 25

26 - 32

33 - 8

Interpretive criteria

Resistant

Intermediate

Sensitive (susceptible)

Source: CLSI, (2012)²¹; cited in Okeke-Nwolisa *et al.* (2018)²²



PLATE 1: Culture plates before incubation

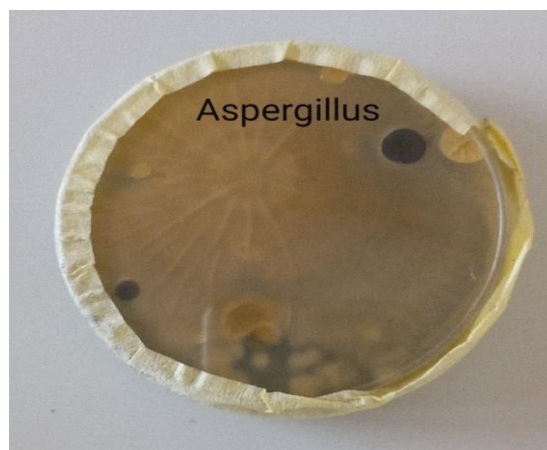


PLATE 2: *Aspergillus spp.* Sensitivity disc after incubation at 37°C for 2 weeks.

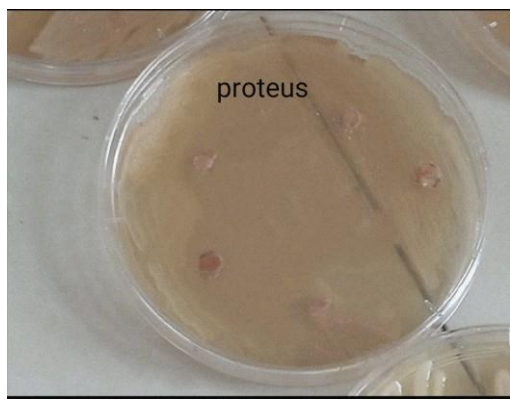


PLATE 3: *Proteus spp.* sensitivity after incubation 37°C for 24 hours.

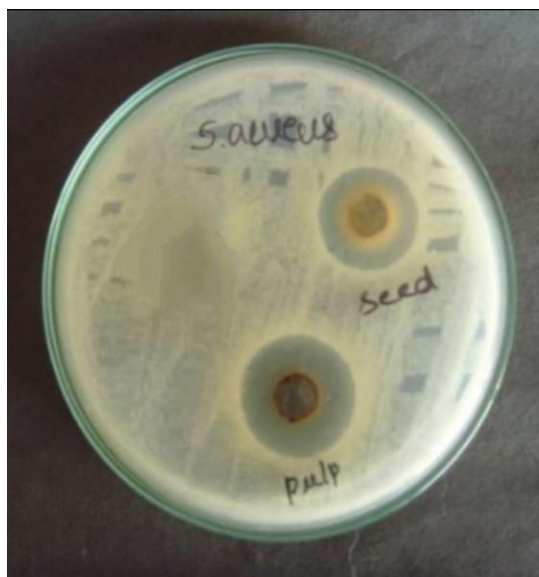


PLATE 4: *Staphylococcus aureus* sensitivity disc after incubation 37°C for 24 hours.

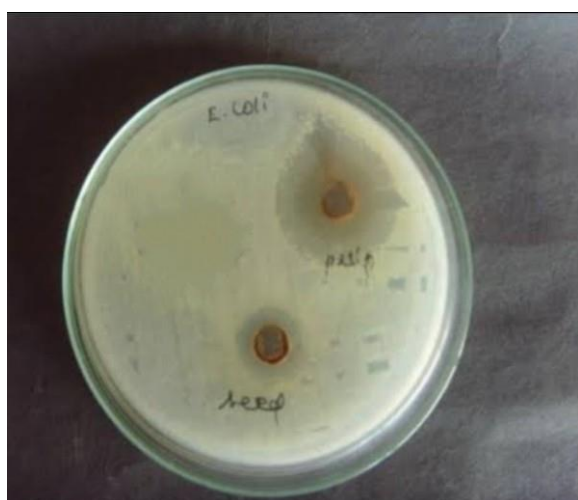


PLATE 5: *Escherichia coli* sensitivity disc after incubation 37°C for 24 hours.

Discussion

Medicinal plants are known for their significance in the management of bacterial and fungal infections because of the high antioxidant and antimicrobial activities they possess²². Interestingly, *Annona muricata* Linn. plant parts have medicinal values of great relevance in the scientific world^{23,24}. This study investigated the antimicrobial activities of aqueous extract of ripe *Annona muricata* Linn. Fruit pulp on clinical isolates. The study findings showed a considerable antimicrobial susceptibility of the test bacterial and fungal isolates to the aqueous extract of *Annona muricata* Linn. fruit pulp as indicated by zone of inhibition diameter in Table 1. for *S. aureus* (36mm; susceptible), *E. coli* (35mm; susceptible) and *Proteus spp.* (38mm; susceptible). However, some bacterial isolates and the fungal isolates showed zone of inhibition diameter within the resistant range as shown in Table 1 for *Klebsiella spp.* (15mm; resistant), *P. aeruginosa* (20mm; resistant), *Candida albicans* (24mm; resistant) and *Aspergillus spp.* (25mm; resistant). The mechanism (s) of action following the exhibition of high antibacterial activities of *A. muricata* Linn. fruit pulp is attributed to the presence of terpenoids, flavonoids, and alkaloids^{23,25}. Furthermore, the zone of inhibition exhibited by these bacterial isolates against the aqueous extract of *A. muricata* Linn. fruit pulp was between 20 to 38 mm, which is in line with the findings of Olugbuyiro et al.²⁶, revealing a zone of inhibition of antibacterial activity of *Annona muricata* leaf extracts of 20 to 42 mm. Abdel-Rahman et al.²⁷ reported antibacterial activity of *Annona muricata* leaf extract against *S. aureus*, *P. aeruginosa*, *E. coli*, which has agreement with the study findings revealing resistance to *S. aureus*, *Klebsiella spp.*, *P. aeruginosa*, *E. coli*. Iyanda-Joe et al.¹⁶ reported resistance to *S. aureus*, *Klebsiella spp.*, *P. aeruginosa* following the fruit skin of *Annona muricata* extract with a zone of inhibition diameter of 15-17 mm, which is highly resistant and corroborates the study report. Pinto et al.² showed similarity to the study findings demonstrating antibacterial activity of methanolic leaf extract of *A. muricata* L. against *S. aureus*, which results from the presence of alkaloids. Neglo et al.²⁸ reported that Methicillin-resistant *Staphylococcus aureus* showed a strong antimicrobial resistance, with zone of inhibition diameter of 3.5mm, against the peel and seed extracts of *A. muricata*, which does not agree with the study findings. Also, acetogenins showed a high resistant against *E. coli* with zone of inhibition of 11-15.67mm, which has agreement with the study result following isolation of acetogenins from *Annona muricata*²⁹. Vinothini and Growther,³⁰ demonstrated high antibacterial activity of *S. aureus* (13-24mm), *Klebsiella pneumoniae* (14mm), *E. coli* (14mm), following aqueous fruit extract of *Annona muricata* Linn, which corroborates the study findings. Lawal et al.³¹

Lawal et al.³¹ showed antibacterial effect of *Annona muricata* leaves against *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*, which corroborates the study findings.

The study findings showed that zone of inhibition diameter for *C. albicans* and *Aspergillus* spp., were 24 mm and 25mm respectively, which are within the resistant range, according to CLSI³² as cited in Okeke-Nwolisa et al.²¹. However, antibiogram activity of the aqueous extract of ripe *Annona muricata* Linn. fruit pulp indicated a high resistance towards these fungal isolates. Possibly, the reason for the resistance to the aqueous extract of ripe *Annona muricata* Linn. fruit pulp by *C. albicans* could be attributed to same mechanism of escape of conventional drugs through the over expression of efflux pumps, alteration of the cell membrane and biofilm formation, which are the most dominant resistance strategies³³. Thus, the use of medicinal plant (*A. muricata*) has several mechanisms, which remain unclear following its antifungal effect. The study report has similarity to the findings of Mgbuehuruike et al.³⁴ revealing a high resistant of 17.60 mm of *C. albicans*, which corroborates to the study findings of 24 mm, which is within the range. Campos et al.³⁵ reported a high fungal resistant of leaves of *Annona muricata* on *Candida albicans* strain, which agrees with the study findings revealing an antifungal impact with a zone of inhibition diameter of 24 mm. Abdel-Rahman et al.²⁷ indicated an antifungal impact of *Annona muricata* seed extracts on *C. albicans* following terpenoids activities, which is in line with the study findings. Report of Vinothini and Growther,³⁰ showed that *C. albicans* exhibited considerable resistance with zone of inhibition diameter of 18-22mm to the aqueous extract of ripe *Annona muricata* Linn. fruit pulp which is in line with the study findings. Lawal et al.³¹ showed antifungal effect of *Annona muricata* leaves against *Candida albicans* and *Aspergillus niger*, which corroborates the study findings.

Conclusion

The study concluded that the aqueous extracts of ripe *Annona muricata* Linn. fruit pulp exhibited considerable antimicrobial activity to both clinical bacterial and fungal isolates, which may explain why it is used locally to treat diarrhoea and other illnesses.

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ASSESSMENT OF BIOMARKERS OF RENAL FUNCTION IN LEPROSY PATIENTS IN OSSIOMO – OGAN, EDO STATE, NIGERIA

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Abstract

Background of study: Parameters such as blood-urea nitrogen, creatinine, uric acid, and electrolytes are good biomarkers of renal function, which could be considered as suitable prognostic indicators of renal diseases.

Aim: This study aimed at assessing the renal biomarkers of renal function in leprosy patients at Ossiomo-Ogan, Edo State, Nigeria.

Materials and methods: The study was conducted at the Leprosy Rehabilitation Centre, Ossiomo-Ogan, in Edo State, Nigeria, between April and December 2021. This study included 108 people between the ages of 18 and 60 (57 leprosy patients and 51 controls).Parameters such as urea, creatinine, chloride, potassium, sodium, and bicarbonate were assayed using standard methods. The data obtained were summarized using the mean and standard deviation. Comparative analysis was done using an independent sample t-test, while correlation tests were done using Pearson's bivariate correlation test. The level of significance was set at p 0.05.

Results: Serum levels of potassium and chloride were significantly elevated in leprosy patients compared with the controls (p<0.05). However, no significant differences were observed in sodium and bicarbonate between leprosy patients and controls (p > 0.05). Findings also indicated no significant differences in serum levels of urea (p = 0.292) and creatinine (p = 0.790) between leprosy patients and control subjects. Age, BMI, blood pressure parameters, urea, creatinine, and electrolytes in both leprosy patients and controls also indicated no significant correlation.

Conclusion: No significant difference in renal function was observed between leprosy patients and non-leprosy-affected individuals. However, the levels of serum urea and creatinine are high, which indicate renal involvement among the leprosy patients. There is a need to analyze renal biomarkers (urea, creatinine electrolytes) as part of routine medical examinations among leprosy patients to prevent renal failure.

Keywords: *leprosy, renal function, electrolytes.*

Introduction

Leprosy is also referred to as Hansen's disease. It is a chronic granulomatous infection generally caused by *Mycobacterium leprae* and *Mycobacterium lepromatosis*, both of which primarily affect the skin and peripheral nerves. The disease is diagnosed on the basis of three criteria: characteristic skin lesions in association with thickened nerves; a demonstration of acid-fast bacilli in slit skin smears; and the histopathology of skin biopsies¹. Leprosy is of great concern in the medical community. This disease is not highly contagious, contrary to popular belief, and treatment is readily available². Through awareness and early medical intervention, significant reduction of disability in the eyes, hands, and feet is possible. Relapses tend to be rare, but any damage caused by neuropathy is irreversible and may require lifelong care³. Many medical publications have extensively reported renal functional impairment in leprosy patients in the recent past⁴⁻⁷. The impairment has been alleged to be due to Erythema nodosum leprosum (ENL)^[4]. Mitsuda and Ogawa⁸ were the first workers to report renal lesions in leprosy. Glomeruli injury has been described in histology findings in leprosy patients, with progressive mesangial glomerulonephritis being the most common lesion⁹⁻¹¹. Many other kinds of glomerulonephritis have also been described^{12-15, 10, 16-20}. The exact pathogenesis of renal lesions in leprosy is still uncertain²¹. The bacteria do not seem to be directly involved in the renal lesions⁸, although they have been detected in the glomeruli and renal parenchyma of some patients^{10, 11}. The glomerular lesion is probably caused by immune complexes, which develop during the reactional states, mainly in Erythema nodosum leprosum²¹.

The prevalence of glomerulonephritis has been reported as ranging from 6 to 50% in leprosy patients²². Amyloidosis, with an incidence ranging from 2 to 55%²², is attributed to chronic granulomatous reactions caused by *Mycobacterium leprae*²⁴ and manifested mainly by elevated proteinuria²⁴. It may progress to chronic renal failure, which is one of the causes of death in leprosy²⁵. Parameters such as blood-urea nitrogen, creatinine, uric acid, and electrolytes are good biomarkers of renal function, which could be considered as suitable prognostic indicators of renal diseases. Many works have been done on leprosy, but few have actually described renal involvement in the study area (Ossiomo-Ogan, Edo State, Nigeria), without a view on electrolyte renal handling and serum urea, hence the motivation and justification of this study.

The aim of this study, therefore, is to assess some renal biomarkers of renal function in leprosy patients in Ossiomo-Ogan, Edo State, Nigeria.

Materials and methods

The study was conducted at the Leprosy Rehabilitation Centre, Ossiomo-Ogan, in Edo State, Nigeria, between April and December 2021. The center is located at a distance from the main village to prevent infected individuals from mixing up with the healthy, non-infected populace. The camp is provided with all the basic amenities such as water, electricity, and health care services to cater for the leprosy patients. The villagers at Ossiomo-Ogan are predominantly farmers and petty traders. The camp is secured, and all the activities surrounding the rehabilitation of the infected persons are done within the camp.

Study Design and Subject Selection

This is a case-control study design. The study subjects include both male and female leprosy patients, while male and female participants who have not been infected by leprosy or lived with leprosy patients served as controls. The leprosy subjects included those who were undergoing treatments and those who were newly diagnosed. The controls, however, were recruited from the healthy population within the village and its environs. This study included 108 people between the ages of 18 and 60 (57 leprosy patients and 51 controls). Excluded from this study were those who were not diagnosed with leprosy and those leprosy patients who have been certified free from the disease. The personal consent of individual participants was sought and obtained.

Questionnaire/Ethical Approval

An interviewer-administered, pre-tested, and structured questionnaire was used to collect data from the patients. The questionnaire consisted of questions designed to elicit details about their personal data, including age, sex, occupation, educational background, marital status, medications, alcohol consumption, smoking habit, duration of the disease, diet, physical activity, and exercise, as well as the history of underlying diseases. The Ethical Committee of the Ministry of Health, Edo State, and leaders of the center approved this study (File Number: HA-737/87; Date of Approval: April 15, 2021). The head of the center was also informed of the nature of the study, and his permission was sought and obtained before the commencement of the study.

Tobacco and alcohol intake

We assessed the alcohol intake and smoking history by recording the types of alcohol the participants consumed as well as the number of sticks of cigarettes smoked daily.

Measurement of Anthropometric Indices and Blood Pressure

Each participant's weight (in kilograms) and height (in meters) were measured. A weighing balance was utilized to measure weight in kilograms, and a stadiometer was used to measure height in meters. Body mass index (BMI) was calculated as the ratio of weight to square of height (kg/m^2). The normal range for BMI is taken as 18–25 kg/m^2 .

Data Analysis

For continuous data, descriptive data was shown as mean and standard deviation, and for categorical variables, it was shown as a percentage. Comparative analysis between variables was done using an independent sample t-test. Correlation tests involving two variables were done using Pearson's bivariate correlation test. The test of significance was set at $p < 0.05$.

Sample Collection and Analysis

Five milliliters of blood were collected and dispensed into a plain container. The non-anticoagulated blood was allowed to clot, spun at 1500 rpm for 10 minutes, and the supernatant serum was separated into sterile tubes. The serum was stored at 20 C for up to 2 weeks prior to analysis. Analysis for urea and creatinine was done spectrophotometrically using commercially purchased reagents from the Fortres company in the United Kingdom. Electrolytes were analyzed using the ion-selective electrode method.

Results

Table 1 shows the demographics, lifestyle, and clinical characteristics of the study population. A total of 108 subjects were recruited for this study, including 51 uninfected controls and 57 patients living with leprosy. The mean age of the participants was 58.75 years (ranging from 22 to 96 years), with a SD of 14.72 years. The healthy control group indicated a significantly higher mean weight (62.58 ± 10.38 kg) compared with the leprosy patients (57.19 ± 10.50 kg). On the other hand, the leprosy patients indicated significantly greater age (63.65 ± 16.19 years vs. 53.29 ± 10.60 years) and SBP (136.17 ± 19.96 vs. 128.15 ± 11.94 mmHg) compared with the control. No significant differences were observed in mean height, BMI, or DBP between the two groups. Majority of the controls, 39.2%, were in the age group 50–59 yrs., while most of the leprosy patients, 59.6%, were in the age group 60 yrs. A greater percentage of the participants were female (controls: 64.7%; leprosy patients: 50.9%). All (100%) of the control subjects and 66.7% of the leprosy patients were married. The majority of the control group (52.9%) were employed, while most of the leprosy patients (45.6%) were retirees. Regarding their smoking and drinking habits, most of the participants were non-smokers (control, 90.2; leprosy, 87.7%) and non-alcoholics (control, 96.1%; leprosy, 71.9%). It is noteworthy that 9.8% of the controls were moderate smokers, 7% of the leprosy patients were mild smokers, and 5.3% were heavy smokers. Similarly, 7.8% of the controls were moderate drinkers; 19.3% of the leprosy patients were mild drinkers, while 5.3% were heavy drinkers. The majority of the participants (controls, 74.5 percent; leprosy patients, 66.7 percent) did not engage in any exercise. Most of the participants (controls, 80.4%; leprosy patients, 70.2%) were not on any form of medication.

Table 2 shows the mean levels of serum electrolytes among the study population. An independent sample t-test indicated that the leprosy patients had significantly higher mean serum levels of potassium (4.05 ± 0.62 vs. 3.81 ± 0.39 mmol/L; $p < 0.05$) and chloride (104.45 ± 3.64 vs. 102.0 ± 2.50 mmol/L; $p < 0.001$) compared with the controls. In contrast, no significant differences were observed in sodium (136.17 ± 3.30 vs. 138.85 ± 14.75 mmol/L) or bicarbonate (22.29 ± 2.42 vs. 21.49 ± 2.94 mmol/L) between the control and leprosy patients.

Table 3 shows the distribution of the incidences of normal and abnormal statuses of the serum electrolytes among the study population. Data shows that an equal percentage (66.7%) of the control and leprosy patients had normal sodium levels.

Leprosy patients indicated a non-significantly higher percentage (86%) of those with normal potassium levels than the control group (82.4%). There were higher percentages of the controls with normal bicarbonate (37.3% vs. 24.6%) and chloride levels (92.2% vs. 75.4%) than the leprosy patients; however, none of these indicated statistically significant differences. More of the controls indicated 'abnormally low' levels of sodium (33.3% vs. 26.3%), potassium (17.6% vs. 10.5%), and chloride (3.9 vs. 1.8%) than the leprosy patients. In contrast, there were more leprosy patients with 'abnormally low' bicarbonate compared with the control group (71.9% vs. 62.7%). No significant percentage differences were observed between the two groups for all electrolytes. Higher incidences of 'abnormally high' sodium (7.0% vs. 0%), potassium (3.5% vs. 0%), bicarbonate (3.5% vs. 0%), and chloride (22.8% vs. 3.9% $p < 0.001$) were observed between the leprosy patients and the control.

Table 4 shows the correlation between serum urea, creatinine levels, and electrolytes among leprosy patients. Pearson's bivariate correlation test indicated no significant relationship between the serum urea level and sodium ($p = 0.861$), bicarbonate ($p = 0.561$), or chloride ($p = 0.331$) levels. In contrast, there was a significant negative correlation between serum urea and potassium levels. The higher the serum urea level of the leprosy patients, the higher their serum potassium concentration. On the other hand, there were no significant relationships between serum creatinine concentration and sodium ($p = 0.370$), potassium ($p = 0.455$), bicarbonate ($p = 0.373$), or chloride ($p = 0.259$).

Table 5 shows the correlation between age, BMI, electrolytes, urea, and creatinine among the leprosy patients. Pearson's bivariate correlation test indicated no significant correlation between age and sodium, potassium, bicarbonate, chloride, urea, and creatinine. Similarly, no significant correlations were observed between BMI and sodium, potassium, bicarbonate, chloride, urea, and creatinine, respectively.

Table 6 shows the correlation between SBP, DBP, electrolytes, urea, and creatinine among the leprosy patients. Pearson's bivariate correlation test indicated no significant correlation between SBP and sodium, bicarbonate, chloride, urea, and creatinine. Similarly, no significant correlations were observed between DBP and sodium, bicarbonate, chloride, urea, and creatinine. In contrast, there was a significant relationship between SBP and potassium ($p = 0.019$) as well as between DBP and potassium ($p = 0.05$).

Figure 1 shows the mean serum concentration of urea in the study population. An independent sample t-test indicated a lack of significant difference ($p = 0.292$) in the serum levels of urea between the control group (31.25 ± 9.13 mg/dl) and the leprosy patients (33.56 ± 11.73 mg/dl).

Figure 2 shows the mean serum concentration of creatinine in the study population. An independent sample t-test indicated no significant difference ($p = 0.790$) in the serum levels of creatinine between the control (0.82 ± 0.19 mg/dl) and the leprosy patients (0.81 ± 0.24 mg/dl).

Figure 3 shows the incidence of normal and abnormal serum levels of urea among the study population. Data indicated that all (100%) of the control patients and 91.2% ($n = 52$) of the leprosy patients had urea levels ≤ 50 mg/dl. On the other hand, 8.8% ($n = 5$) of the leprosy patients and none of the controls had an incidence of abnormally high urea levels (> 50 mg/dl).

Figure 4 shows the incidence of normal and abnormal serum levels of creatinine among the study population. Data indicated that all (100%) of the control patients and 96.5% ($n = 55$) of the leprosy patients had urea levels ≤ 1.4 mg/dl. On the other hand, 3.5% ($n = 2$) of the leprosy patients and none of the controls had an incidence of abnormally high urea levels (> 1.4 mg/dl).

Table 1. Demographics, Lifestyles and Clinical Characteristics of the Study Population

Characteristics	Control (n = 51) Mean ± SD or n (%)	Leprosy Patients (n = 57) Mean ± SD or n (%)	Total (n = 108) Mean ± SD or n (%)
Weight (kg)	62.58 ± 10.38	57.19 ± 10.50*	59.74 ± 10.74
Height (meters)	1.64 ± 0.15	1.61 ± 0.13	1.62 ± 0.14
BMI (kg/m ²)	23.69 ± 7.42	22.24 ± 5.03	22.92 ± 6.29
SBP (mmHg)	128.15 ± 11.94	136.17 ± 19.96*	132.38 ± 17.06
DBP (mmHg)	78.09 ± 5.76	77.22 ± 7.65	77.63 ± 6.81
Age (years)	53.29 ± 10.60	63.65 ± 16.19	58.75 ± 14.72
<40	2 (3.9)	0 (0)	2 (1.9)
40 – 49	13 (25.5)	15 (26.4)	28 (25.9)
50 – 59	20 (39.2)	8 (14.0)	28 (25.9)
≥60	16 (31.4)	34 (59.6)	50 (46.3)
Sex			
Males	18 (35.3)	28 (49.1)	46 (42.6)
Females	33 (64.7)	29 (50.9)	62 (57.5)
Marital Status			
Single	0 (0)	19 (33.3)	19 (17.6)
Married	51 (100)	38 (66.7)	89 (82.4)
Occupational Status			
Employed	27 (52.9)	4 (7.0)	31 (28.7)
Unemployed	14 (27.5)	21 (36.8)	35 (32.4)
Retired	9 (17.6)	26 (45.6)	35 (32.4)
Self Employed	1 (2.0)	6 (10.5)	7 (6.5)
Smoking Status			
Non-Smokers	46 (90.2)	50 (87.7)	96 (88.9)
Smokers	5 (9.8)	7 (12.3)	12 (11.1)
Alcoholic Status			
Non-Drinkers	49 (96.1)	41 (71.9)	90 (83.3)
Drinkers	2 (3.9)	16 (28.1)	18 (16.7)
Exercise Status			
Non-Exercisers	38 (74.5)	38 (66.7)	76 (70.4)
Exercisers	13 (25.5)	19 (33.3)	32 (29.6)
Medication			
No	41 (80.4)	40 (70.2)	81 (75.0)
Yes	10 (19.6)	17 (29.8)	32 (25.0)

Abbreviations: BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; * Significant difference between control and leprosy patients.

Table 2. Mean Levels of Serum Electrolytes among the Study Population

Variables	Control (n = 51)	Leprosy Patients (57)	t-Statistics	P-Value
Sodium (mmol/L)	136.17 ± 3.30	138.85 ± 14.75	-1.27	0.207
Potassium (mmol/L)	3.81 ± 0.39	4.05 ± 0.62	-2.35	0.021
Bicarbonate (mmol/L)	22.29 ± 2.42	21.49 ± 2.94	1.53	0.128
Chloride (mmol/L)	102.0 ± 2.50	104.45 ± 3.64	-4.03	<0.001

Table 3. The Incidence of Normal and Abnormal Statuses of the Serum Electrolytes among the Study Population

Electrolytes	Control (n = 51)	Leprosy Patients (n = 57)	P - Value
Sodium			
<i>Normal</i>	34 (66.7)	38 (66.7)	1.00
<i>Abnormally Low</i>	17 (33.3)	15 (26.3)	0.362
<i>Abnormally High</i>	0 (0)	4 (7.0)	-
Potassium			
<i>Normal</i>	42 (82.4)	49 (86.0)	0.758
<i>Abnormally Low</i>	9 (17.6)	6 (10.5)	0.194
<i>Abnormally High</i>	0 (0)	2 (3.5)	-
Bicarbonate			
<i>Normal</i>	19 (37.3)	14 (24.6)	0.128
<i>Abnormally Low</i>	32 (62.7)	41 (71.9)	0.439
<i>Abnormally High</i>	0 (0)	2 (3.5)	-
Chloride			
<i>Normal</i>	47 (92.2)	43 (75.4)	0.188
<i>Abnormally Low</i>	2 (3.9)	1 (1.8)	0.414
<i>Abnormally High</i>	2 (3.9)	13 (22.8)	<0.001

Normal ranges: Sodium, 135 – 147 mmol/L; Potassium, 3.5 – 5.0 mmol/L; Bicarbonate, 23 – 29 mmol/L; Chloride, 98 – 106 mmol/L.

Table 4. Bivariate Correlation between Serum Urea, Creatinine Levels and Electrolytes among Leprosy Patients

VARIABLES	R (p-value)	VARIABLES	R (p-value)
Urea vs. Sodium	0.024 (0.861)	Creatinine vs. Sodium	0.121 (0.370)
Urea vs. Potassium	-0.327 (0.013)	Creatinine vs. Potassium	-0.101 (0.455)
Urea vs. Bicarbonate	0.079 (0.561)	Creatinine vs. Bicarbonate	0.120 (0.373)
Urea vs. Chloride	-0.131 (0.331)	Creatinine vs. Chloride	-0.152 (0.259)

Abbreviation: R = Correlation Coefficient

Table 5. Correlation between Age, BMI, Electrolytes, Urea and Creatinine among the Leprosy Patients

VARIABLES	R (p-value)	VARIABLES	R (p-value)
Age vs. Sodium	0.028 (0.836)	BMI vs. Sodium	-0.180 (0.181)
Age vs. Potassium	-0.066 (0.627)	BMI vs. Potassium	0.094 (0.489)
Age vs. Bicarbonate	-0.144 (0.286)	BMI vs. Bicarbonate	-0.016 (0.908)
Age vs. Chloride	-0.078 (0.562)	BMI vs. Chloride	-0.112 (0.405)
Age vs. Urea	0.189 (0.158)	BMI vs. Urea	0.095 (0.481)
Age vs. Creatinine	0.008 (0.951)	BMI vs. Creatinine	0.050 (0.713)

Abbreviations: BMI = Body Mass Index; R = Correlation Coefficient

Table 6. Correlation between Blood Pressure Parameters, Electrolytes, Urea and Creatinine among the Leprosy Patients

VARIABLES	R (p-value)	VARIABLES	R (p-value)
SBP vs. Sodium	0.009 (0.991)	DBP vs. Sodium	0.011 (0.934)
SBP vs. Potassium	0.310 (0.019*)	DBP vs. Potassium	0.259 (0.05*)
SBP vs. Bicarbonate	-0.022 (0.872)	DBP vs. Bicarbonate	-0.137 (0.311)
SBP vs. Chloride	0.061 (0.652)	DBP vs. Chloride	-0.018 (0.895)
SBP vs. Urea	0.161 (0.233)	DBP vs. Urea	0.154 (0.253)
SBP vs. Creatinine	0.203 (0.129)	DBP vs. Creatinine	0.114 (0.397)

* Significant correlation. Abbreviations: SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; R = Correlation Coefficient

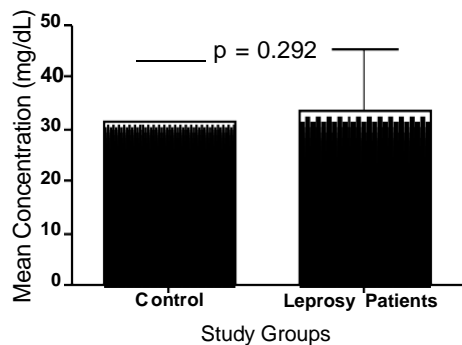


Figure 1. Mean Serum Concentration of Urea among the Study Population

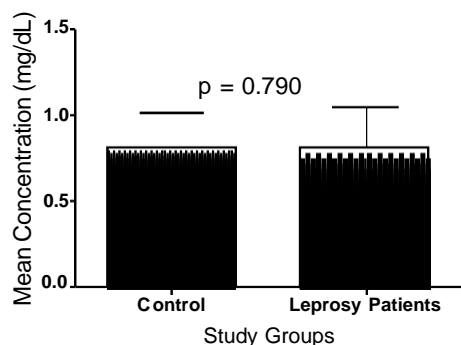


Figure 2. Mean Serum Concentration of Creatinine among the Study Population

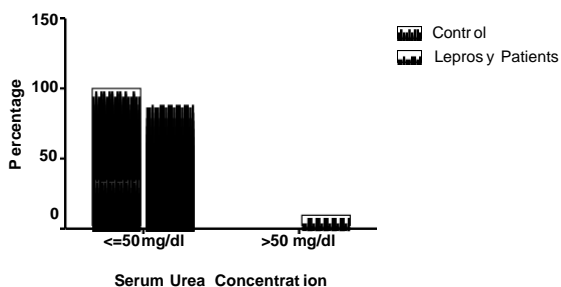


Figure 3. Incidence of Normal and Abnormal Serum Level of Urea among the Study Population.

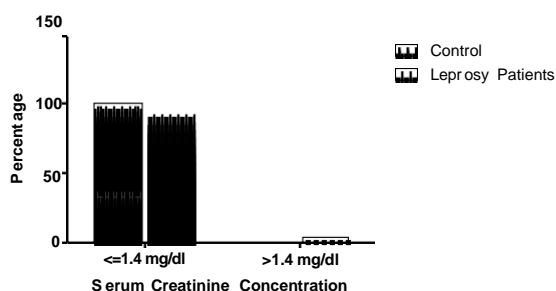


Figure 4. Incidence of Normal and Abnormal Serum Level of Creatinine among the Study Population.

Discussion

Leprosy is a multisystem infectious disease that can involve the kidneys in a variety of ways¹¹. The exact pathogenesis of renal lesions in leprosy is still unclear²⁶. Mycobacterium leprae does not appear to be directly involved in the creation of renal lesions²⁷, although it has been detected in the renal parenchyma of some patients, including the glomeruli^{10,11}. Glomerular lesions are probably mediated by immunocomplexes^{17,26}. It has been ascertained by some workers²⁷ that leprosy can occur at any age, and they also suggested that the development of the disease depends on the host immune response²⁸⁻³¹. In this study, the mean age of the participants was 58.75 years (ranging from 22 to 96 years). This is in agreement with some workers who opined that individuals aged 50–60 years are mostly affected by leprosy³². Umahi-Ottah et al.³ recorded 60 years and above, while another study by Reibel et al.³⁴ indicated that the age group of 20–64 years was mostly affected. We also discovered in this study that more females, 33 (64.7%), were infected than males, 18 (35.3%). This result agrees with many authors: Umahi-Ottah et al. (50.9%)³³, Montenegro et al.³⁵, Date and Johny¹⁴, Kirsztajn et al.²³, Ponce et al.³⁶, Silva Junior and Daher³⁷, Phadnis et al.³⁸, Margarido-Marchese et al.⁹ who all found a higher

prevalence of leprosy tilted towards females. In contrast, Salgado et al.⁹ reported that males were more affected by leprosy than females. The reason for higher susceptibility in females may be due to immunocomplexes, which are implicated in the development of the disease.

From this study, 8.8% (n = 5) of leprosy patients have an abnormal urea level greater than 50 mg/dL. This agrees with the results of previous works by Nadeem et al.⁴ and Kanwar et al.⁴¹. They found raised levels of urea in up to 53% of leprosy patients in their works. da Silva Jnr and Daher²⁷ in their study found 20 (62.5% of the total) leprosy patients with a urea value above 40 mg/ dl. Some previous workers—Nadeem et al.⁴⁰; Bajaj et al.²; Thomas et al.⁷; and Mittal et al.²⁰—failed to observe any significant rise in urea level even in the reactionary state of leprosy. Also, in this study, 3.5% (n = 2) of leprosy patients have abnormal creatinine values above >1.4 mg/dL.

This agrees with the results obtained by other workers. According to daSilva Jnr and Daher²⁷, creatinine levels above 1.4 mg/dl were recorded in 6 (18.75%) leprosy patients in their study. Singh et al.²⁵ found that 9.33% of leprosy patients exhibited increased creatinine levels. Date et al.¹⁹ reported raised serum creatinine (2 out of 8) among reactional lepromatous patients.

Bajaj et al.² reported significantly increased serum creatinine in reactive cases but not significantly elevated levels in quiescent or uncomplicated leprosy patients. Savas et al.⁴² reported significantly higher urea and creatinine levels, respectively, in their works. They attributed the higher results to the higher mean age of their leprosy patients. In our study, the mean age was 58.75 years, which seems not to be very high. The 3.5% abnormal creatinine level recorded may be due to a few participants aged above 70 years, an age that may be responsible for immunocomplex susceptibility. In contrast, a study by Kirsztajn et al.²³ indicated that no obvious alteration of renal function was detected in the analysis of serum creatinine. Also contrasting the above authors, Thomas et al.⁷ and Gutman et al.⁶ have reported normal serum creatinine levels in reactive leprosy cases. However, from this present study, the mean urea and creatinine concentrations of leprosy patients were not statistically significant when compared with the controls.

The mean level of potassium and chloride is higher in leprosy patients when compared with the controls in this study (Table 2). Leprosy patients indicated a non-significantly higher percentage (86%) of those with normal potassium levels than the control group (82.4%). There were higher percentages of the controls with normal bicarbonate (37.3% vs. 24.6%) and chloride levels (92.2% vs. 75.4%) than the leprosy patients; however, none of these indicated statistically significant differences. More of the controls indicated 'abnormally low' levels of sodium (33.3% vs. 26.3%), potassium (17.6% vs. 10.5%), and chloride (3.9 vs. 1.8%) than the leprosy patients. In contrast, there were more leprosy patients with 'abnormally low' bicarbonate compared with the control group (71.9% vs. 62.7%). No significant percentage differences were observed between the two groups for all electrolytes. Higher incidences of 'abnormally high' sodium (7.0% vs. 0%), potassium (3.5% vs. 0%), bicarbonate (3.5% vs. 0%), and chloride (22.8% vs. 3.9; $p < 0.001$) were observed between the leprosy patients and the control. This is in contrast with previous works by Savas et al.⁴², who reported normal sodium and potassium levels among the leprosy patients.

There is no significant relationship between serum urea level and sodium ($p = 0.861$), bicarbonate ($p = 0.561$), or chloride ($p = 0.331$) levels in this study. In contrast, there was a significant negative correlation between serum urea and potassium levels. The higher the serum urea level of the leprosy patients, the higher their serum potassium concentration. On the other hand, there were no significant relationships between serum creatinine concentration and sodium ($p = 0.370$), potassium ($p = 0.455$), bicarbonate ($p = 0.373$), or chloride ($p = 0.259$) (Table 4).

Also from the results obtained in this study, there was no significant correlation between age and sodium, potassium, bicarbonate, chloride, urea, and creatinine. Similarly, no significant correlations were observed between BMI and sodium, potassium, bicarbonate, chloride, urea, and creatinine, respectively (Table 5). There is no significant correlation between SBP and sodium, bicarbonate, chloride, urea, and creatinine. Similarly, no significant correlations were observed between DBP and sodium, bicarbonate, chloride, urea, and creatinine. In contrast, there was a significant relationship between SBP and potassium ($p = 0.019$) as well as between DBP and potassium ($p < 0.05$) (Table 6). Reasons for the above results may be attributed to the fact that none of the leprosy patients has been diagnosed with a renal abnormality, unlike the work done earlier on reactive and uncomplicated cases by some workers^{27,42,43}. The caveat in the study was the non-inclusion of a urine sample in the parameters analyzed, which will be clarified in further study.

Conclusion

From this study, the levels of serum urea and creatinine are high, which indicate renal involvement among the leprosy patients. There is a need to always analyze renal biomarkers (urea, creatinine electrolytes) as part of routine medical examinations among leprosy patients to prevent renal failure, which is the cause of death among them.

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ATTITUDE, PERCEPTION AND PRACTICE AND BARRIERS OF PHYSIOTHERAPISTS TOWARDS THE ASSESSMENT AND MANAGEMENT OF RISK FACTORS OF LIFESTYLE-RELATED DISEASES: A CROSS-SECTIONAL SURVEY

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Abstract

Background of the study: Prevention and management of lifestyle-related diseases (LRDs) are deemed a priority in contemporary physiotherapy. However, questions subsist in developing countries like Nigeria on the place of physiotherapy practice in the assessment and management of risk factors of LRDs.

Aim of the study: This study provide insights into the attitude, perception and practice of physiotherapists towards the assessment and management of risk factors of LRDs during patient care.

Materials and Method: A total of 110 physiotherapists were recruited from public and private hospitals in Lagos State, Nigeria. Participants completed an adapted questionnaire. The questionnaire consisted of 10 sections that assessed demographic and physical characteristics, risk factors and management of LRDs, and attitudes of participants in the assessment and management of LRDs. Data was summarized using frequencies and percentages.

Results: Respondents always assessed risk factors of LRDs in the descending order of: blood pressure 68 (61.8%), alcohol use 41 (37.3%), exercise 41 (37.3%), level of activity 40 (36.4%), tobacco use 37 (33.6%), and diet 31 (28.2%). Regarding respondents' management options for 20% overweight or more, 58 (52.7%) always use exercise regularly, 57 (51.8%) always use decreasing calorie intake, 49 (44.6%) always use decreasing dietary fats, 45 (40.9%) always perform specific exercises, whereas 28 (25.5%) advises patients to quit smoking. Also, respondents' reported as 'very effective' the use of exercise (64, 58.2%), healthy diet (61, 55.5%) and weight reduction (57, 51.8%) for changing patients behaviour.

Conclusions: Blood pressure was the most assessed risk factors of LRDs by physiotherapists in Lagos. Physiotherapists in Lagos always advise individuals with LRDs on dieting, weight reduction, cessation of smoking and alcohol intake. Management options of exercise, healthy diet and weight reduction are very effective for changing patients' behaviour.

Keywords: *Lifestyle-related diseases, attitude, perception, practice, physiotherapists.*

Introduction

Global disease burden has been increasingly dominated by lifestyle-related diseases (LRDs) often referred to as non-communicable diseases (NCDs) which are the leading causes of global deaths.¹⁻⁶ Lifestyle-related diseases are a major health concern in the 21st century accounting for 74% of all deaths (41 million) worldwide with 33.3 million deaths attributed to NCDs.⁷ Quite commonly, LRDs have been described as diseases derived from behavioural habits and choices and include ischaemic heart diseases, chronic obstructive lung diseases, hypertension and stroke, cancers, type 2 diabetes and obesity.^{2,5,7,8} Associated behavioural risk-factors of LRDs include tobacco smoking, unhealthy diet, alcohol abuse, sedentariness, stress and poor sleep.^{2,5,8}

The prevalence of these factors of LRDs remains high worldwide with low-and middle-income countries in daring upsurge.⁴ The world health organization's NCDs country profiles showed that in Nigeria alone, non-communicable diseases accounted for about half a million deaths of individuals under age 60 years, the most common of which were chronic respiratory diseases, cardiovascular disease and diabetes and that these NCDs accounted for 24% of all deaths in Nigeria.^{6,7} A report by the World Economic Forum and Harvard University, estimated that NCDs (LRDs) over the next two decades will cost more than US\$30 trillion, a figure adduced to represent 48% of the global GDP in 2010.⁹ The implication of **this report** suggests that millions of people around the world would be below the poverty line, especially in low-income countries who may be unable to cope due to financial distress. Also, it is suggested that failure to mitigate the surge of LRDs would yield heavy financial burden of diseases which in projection may be a heavy financial burden for even the wealthiest countries of the world.¹⁰ Thus, prevention of lifestyle diseases should be the priority of every country.

Consequently, prevention and management of lifestyle conditions are deemed a priority in general medical practice or contemporary physiotherapy.^{2,11} Indeed, it is imperative that healthcare focus should shift from an illness model to a wellness model which necessitates the need of healthcare providers to re-adjust their goals, strategies and patterns of interaction with healthcare recipients and to develop workforce capacity for sustainable, ethical and effective health promotion action to target lifestyle diseases at all levels.^{2,12} Regardless of job designation, each member of the health team should see that health promotions of lifestyle modification are incorporated in the plan of optimal care.

The World Physiotherapy (WPT) describes physiotherapy as a profession concerned with identifying and maximising quality of life and movement potential within the spheres of promotion, prevention, treatment/intervention, and rehabilitation.¹³ Therefore, physiotherapists have a major role in reshaping the healthcare system especially in wellness and optimal care.¹³ The role of physiotherapists in counselling for exercise, nutrition, dieting, smoking, stress reduction and other lifestyle modification was recently explored in the light of modern view of healthcare professionalism.² Thus, physiotherapists make tremendous contributions to the society through incorporating various strategies to induce lifestyle behaviour change into the overall clinical care. However, questions still subsist in developing countries like Nigeria on the place of physiotherapy practice in the assessment and management of risk factors of LRDs. Therefore, this study was aimed at providing insights into the attitude, perception and practice of physiotherapists towards the assessment and management of risk factors of LRDs during patient care in a developing country.

Methodology

The study involved 110 physiotherapists recruited from 2 Teaching hospitals, 5 General hospitals, 3 Specialist/ Reference hospitals, 5 Private hospitals/Clinics, and attendees at a 2-day workshop held by the Medical Rehabilitation Therapist (Registration) Board of Nigeria in Lagos 2017. Instrument used was a questionnaire adapted from a related previous study titled 'Assessment and Management of Risk Factors for the Prevention of Lifestyle-related Diseases: A cross-sectional survey of current activities, barriers and perceived training needs of primary care physiotherapists in the Republic of Ireland'.¹⁴ The questionnaire was adapted to the present study by a Focus group made up of experienced physiotherapy Academics, Researchers and Clinicians. The adapted questionnaire has 10 sections. Section 1 obtained demographic data of the participants; Section 2 sought information on physiotherapist' assessment of various risk factors (harmful use of alcohol, unhealthy diet, low exercise, tobacco use, high blood pressure, lack of physical activity and exercise); Sections 3 to 6 obtained information on physiotherapists' management of the risk factors of LRD's; Sections 7, 8 & 9 obtained information on the perception and attitudes towards the assessment and management of risk factors of lifestyle-related diseases.

Section 10 obtained information on the barriers faced by physiotherapists in assessing and managing behavioural risk factors.

One hundred and ten questionnaires were retrieved from a total of one hundred and fifty-seven administered questionnaires on a one-on-one basis with the aim of the study clearly explained on copies of the questionnaire. Respondent's consent was also sought and obtained before the questionnaire was distributed and self-administered by the respondents and retrieved the following day by the researchers.

Data Analysis

Descriptive statistics of frequencies and percentages were used to analysed the data and the results were represented using Tables, Histograms and Pie charts.

Results

A total of 110 questionnaires were retrieved from the respondents yielding a response rate of 70%. The majority 63 (57.3%) of the respondents were males, while 47 (42.7%) were female physiotherapists.

Thirty eight (34.5%) of the respondents graduated from the University of Lagos, 32 (29.1%) graduated from University of Ibadan, 18 (16.4%) graduated from Obafemi Awolowo University, 7 (6.4%) graduated from University of Nigeria, Nsukka, 8 (7.3%) graduated from Bayero University, Kano, 3 (2.7%) graduated from University of Maiduguri, 2 (1.8%) graduated from University of Ghana and 1 (0.9%) graduated from Nnamdi Azikiwe University.

Twenty-eight (25.5%) of the respondents had worked for 1 to 5 years while 19 (17.3%) had a working experience of 20 years and above (Figure 1). Thirty-four (30.9%) of the respondents worked in the Teaching hospitals while only 2 (1.8%) worked in the Sport centre (Figure 1). On the respondents' specialist/practice units, Orthopaedics specialist were in the majority 56 (50.9%), while specialists in Ergonomics and Women's health were in the minority 1 (0.9%) (Figure 2).

Table 1 presents respondents practice settings and grade levels. Respondents who worked in the Teaching hospitals were in the majority 34 (30.9%), while respondents who worked in Sport centres were in the minority 2 (1.8%). Also, respondents in Physiotherapy cadre were in the majority 36 (32.9%), followed by Senior physiotherapists 30 (27.3%), while respondents in Directorate cadre were in the minority 2 (1.8%). The number of patients treated by the respondents weekly are presented in Table 2. The mean number of patients treated weekly was 28.3.

The highest number of patients treated was 180 patients reported by one respondent 1 (0.9%), while the lowest number of patients treated weekly was 1 reported by 2 respondents 2 (1.8%). Majority (108, 98.2%) of the respondents claimed that they participated in Continuous Professional Development (CPDs)/ Training/seminar while only 2 (1.8%) respondents did not participate (Figure 3). Forty-seven (42.7%) reported that they participated in more than thrice CPDs yearly (Figure 3).

Respondents' assessment of risk factors of LRDs including alcohol use, diet, exercise, tobacco use, activity level and blood pressure are presented in Table 3. Majority 68 (61.8%) of the respondents always enquired about the patient's blood pressure. Thirty-one (28.2%) of the respondents always assessed dietary status of the patients, forty-one (37.3%) always assessed exercise in patients and forty (36.4%) always assessed activity level in patients. Forty-one (37.3%) always assessed alcohol use whereas 5 (4.5%) never assessed them.

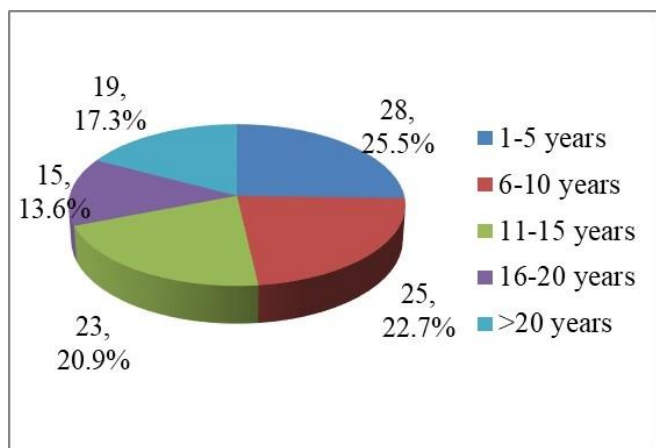


Figure 1: Years of working experience of the respondents

Table 2: Number of patients treated weekly by the respondents

Number of patients treated weekly	Frequency (n)	Percentage (%)
1	2	1.8
3	3	2.7
4	2	1.8
5	4	3.6
6	2	1.8
7	2	1.8
8	3	2.7
10	11	10.0
12	2	1.8
14	1	0.9
15	9	8.2
18	1	0.9
20	12	10.9
24	3	2.7
25	7	6.4
28	1	0.9
30	8	7.3
35	6	5.5
40	16	14.5
50	8	7.3
53	1	0.9
65	1	0.9
70	1	0.9
100	2	1.8
150	1	0.9
180	1	0.9
Total	110	100.0

Table: Frequency Distribution of Respondents' Practice Setting and Grade level

	Frequency (n)	Percentage (%)
Practice Setting:		
Private hospital	16	14.5
Specialist hospital	26	23.6
Teaching hospital	34	30.9
General hospital	23	20.9
Military hospital	9	8.2
Sport centre	2	1.8
Total	110	100.0
Grade level:		
Physiotherapist	36	32.7
Senior Physiotherapist	30	27.3
Principal Physiotherapist	1	10.0
Chief Physiotherapist	14	12.7
Assistant Director	13	1.8
Deputy Director	4	3.6
Director	2	1.8
Total	110	100.0

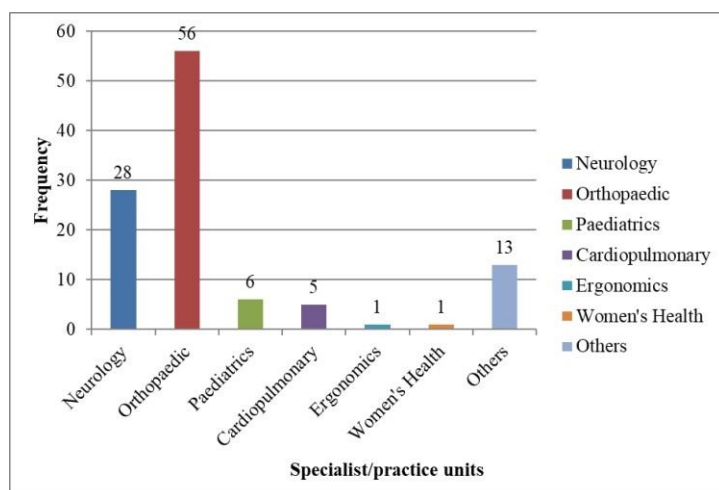


Figure 2: Frequency distribution of specialist/practice units

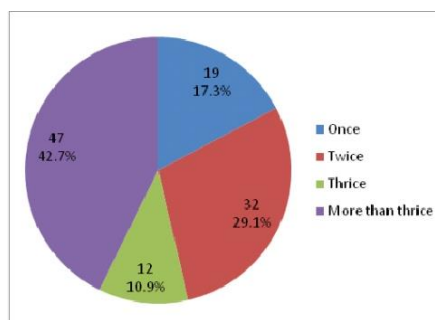


Figure 3: Respondents' yearly participation in Continuous Professional Development Training/seminar

Table 3: Frequency Distribution of Respondents' Assessment of Risk Factors of Lifestyle-related Diseases and Management Options in an Asymptomatic Adult Patient

Risk factor	Never n (%)	Rarely n (%)	Sometimes n (%)	About ½ the time n (%)	Often n (%)	Usually n (%)	Always n (%)
Assessment							
Alcohol usage	5 (4.5)	7 (6.4)	14 (12.7)	10 (9.1)	21 (19.1)	12 (10.9)	41 (37.3)
Diet	2 (1.8)	7 (6.4)	13 (11.8)	13 (11.8)	24 (22.7)	19 (17.3)	31 (28.2)
Exercise	0 (0)	2 (1.8)	10 (9.1)	11 (10.0)	30 (27.3)	16 (14.5)	41 (37.3)
Tobacco usage	6 (5.5)	7 (6.4)	14 (12.7)	12 (10.9)	24 (21.8)	10 (9.1)	37 (33.6)
Activity level	0 (0)	1 (0.9)	4 (3.6)	18 (16.4)	28 (25.5)	19 (17.3)	40 (36.4)
Blood Pressure	0 (0)	0 (0)	4 (3.6)	5 (4.5)	14 (12.7)	19 (17.3)	68 (61.8)
Management							
Regular exercise	2 (1.8)	2 (1.8)	7 (6.4)	16 (14.5)	26 (23.6)	29 (26.4)	28 (25.5)
?fruits & veg. consumption	0 (0)	8 (7.3)	14 (12.7)	13 (11.8)	30 (27.3)	27 (24.5)	18 (16.4)
? Dietary fats consumption	0 (0)	8 (7.3)	11 (10.0)	10 (9.1)	26 (23.6)	27 (24.5)	28 (25.5)

Key: ?=Increase; ?=Decrease; veg.=Vegetables

Thirty-seven (33.6%) always assessed tobacco usage in patients, whereas 6 (5.5%) never assessed for tobacco usage. Thus, respondents always assessed risk factors of LRDs in the descending order of: blood pressure 68 (61.8%), alcohol use 41 (37.3%), exercise 41 (37.3%), level of activity 40 (36.4%), tobacco use 37 (33.6%), and diet 31 (28.2%). Also, presented in Table 3 is respondents choice of general management options for LRDs. More than a quarter of the respondents always use regular exercise, increase fruit and vegetable consumption and decrease dietary fat consumption in managing LRDs.

Similarly, respondents were asked about specific management options for risk factors of LRDs under several subheadings: exercise and diet, 20% overweight or more, cigarette smoking with high blood pressure (Table 4). About half of the respondents always used management options of: exercise regularly; decrease calorie intake, decrease dietary fat consumption and performing specific exercises for patients with 20% overweight or more; whereas about a third of the respondents used management options of setting weight loss goals and setting specific exercises for patients with 20% overweight or more (Table 4). Over half of the respondents focused on advising patients to exercise regularly [(58, 52.7%) and decrease caloric intake (57, 51.8%) in their management of overweight (Table 4). Thirty-five (31.8%) of the respondents reported that they 'usually' advised patients to set a goal for weight loss (Table 4). Forty-nine (49, 44.5%)

of the respondents reported that they 'always' advised patients to decrease dietary fat consumption (Table 4). Most of the respondents reported that they 'often' (28, 25.5%) and 'always' (38, 34.5%) advised patients to set specific exercise goals in terms of frequency and duration (Table 4). Only 45 (40.9%) of the respondents reported that they advised patients to perform specific exercises.

Also, in the management of patients with LRD that smokes cigarettes, the respondents (30, 27.3%) reported that they 'always' advised the patients to quit smoking (Table 4).

The respondents were less likely to advise setting a 'quit date' and provide self-help materials. The same number of respondents (22, 20.0%) 'never' and 'usually' advised setting a 'quit date', while only 10 (9.1%) of the respondents 'always' advised setting a 'quit date' (Table 4). Most respondents did not provide any self-help materials to patients who smoked cigarettes (25, 22.7%), while only 9 (8.2%) of the respondents provided self-help materials.

Also, respondents' management options for patients who smoked cigarettes with high blood pressure is presented in Table 4. Only 39 (35.5%) of the respondents 'always' reviewed health risks of hypertension. Forty-six (41.8%) of the respondents advised weight loss for patients who were overweight. Forty-five (40.9%) of the respondents reported that they

advised salt reduction for a hypertensive patient. Over half of the respondents (72, 65.5%) focused on talking about the importance of taking medication regularly.

Thirty-eight (34.5%) of the respondents 'somewhat agreed' that smoking cessation counselling was an effective use of their time as physiotherapist (Table 5). Eleven (10%) of the respondents reported that they 'strongly agreed' that for most patients, health education does little to promote their adherence to a healthy lifestyle (Table 5). Thirty-four (30.9%) of the respondents 'somewhat disagreed' that they are less effective than professional counsellors in getting patients to quit smoking (Table 5). Nineteen (17.3%) of the respondents 'strongly disagreed' that patients without symptoms will rarely change their behaviour on the basis of their advice and over half of the respondents (58, 52.7%) 'somewhat agreed' that most patients try to change their lifestyles if they advised them to do so (Table 5). The Table also shows the frequency distribution of respondents' attitude towards the assessment and management of risk factors of lifestyle-related diseases. About half of the respondents (54, 49.1%) reported that they were 'moderately effective' in changing their patient's behaviour with respect to alcohol consumption.

Over half of the respondents reported that they were 'very effective' in changing their patients' behaviour with respect to exercise (64, 58.2%), healthy diet (61, 55.5%) and weight reduction (57, 51.8%). When asked about smoking cessation, four (3.6%) of the respondents 'do not counsel' their patients on smoking cessation. Forty-nine (49, 44.5%) of the respondents reported that they were 'very effective' in changing their patients' behaviour with respect to stress management (Table 8). Majority of the respondents felt it was 'very important' to counsel patients about alcohol consumption (77, 70.0%), blood pressure (106, 96.4%), exercise (105, 95.5%), healthy diet (96, 87.3%), smoking (78, 70.9%), weight reduction (99, 90.0%) and stress/relaxation (92, 83.6%) (Table 6). Table 7 provides detailed information relating to the barriers preventing the respondents from assessing and managing risk factors of lifestyle-related diseases. Over half of the respondents (56, 50.9%) felt lack of time was a 'very important' barrier. Eighteen (16.4%) of the respondents reported that their personal lack of interest in providing preventive services was 'not important' enough to be a potential barrier.

Forty-nine (44.5%) of the respondents reported that the lack of patient interest in prevention was a 'very important' barrier (Table 7). Thirty-three (30.0%) of the respondents felt their uncertainty about what preventive services to provide was a 'very important' barrier (Table 7). Less than half of the respondents reported the following barriers to be 'very important': lack of proper patient education materials (46, 41.8%), communication difficulties with patients (50, 45.5%), cultural differences between physiotherapists and patients (38, 34.5%), the patient came for a different purpose (25, 22.7%) and patient's social belief concerning certain risk factors (50, 45.5%).

Table 4: Frequency Distribution of Respondents' Management for Participants who were more than 20% Overweight; who smoked cigarettes and who had High Blood Pressure in addition to Cigarettes Smoking

Management Options	Never n (%)	Rarely n (%)	Sometimes n (%)	About ½ the time n (%)	Often n (%)	Usually n (%)	Always n (%)
<u>≥20% overweight</u>							
Exercise regularly	0 (0)	1 (0.9)	1 (0.9)	3 (2.7)	15 (13.6)	32 (29.1)	58 (52.7)
? Calorie intake	1 (0.9)	2 (1.8)	2 (1.8)	5 (4.5)	16 (14.5)	27 (24.5)	57 (51.8)
Set weight loss goals	1 (0.9)	3 (2.7)	5 (4.5)	10 (9.1)	17 (15.5)	35 (31.8)	39 (35.5)
? Dietary fat consumption	0 (0)	2 (1.8)	2 (1.8)	9 (8.2)	14 (12.7)	34 (30.9)	49 (44.6)
Set specific exercise goals in terms of freq. and duration	1 (0.9)	4 (3.6)	8 (7.3)	12 (10.9)	19 (17.3)	28 (25.5)	38 (34.5)
Perform specific exercises	1 (0.9)	1 (0.9)	9 (8.2)	10 (9.1)	18 (16.4)	26 (23.6)	45 (40.9)
Smoked cigarettes							
Advises to quit smoking	2 (1.8)	2 (1.8)	7 (6.4)	16 (14.5)	26 (23.6)	29 (26.4)	28 (25.5)
Advises on setting a quit date	0 (0)	8 (7.3)	14 (12.7)	13 (11.8)	30 (27.3)	27 (24.5)	18 (16.4)
Provide self-help materials	0 (0)	8 (7.3)	11 (10.0)	10 (9.1)	26 (23.6)	27 (24.5)	28 (25.5)
HBP and smoked cigarette							
Reviewed health risks of HBP	1 (0.9)	3 (2.7)	4 (3.6)	8 (7.3)	29 (26.4)	26 (23.6)	39 (35.5)
Advises weight loss	1 (0.9)	0 (0)	4 (3.6)	6 (5.5)	20 (18.2)	33 (30.0)	46 (41.8)
Advises salt reduction	3 (2.7)	2 (1.8)	11 (10.0)	3 (2.7)	18 (16.4)	28 (25.5)	45 (40.9)
Advises adherence to medication	0 (0)	1 (0.9)	1 (0.9)	2 (1.8)	12 (10.9)	22 (20.0)	72 (75.5)

Key: ?=Decrease; HBP=High blood pressure

Table 5: Frequency distribution of respondents' attitude towards the assessment and management of risk factors of lifestyle-related diseases

Variable	Strongly Agree n(%)	Somewhat Agree n(%)	Neither agree nor disagree n(%)	Somewhat Disagree n(%)	Strongly Disagree n(%)
Extent to which you agree with the following statements					
Smoking cessation counselling is an effective use of my time as a physiotherapist	34 (30.9)	38 (34.5)	24 (21.8)	9 (8.2)	5 (4.5)
For most patients, health education does little to promote their adherence to a healthy lifestyle	11 (10.0)	17 (15.5)	6 (5.5)	27 (24.5)	49 (44.5)
I am less effective than professional counsellors in getting patients to quit smoking	7 (6.4)	20 (18.2)	19 (17.3)	34 (30.9)	30 (27.3)
Patients without symptoms will rarely change their behaviour on the basis of my advice	11 (10.0)	23 (20.9)	30 (27.3)	27 (24.5)	19 (17.3)
Most patients try to change their lifestyles if I advise them to do so	29 (26.4)	58 (52.7)	19 (17.3)	2 (1.8)	2 (1.8)
Effectiveness in changing patient's behaviour with respect to some risk factors	Very effective n(%)	Moderately effective n(%)	Somewhat Effective n(%)	Minimally effective n(%)	Do not counsel n(%)
Alcohol consumption	21 (19.1)	54 (49.1)	21 (19.1)	9 (8.2)	5 (4.5)
Exercise	64 (58.2)	34 (30.9)	11 (10.0)	1 (0.9)	0 (0)
Healthy diet	61 (55.5)	38 (34.5)	10 (9.1)	1 (0.9)	0 (0)
Smoking cessation	12 (10.9)	46 (41.8)	29 (26.4)	19 (17.3)	4 (3.6)
Weight reduction	57 (51.8)	36 (32.7)	15 (13.6)	2 (1.8)	0 (0)
Stress management	49 (44.5)	35 (31.8)	18 (16.4)	7 (6.4)	1 (0.9)

Table 6: Frequency distribution of respondents' perception towards the assessment and management of risk factors of lifestyle-related diseases

Variable	Not important n(%)	Minimally Important n(%)	Somewhat Important n(%)	Moderately Important n(%)	Very Important n(%)
Alcohol consumption	1 (0.9)	1 (0.9)	7 (6.4)	24 (21.8)	77 (70.0)
Blood pressure	1 (0.9)	0 (0)	1 (0.9)	2 (1.8)	106 (96.4)
Exercise	1 (0.9)	0 (0)	0 (0)	4 (3.6)	105 (95.5)
Healthy diet	1 (0.9)	1 (0.9)	1 (0.9)	11 (10.0)	96 (87.3)
Smoking	1 (0.9)	5 (4.5)	6 (5.5)	20 (18.2)	78 (70.9)
Weight reduction	1 (0.9)	0 (0)	5(4.5)	5 (4.5)	99 (90.0)
Stress/Relaxation	1 (0.9)	0 (0)	3 (2.7)	14 (12.7)	92 (83.6)

Table 7: Frequency distribution of respondents' barriers to the assessment and management of risk factors of lifestyle-related diseases

Variable	Not Important n(%)	Minimally Important n(%)	Somewhat important n(%)	Moderately Important n(%)	Very important n(%)
Lack of time	10 (9.1)	4 (3.6)	17 (15.5)	23 (20.9)	56 (50.9)
Personal lack of interest in providing preventive services	18 (16.4)	10 (9.1)	22 (20.0)	23 (20.9)	37 (33.6)
Lack of patient interest in prevention	10 (9.1)	6 (6.5)	26 (23.6)	19 (17.3)	49 (44.5)
Uncertainty about what preventive services to provide	14 (12.7)	9 (8.2)	23 (20.9)	31 (28.2)	33 (30.0)
Lack of proper patient education materials	10 (9.1)	8 (7.3)	16 (14.5)	30 (27.3)	46 (41.8)
Communication difficulties with patients	14 (12.7)	6 (5.5)	17 (15.5)	23 (20.9)	50 (45.5)
Cultural differences between physiotherapists and patients	18 (16.4)	15 (13.6)	17 (15.5)	22 (20.0)	38 (34.5)
The patient came for a different purpose	19 (17.3)	24 (21.8)	23 (20.9)	19 (17.3)	25 (22.7)
Patient's social belief concerning certain risk factors	7 (6.4)	6 (5.5)	26 (23.6)	21 (19.1)	50 (45.5)

Discussion

This study determined the attitude, perception and practice of physiotherapists in Lagos, Nigeria towards the assessment and management of risk factors of lifestyle-related diseases in patient management. This study also provided information on the barriers physiotherapists encounter in the assessment and management of risk factors of lifestyle-related diseases in patient management. The profile of respondents in this study is quite appealing given their years of working experience, areas of specialization, practice setting, grade level of practice, continuous professional development and number of patients encountered in practice. The profile of physiotherapists presented in this study is comparable with that reported among Spanish physiotherapists.¹⁵ Also, the finding of more male Nigerian physiotherapists than females in this study corroborates the report of Balogun et al of male dominance in Nigerian physiotherapists workforce.¹⁶ Blood pressure was the most assessed risk factor of LRDs by respondents in this study. This finding is in agreement with the report of Abaraogu and colleagues that Nigerian physiotherapists always assessed blood pressure in the management of LRDs.¹⁷ However, this finding contrasts with a recent study among Italian physiotherapists that reported that less than a third of physiotherapists measured exercise related blood pressure in clinical practice.¹⁸ Severin and colleagues opined that it is necessary that physiotherapists routinely assess blood pressure in clinical practice.¹⁹ Also, more than a third of respondents in this present study agreed that they always assessed physical activity and exercise status in their management of patients with LRDs. This finding is lower than the report of O'Donoghue et al who observed that 78% of primary care physiotherapists always assessed physical activity level.¹⁴ Overall, assessments of blood pressure, physical activity level and exercise status are imperative in clinical practice as there is evidence that physical activity and exercise are effective treatments or adjuncts to treatments in the prevention and management of LRDs.^{20,21} Also, the finding of this study that more than a third of the respondents always assessed the dietary status of patients was in agreement with O'Donoghue et al who stated that 55% of primary care physiotherapists sometimes assessed dietary status of their patients.¹⁴ In this present study, it was observed that a number of the respondents always assessed the dietary status of patients, with even fewer respondents providing interventions like increasing consumption of fruits and vegetables and decreasing dietary fat consumption respectively.

Many respondents reported healthy diet as being very effective in changing patient's behaviour. This finding is contrary to the report by O'Donoghue et al that primary care physiotherapists lacked the knowledge and expertise relating to nutritional issues.¹⁴ However, the report of Johnston et al indicated that it is possible for healthcare professionals to make their clients mindful of lifestyle subjects outside of their immediate areas of expertise.²²

About half of the respondents advised overweight patients to decrease caloric intake. This finding is contrary to the report by O'Donoghue et al whose study on prevention of LRDs indicated that over half of the primary care physiotherapists in Ireland did not recommend intake of fewer calories.¹⁴ On the other hand, the finding that respondents in this study advised overweight patients to decrease calorie intake is in accordance with previous studies.^{17,23,24}

Our finding that less than half of the respondents advised the patients to quit smoking and only very few of the respondents always provided self-help materials corroborates O'Donoghue et al who found that less than half of the primary care physiotherapists always assessed smoking status and that most did not provide any written advice or educational materials relating to smoking cessation.¹⁴ With smoking as the leading cause of preventable death, and the estimation that smoking will cause more deaths than any single disease worldwide by 2020, its assessment requires immediate prioritisation by all healthcare professionals.^{10,25,26} Reports

from the US Centers for Disease Control and Prevention show that many smokers seek information on how to quit, and approximately 70% of these smokers want to quit.²⁷ Physiotherapists' lack of confidence in their ability to provide smoking cessation interventions was identified as the greatest barrier to providing this service.²⁸⁻³⁰

The last of the behavioural risk factors considered was alcohol consumption. In this study a small number of the respondents never assessed alcohol use in patients. This is contrary to the report by O'Donoghue et al that almost all of the primary care physiotherapists did not assess alcohol consumption.¹⁴ O'Donoghue and colleagues demonstrated that the provision of an information leaflet is somewhat effective in changing one's drinking habits and this is encouraging for primary care healthcare professionals, such as physiotherapists, who are unaccustomed to broaching the subject of alcohol consumption.¹⁴

Finally, the respondents in this study reported that advising on LRDs were 'very effective' in changing their patients' behaviour with respect to exercise, healthy diet and weight reduction. This is reflected by the management options advised by respondents to each category of individuals with LRDs. Some barriers to the assessment and management of risk factors of lifestyle-related diseases were identified among physiotherapists in this study, the most common of which were lack of time, communication difficulties with patients and patient's social belief concerning certain risk factors. There is need to address these limitations in order to enhance the perception, knowledge and skills in contemporary and

emerging health care delivery and to enhance physiotherapy practice in line with global professional trends and best practices, and overall to champion health professionals' role in health promotion, wellness and healthy ageing.

Conclusion

Blood pressure was the most assessed risk factor of lifestyle related diseases by physiotherapists in Lagos, Nigeria. Physiotherapists in Lagos do advise individuals with lifestyle-related diseases on dieting and weight reduction, smoking cessation and alcohol intake. Management options of exercise, healthy diet and weight reduction are very effective for changing patients' behaviour, whereas alcohol consumption, blood pressure, exercise, diet, smoking, weight reduction and stress or relaxation are perceived as very important in the assessment and management of LRDs. Lack of time, communication difficulties with patients and patient's social belief concerning certain risk factors were some common barriers to assessing and managing risk factors of LRDs.

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BACTERIAL CONTAMINATION AND ANTIBIOGRAM OF ISOLATES FROM THE HANDS OF UNDERGRADUATE STUDENTS AND FOMITES AT NNAMDI AZIKIWE UNIVERSITY NNEWI CAMPUS ANAMBRA STATE

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Abstract

Background: Health professionals are at high risk of acquiring bacterial contamination and are potential sources of health-acquired infections as well as community acquired infections. This study determined the bacterial contamination and antibiogram of isolates from the hands of undergraduate students and fomites at Nnamdi Azikiwe University, Nnewi Campus, Nnewi Anambra State.

Methods: A cross-sectional study was conducted between April and July 2022 in different Departments of Faculty of Health Sciences and Technology. A total of 112 swab samples from hands of students of health profession and 20 seats were swabbed using a simple-rinse method. The isolated Bacterial colonies were counted and species were identified using standard bacteriological techniques. Antibiotic susceptibility testing was performed using a disk diffusion technique. Chi-square test was done to ascertain the association between variables.

Results :The proportion of *E.coli* was found to be 17.9%, followed by *klebsiella pneumonia* with prevalence of 11.9%, while *Salmonella* and *Proteus* spp were 10.3% and 8.3% respectively. The relationship between the number of bacterial isolated from hands and seat was significant (P=0.01), ($X^2=8.7$). The overall multidrug-resistant rates among *E.coli*, *Klebsiella pneumonia*, *Proteus species*, *Salmonella* species were 50%, 43%, 43%, 43% and 35% respectively.

Conclusion: There is low prevalence of pathogenic enteric bacteria among students in the study area.

Key Words: *Enteric bacteria, students, fomites, hands, Nnewi.*

Introduction

The hands are the chief organs for physical manipulation of the environment. As a paired organ, the hand is controlled by the opposing brain hemisphere¹ and enables one to do all manner of things. The hand serves as a medium for the propagation of microorganisms from place to place and from person to person. Although it is nearly impossible for the hand to be free of microorganisms, the presence of pathogenic bacteria may lead to chronic or acute illness. Human's hands usually harbour microorganisms both as part of body normal flora as well as transient microbes contacted from the environment². The natural habitat of microorganisms like *Staphylococcus* is the human skin and can therefore be passed from one person to another². Many food-borne diseases and pathogenic microorganisms are spread by contaminated hands². One common way by which organisms that are not resident in the hand are picked up is by contact with surfaces such as table tops, seat surfaces, door knob or handles, banisters, toilet handles and taps in restrooms³.

Other surfaces such as classroom surfaces have been shown to play a role in the transmission of human pathogens either directly, by surface-to-mouth contact, or indirectly, by contamination of fingers with microorganisms from the gut and subsequent hand-to-mouth contact³. Several studies have shown that classroom surface carries and spread of *Salmonella* bacteria which causes salmonellosis³. *Campylobacteriosis*, like many gastrointestinal human diseases, has its ecology in which the propagation of human infection and disease depends on pathogen survival and finding new hosts to replicate and sustain the pathogen population³. Environmental factors that influence the size of the pathogen reservoirs include temperature, nutrient availability, and moisture availability during the period the pathogen population is moving through the environment between infected and susceptible hosts⁴. University students are exposed to higher risks of diarrheal disease by consuming contaminated water and food and contact with surfaces. If proper treatment not given, this can prove fatal, particularly to university students under 18 years old⁴. Many of these illnesses occur unnecessarily since the fecal-oral routes of disease transmission are easily

Materials And Method

Study area

Nnewi is the second largest city in Anambra State in South Eastern Nigeria, and is a metropolitan city comprises of two local government areas, Nnewi North and Nnewi South. Nnewi North is commonly referred to as Nnewi central, and comprises four autonomous Villages: Otolu, Uruagu, Umudim, and Nnewichi

Study Design

A total of one hundred and twelve (112) samples collected from classrooms seat surfaces and hands surfaces of students were used for this study. The seats were randomly selected from different Departments in the Faculty of Health Sciences and Technology. Thereafter, each of the seat surfaces and hand surfaces of students were carefully swabbed using sterile swab stick. Each of the swab sticks was inoculated on *MacConkey* and *Salmonella, Shigella* Agar and incubated at 37 degree Celsius for 24 hours. Afterwards, the colony growth were read and coliforms isolated based on their media characteristics. The isolated colonies (coliforms) were preserved as pure colonies on nutrient broth. The colonies isolated were differentiated and identified into their separate species using specific biochemical tests such as; Indole, motility test for *E. coli*, catalase and dextrose fermentation test for *salmonella* and *shigella*.

Sampling Technique

Seats and students hands were randomly selected using stratified sampling technique. A sample size of 112 was used to carry out this research.

Sample collection.

Sample was collected using sterile moist swab sticks to swab the hands and seats surfaces. The swab sticks was secured immediately into their containers and labelled properly with date and identification number for ease of identification. The swab sticks were then taken to the laboratory for processing within 30 minutes of collection.

Sample processing and identification of pathogen

Each swab sample was inoculated on sterilized blood agar, MacConkey agar and Chocolate agar plates respectively and incubated at 37 C for 24 hours. Each plate was examined for evidence of growth and the isolates identified by gram staining and standard biochemical tests; Indole production, Citrate utilization, Urease test, Methyl-Red (MR) Test, and Voges-Proskauer (VP) Test.

Statistical analysis

Chi-square test was done to ascertain the association between variables at level of significance of $p = \geq 0.05$

Results

From the prevalence of *Enterobacteriaceae* isolated from hands and seat surfaces, the results showed that out of the 112 samples collected, *E.coli* had the highest prevalence 60 (17.9%) followed by *Klebsiella pneumonia* 40(11.9%), *Proteus* 28(8.3%), and the least isolated *Salmonella* 10(3.0%) (Table 1). 20 samples from the left hands, 23 from the right hands and 17 from the seat surfaces yielded the growth of *E.coli*. 15 samples from the left hands, 16 from the right hands and 9 from the seat surfaces yielded *Klebsiella Pneumonia*. *Proteus species* were isolated from 13 swabs from the left hands, 7 swabs from the right hands and 8 from the seat surfaces, while the growth of *Salmonella* were detected from 5, 2, and 3 swabs from, left hands, right hands and seat surfaces respectively (Table 2). There is significant difference in the number of bacterial isolated from the hands and seats with p-value 0.01 and X² value of 8.7. **Table 3:** Antibiogram of bacterial isolates from the hands of medical students and formite. All the isolates demonstrated varying degree of susceptibility and resistant to the tested antibiotics. The overall multidrug-resistant rates among *E.coli*, *Klebsiella pneumonia*, *Proteus species*, and *Salmonella Species* were 50%, 43%, 43%, 43% and 35% respectively.

Table 1: Prevalence of bacterial isolates

Bacterial isolates	Frequency	Prevalence
<i>E.coli</i>	60	17.9
<i>Klebsiella</i>	40	11.9
<i>Proteus</i>	28	8.3
<i>Salmonella</i>	10	3

Table 2: Correlation between different sites of sample collection

Bacterial isolates	Left hand sample	Right hand sample	Seat sample	chi-square	p-value
<i>E.coli</i>	20	23	17	8.7	0.01
<i>Klebsiella</i>	15	16	9		
<i>Proteus</i>	13	7	8		
<i>Salmonella</i>	5	2	3		
No growth	59	64	75		

t -value is significant at =0.05

Table 3: Antibiogram of bacterial isolates from the hands of medical students and formite

Bacterial isolates	OFX	CPX	PEF	AU	SXT	CN	CEP	AMX	N	S	LEV	NA	CTRX	LYN	Overall MDR (%)
<i>E.coli</i>	S	S	S	S	R	S	S	S	R	R	R	R	R	R	50
<i>Klebsiella</i>	S	S	S	S	R	S	R	S	R	R	S	R	S	R	43
<i>Proteus</i>	S	S	S	S	R	S	R	S	R	R	S	R	S	R	43
<i>Salminella</i>	S	S	S	S	R	S	S	R	S	S	S	R	R	R	35

MDR= Multidrug resistant; S= Sensitive;R= Resistance; OFX=Ofloxacin; CPX=Ciproflaxacin PEF= Reflacin; AU= Augmentin; CN= Gentamycin; AMX= Amoxil; N= Ampicillin S= Streptomycin; CEP= Ceporex; LEV= Levosloxacin; NA = Nalidicic acid CTRX= Ceftriaxone; LYN= Lynlomycin; SXT= Cotrimoxazole

Discussion

The results revealed that *E.coli* which is an enteric pathogens had the highest prevalence rate of 17.9% followed by *klebsiella pneumonia* 40(11.9%). Bassey *et al.*⁶ in their study also documented high prevalence of *E.coli* followed by *Klebsiella sp.* Others are *Proteus* 28(8.3%), and the least isolated *Salmonella* 10(3.0%). The low prevalence of these isolates might be because an average student especially in medical school understands the implication of dirty environment and as thus observe personal hygiene to an extent. The presence of these organisms in the study area might be as a result of students transferring microorganisms form different locations into the lecture hall. The implication of this is that it's presence in the study area might result from faecal contamination of hands of students. This study also revealed that potentially pathogenic *Enterobacteriaceae* are present in different sampled fomites. The findings from this study affirmed earlier report that inanimate surfaces harbours pathogenic organisms⁷. The occurrence and survival of organisms on inanimate surfaces is greatly influenced by their ability to inhabit and thrive on dry surfaces⁸. This intrinsic feature is due to the presence of surface molecules (flagella, pili and polysaccharide capsule) and the production of extracellular matrix (adhesion molecules and biofilms)^{9,10}. The association between the number of bacterial isolated from hands and seat was significant, this finding proves that faecal -oral transmission is one of the means of disease transmission³. The sensitivity results indicated that most of the bacterial isolates were sensitive to the majority of the antibacterial agents utilized in the study.

Escherichia. coli showed highest resistance rate to all the tested antibiotics with overall multi drug resistance rate of 50%. This agrees with the result of the study by Bassey *et al.*, 2022. *Escherichia coli* is known to produce Extended Spectrum β -Lactamses¹¹. These enzymes inactivate the potencies of antibiotics; this explains its exceptional insensitivity to some of antibiotics as seen in this study. Sensitivity to gentamycin recorded in this study agrees with another study¹². Susceptibility to ciprofloxacin in this study corroborates the finding of a similar study⁶ which reported 47.9% sensitivity. Resistance and sensitivity of Klebsiella to Nalidixic acid and Ciprofloxacin(CPX) respectively in this study, disagrees with findings of⁶ who recorded 100% susceptibility of Klebsiella to nalidixic acid and 7.4% resistance to CPX.

The high resistance rate observed among members of Enterobacteriaceae in this study supports earlier assertion that majority of multidrug resistant isolates in clinical and environmental samples are Gram negative bacteria^{13, 14}. Gram negative bacteria possessed outer membrane in addition to cell wall. This membrane prevents many substances from entering into the cell¹⁵.

CONCLUSION

Inanimate surfaces of classroom seats and hands of students harbour members of enterobacteriaceae but at low prevalence. Most of the isolates demonstrated multidrug resistant to commonly used antibiotics.

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ELEVATED INTER-ARM BLOOD PRESSURE DIFFERENCE: LEVELS AND CORRELATES AMONG STROKE SURVIVORS

Authors

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Abstract

Background: Differences could exist in blood pressure measurement obtained from both arms, and it is deemed abnormal when it is equal to/ greater than 10mmHg. The elevated interarm blood pressure differences (IABPDs) have been associated with an increased risk for cardiovascular dysfunction.

Objectives: This study aimed at determining the levels and correlates of elevated IABPDs in systolic and/or diastolic values of stroke survivors.

Methods: Sixty-one stroke survivors (27males and 34females) were recruited from the stroke unit of the Physiotherapy Clinic at the University of Port Harcourt Teaching Hospital, Nigeria. BP values were measured in both arms with the patient in a sitting position. An interval of 5 minutes was observed before measuring from the other arm. Data obtained were analyzed and summarized, using descriptive statistics of frequency and percentage. Inferential statistics of Chi-Square was used to determine significant differences between variables. Level of significance was set at $p < 0.05$.

Results: Findings revealed elevated IABPDs in 82% of the participants; with the greatest difference noted to be 30mmHg. There was an association between IABPDs and Gender ($p=0.36$), BMI ($p=0.41$), and affected arm (0.017) respectively.

Conclusions: Elevated IABPDs was common among the stroke survivors; with discrete higher systolic and diastolic BP values that elicited such IABPDs derived from both arms. Females had twice as much elevated IABPDs than the male participants. Such elevated IABPDs shows an increased risk for cardiovascular diseases hence it is vital to observe it among patients with diseases like stroke which can reoccur. Overall, this measure will help all health care professionals to optimally monitor and care for stroke survivors.

Keywords: IABPDs, Stroke Survivors, Blood Pressure

Introduction

Differences could exist in systolic and/or diastolic blood pressure values obtained from measurements on both arms. Such inter-arm blood pressure difference (IABPD) is commonly observed clinically but is considered elevated and also significant when it is equal to or above 10 mmHg. The elevated inter-arm blood pressure differences (IABPDs) have been associated with an increased risk for cardiovascular disorder or dysfunction and increased cardiovascular mortality¹; emphasizing attention to such variables towards safe and optimal management of disease like stroke which is likely to reoccur as systolic and/or diastolic high blood pressure values remains the most modifiable risk factor for repeat/recurrent stroke². It is important to observe these differences in the blood pressure measurement of stroke patients especially during their initial assessment and as they are undergoing treatment. It is recommended that blood pressure should be taken from both arms to be properly informed as well as to detect any elevated differences^{3,4}.

According to Yoonkung et al.⁵, differences in systolic and/or diastolic blood pressure has been reported in general population (4%), diabetic patients (7%) and stroke patients (10%)

Muscle tone also influences the value of the systolic and/or diastolic blood pressure. In paretic patients, the flaccidity or spasticity of a muscle influences the value of the systolic and diastolic blood pressure on affected arm by either increasing or decreasing blood pressure⁴. However, there was agreement that the tonicity of muscle is a predictor of IABPDs which could be as a result of increased compressibility of hypotonic muscles by the sphygmomanometer cuff resulting in the partial occlusion of the brachial artery or as a result of the hypertonic muscles resisting the compressibility of the sphygmomanometer cuff in spastic arms⁶⁻⁸.

Differences in blood pressure can cause misinterpretation and mismanagement of high blood pressure when not recognized⁵. The prevalence of IABPD as reported in Clark et al⁹ was usually present in the presence of hypertension. Studies have shown an existence of inter-arm blood pressure values difference but with majority of them not later than 2 decades and only one work carried out in Nigeria².

Methods

Research Design

A cross-sectional descriptive design was used for this study. Consecutive sampling was used in recruiting participants in the study.

Participants

The participants in this study were stroke survivors attending physiotherapy outpatient clinic in University of Port Harcourt Teaching Hospital, Rivers State. The inclusion criteria for this study were patients with first episode of stroke within one year, stroke patients with absence of upper extremity amputation, patients that are ≥ 18 years of age and with ability to sit upright with minimal support. Patients that did not meet the criteria were excluded from the study. A total of 61 stroke survivors aged between 30 and 80 years comprising of 34 females and 27 males consented to participate in the study.

Study setting

This study was conducted at the University of Port Harcourt Teaching Hospital (UPTH) from June-October 2021

Participants

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Study setting

This study was conducted at the University of Port Harcourt Teaching Hospital (UPTH) from June-October 2021

Procedure

Ethical approval for the study was obtained from the University of Port Harcourt Teaching Hospital ethical committee. Stroke survivors attending physiotherapy clinic in the hospital were approached during their clinic days and their consents were sought and obtained before recruiting them in the study. A proforma containing the sociodemographic data of the patients was administered by the researchers to the participants. Patients' clinical assessments (muscle tone, duration of stroke and side of affection) were obtained from the case notes of patients. The participants body mass index (BMI), stage of recovery, muscle bulk, cause of stroke, blood pressure measurements (using manual sphygmomanometer) were obtained during patients' review by the researchers.

Measurements

Body Mass Index: Body mass index was measured using a stadiometer for the height and weighing balance for the body weight. Error due to parallax was avoided during the reading on both the stadiometer and weighing balance by ensuring vertical eye contact on the measuring apparatus.

Blood Pressure Measurement: The blood pressure was measured using a standardized manual sphygmomanometer and a stethoscope. All blood pressure measurements were taken with the patient in a sitting position, back supported and the feet flat on the floor with legs uncrossed. The arm was bare and supported using pillows placing the antecubital fossa at the heart level the cuff placed such that the lower the lower edge is placed at least 2-3cm above the antecubital fossa to allow space for placement of the chest piece (bell or diaphragm) of the stethoscope. Correct cuff size was used for each

participant such that the bladder encircles 80% of the arm and placing the midline of the bladder cuff over the brachial artery in the antecubital fossa. During the blood pressure measurement, the arm that was used for initial measurement in each participant was selected randomly and three recordings of the blood pressure was taken for each arm, at 7 minutes interval respectively. The mean for each for set of the three recordings were calculated and used for data analysis. Deflation rate of the pump was 2-3mm per second.

Data Analysis

Descriptive statistics of frequency and percentages summarized the age, gender of the stroke survivors, selected clinical characteristics of stroke (tonicity, side affected, BMI, stage of stroke, differences in muscle bulk and duration of stroke) inherent in the participants. Inferential statistics using Chi-Square test was used in determining the association between IABPDs and age, sex and clinical characteristics of the participant such as BMI, affected arm, stage of stroke, duration of stroke and difference in muscle bulk. A P-value of < 0.05 was considered statistically significant.

Results

Table 1 shows the demographic profile and clinical characteristics of the participants. The 61 participants comprise of 27 male (44.3%) and 34 female (55.7%); within the age group of 30–40 (11.5%), 41-50 (23%), 51-60 (32.8%), 61-70 (27.9%) and 71-80 (4.9%). Ischaemic and hemorrhagic type of stroke comprises of 35 (57.4%) and 26 (42.6%) of the population respectively with arm affection more on the left 31(50.8%) than on the right 30 (49.2%). It further revealed that 20 (32.8%) and 9 (14.8%) of the participants are overweight and obese respectively. Participants with stroke for greater than 7 months accounted for 52.7% of stroke survivors

Among the 61 participants recruited for the study, 50(82%) of them have elevated interarm blood pressure differences and 11(18%) showed not to have an elevated interarm blood pressure differences. Most participants (82%) were observed to have elevated interarm blood pressure differences while this observation was not noted in other patients (18%).

The association between elevated IABPD and age, sex and BMI is presented in Table 2. A significant association existed between elevated IABPD and sex ($p=0.036$). Elevated IABPD was highest (55.7%) among the female gender and lowest (44.3%) among the male gender. A significant association was also observed between elevated IABPD and BMI ($p=0.041$). Notably, 7 (11.5%) were underweight, 25(41%) normal weight, 20(32.8%) overweight and 9(14.8%) obese. In contrast, there was no significant association between elevated IABPD and age ($p=0.218$). A significant association was observed between elevated IABP and stage of stroke ($p<0.000$). For differences in muscle bulk ($p=0.566$) and duration of stroke ($p=0.432$), no significant association were observed. A significant association was also observed between elevated IABPD and affected arm ($p=0.017$).

Table 1: Demographic and clinical characteristics of participants

Variables	Frequency(n)	Percentage (%)
Age		
30-40	7	11.5
41-50	14	23.0
51-60	20	32.8
61-70	17	27.9
71-80	3	4.9
Sex		
Female	34	55.7
Male	27	44.3
Affected Arm		
Left	31	50.8
Right	30	49.2
Type of stroke		
Ischemic	35	57.4
Hemorrhagic	26	42.6
Stage of stroke		
Flaccid	13	21.3
Spasticity appears	4	6.6
Spasticity increases	17	27.9
Spasticity decreases	6	9.8
Complex movement combinations	4	6.6
Spasticity decreases	13	21.3
Normal functions return	4	6.6
Duration of stroke		
0-3 months (acute)	23	37.7
3-6 months (subacute)	6	9.8
> 6months (chronic)	32	52.5
BMI		
<18.5 (Underweight)	7	11.5
18.5-24.9 (Normal)	25	41.0
25.0-29.9 (Overweight)	20	32.8
30.0 upwards (Obese)	9	14.8

Table 2: Elevated Inter-arm differences

	Frequency	Percentage (%)
YES	50	82%
NO	11	18%

Table 3: Elevated Inter-Arm Blood Pressure Difference

FACTORS	X²	p-value
Age	5.760	0.218
Sex	4.407	0.036*
BMI	8.276	0.041*
Stage of stroke	24.168	0.000*
Diff. in muscle bulk	1.140	0.566
Duration of stroke	1.680	0.432
Affected arm	5.720	0.017*

* Indicates significance at $p < 0.05$

Discussion

The interarm blood pressure difference of ≥ 10 mmHg was noted in 82% of the participants. Verberk et al.¹⁰, in their study stated that method of inter-arm difference (IAD) performance had a significant influence on its prevalence. Cassidy & Jones¹¹ in their study also observed wide range of interarm blood pressure differences. Interarm blood pressure difference ≥ 10 mmHg shows an increased risk for cardiovascular diseases, including increased cardiovascular disease related mortality and morbidity and all-cause mortality. Among the study participants, there are more female stroke patients than their male counterpart. This could be due to the unmonitored and poorly treated pregnancy induced hypertension, hypercholesterolemia and gestational diabetes. Maduagwu et al² and Dewar et al⁸ in their study also recorded female preponderance. Conversely, Orme et al¹² and Clark et al⁹ in their study found no significance association between elevated IABPD with gender. Elevated IABPD was significantly observed in the affected arms of the participants which could be as a result of the variations in muscle tone between the affected and unaffected limb. This corresponds to a study by Yagi et al.¹³, Dewar et al.⁸, and Uijen⁴ where elevated IABPD was significantly observed in the paretic limb than in the nonparetic limb. Age, difference in muscle tone and duration of stroke were found in this study to have no significance association with elevated IABPD between the affected and unaffected arm. This concurs with the finding of Maduagwu et al.², Uijen⁴, Orme et al.¹² and Dewar et al⁸ although reason(s) for this could not be ascertained. Conversely, Lane et al¹⁴ found that age can be a significant predictor of elevated inter-arm BP differences for the general population. However, with increase in age, loss of vascular elasticity with a concurrent increase in arterial resistance to compression is usually common which might account for differences in BPs when taken in both arms¹⁴. Body mass index (BMI), stage of stroke and the arm affected were found in this survey to have a significant effect on elevated interarm blood pressure differences. Schwartz et al¹⁵ noted that increased body mass index (BMI) is associated with elevated systolic IADs. In paretic patients, the flaccidity or spasticity of a muscle influences the value of the systolic and diastolic blood pressure by either increasing or decreasing it⁴. This agrees with the findings of Maduagwu et al.², Uijen and Hassink-Franke⁴, Moorthy et al⁶, Panayiotou et al.⁷ and Dewar et al⁸. It was also found that stages of stroke have significant effect on elevated IABPD which could also be attributed to muscle tonicity as stage of stroke also represents the tone of the muscle at a given period.

Limitations of the study

This preliminary study involved only 61 participants, thus the study result might not have captured enough to make incontrovertible conclusions. The study utilized literatures that seem to be later than 2 decades ago due to unavailability of studies.

Conclusion

Differences could exist in blood pressure measure when taken from both arms and it is deemed abnormal when it is greater than or equal to 10mmHg. It is important to observe this difference in the blood pressure measurement of patients with diseases like stroke which can reoccur especially during their initial assessment and as they are undergoing treatment. Special attention should be given to women as they are more likely to have this elevated IABPDs. It is recommended that BP should be taken from both arms as to be properly informed and to detect any elevated differences and to assist to optimally monitor and care for stroke patients.

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MOLECULAR DETECTION OF CEFOTAXIMASE MUNICH (CTX-M) RESISTANT *ACINETOBACTER BAUMANNII* IN A TERTIARY CARE HOSPITAL IN SOUTHEAST NIGERIA

Authors

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menace associated with this organism.

Key Words: *Multidrug resistance, Acinetobacter baumannii, hospital infections*

Abstract

Background: *Acinetobacter baumannii* (*A. baumannii*) is one of the numerous organisms responsible for multidrug resistant, hospital acquired infections in many tertiary health care institutions worldwide.

Aim: To detect the presence of cefotaximase (CTX) resistant *A. baumannii* in NAUTH Nnewi, Southeast, Nigeria.

Materials and Methods: Clinical isolates of Gram-negative bacilli (n=210) were obtained from several clinical specimens. All isolates were phenotypically identified in the laboratory using standard cultural methods. Antimicrobial susceptibility tests were performed on all *A. baumannii* species detected using the Kirby Bauer disc diffusion technique. Isolates resistant to any of the 3rd generation Cephalosporins were screened for ESBL activity using the Double disc synergy test. Polymerase Chain Reaction was then used to detect the presence of CTX gene from the ESBL positive isolates.

Results: Out of the 210 Gram-negative bacilli, 20 (9.5%) were *Acinetobacter* species. The organisms were most resistant to amoxicillin-clavulanic acid and the 3rd generation cephalosporins. Cefotaximase (CTX) gene was observed in 3/20 (5%) of the *Acinetobacter* species.

Conclusion: Multidrug resistant *Acinetobacter baumannii* was prevalent in the study area, although the rate of CTX production was relatively low. Consequently strict application of good infection prevention and control measures in the hospital setting is necessary to curb the menace associated with this organism.

Key Words: *Multidrug resistance, Acinetobacter baumannii, hospital infections*

Introduction

Acinetobacter baumannii (*A. baumannii*) accounts for about 80% of reported *Acinetobacter* human infections. The organism is a ubiquitous, intrinsically multidrug-resistant and rapidly emerging pathogen. It causes a range of healthcare associated infections including sepsis, pneumonia, meningitis, urinary tract infection, and wound infection. The organism has the ability to survive under a wide range of environmental conditions. Its persistence for extended period of time on surfaces makes it a frequent cause of outbreaks in healthcare settings^{1,2}. *Acinetobacter baumannii* preferentially colonizes aquatic environments, and in healthcare settings, these include fomites like irrigating solutions and intravenous solutions³. These organisms can be cultured from hospitalized patients' sputum or respiratory secretions, wounds, and urine⁴.

In recent years, multidrug-resistant *A. baumannii* isolates have been increasingly reported worldwide and has been seen to be emerging as a cause of numerous global outbreaks^{5,6}. Multidrug-resistant *A. baumannii* strains are associated with an enhanced risk of morbidity, mortality and prolonged duration of hospitalization⁷. Although several studies on multidrug resistant (MDR) *A. baumannii* (MDR-AB), have been done worldwide, there is insufficient information about the pathogen in the South eastern parts of Nigeria hence the design of the present study.

Materials And Methods

Study area:

The study was conducted at the Medical Microbiology and Parasitology Laboratory of Nnamdi Azikiwe University Teaching Hospital, Nnewi, Southeastern Nigeria. The hospital is a tertiary institution and a major referral Centre serving individuals from most parts of South-east, Nigeria.

Study Design:

This was a prospective hospital based cross-sectional study conducted from March to October 2019.

Study Population

Twenty *Acinetobacter* species were obtained from 210 Gram negative bacilli isolated from several clinical specimens of patients attending the Nnamdi Azikiwe University Teaching Hospital, Nnewi, a major referral centre serving individuals from most parts of South-East, Nigeria. The bacteria were collected within from March to May 2019.

Ethical approval

Ethical approval was obtained from the Research and Ethics Committee of Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi.

Isolation and characterization of *Acinetobacter baumannii*

Duplicate swabs (HVS and wound swabs) were collected by rolling moistened sterile swab sticks over the infected sites for about 5 seconds⁸. Urine and sputum specimens were collected in their appropriate containers. Blood specimens were collected in appropriate BactAlert blood collection bottles. The blood culture bottles were incubated in a BactAlert 3D 60 automated blood culture machine until the bottles were flagged positive or when no growth was observed after 5 days of incubation⁸. Positive blood culture specimens were sub-cultured on chocolate agar and Mac Conkey agar (Oxoid, UK) and the culture plates were incubated at 35-37°C for 24 hours. All other specimens were sent to the laboratory immediately after collection and cultured on chocolate agar and Mac Conkey agar (Oxoid, UK) and incubated at 35-37°C for 24 hours⁸.

The isolates were Gram-stained, and the Gram-negative rods were subjected to confirmatory identification of *Acinetobacter* species using the Microbact™ Gram-negative bacteria identification kit (Oxoid, UK)⁸ motility and oxidase tests⁸.

Antimicrobial Susceptibility testing

The Modified Kirby-Bauer antimicrobial susceptibility testing technique was performed on all isolates confirmed as *A. baumannii*⁸. A lawn of each bacterial inoculum equivalent to 1.5 X 10⁸ CFU/ml, was made on the surface of a Mueller-Hinton agar (Oxoid, UK) plate using a sterile swab stick and left to dry for 3-5 minutes. Antibiotics were then placed on the lawn, and the plates were incubated aerobically at 35-37°C for 16-18 hours. The zones of growth inhibition around each antibiotic disc were then measured and reported based on the guidelines of the Clinical and Laboratory Standard Institute (CLSI)⁸. The antibiotics tested against the isolates include: Ceftazidime (30 µg), Cefuroxime (30 µg), Ciprofloxacin (30 µg), Ceftriaxone (30 µg), Piperacillin Tazobactam (10 µg), Amikacin (30 µg), Imipenem (10 µg), Ertapenem (10 µg), Meropenem (10 µg), Cefixime (5 µg), Colistin and Gentamicin (10 µg) (Oxoid UK). The test was controlled using *Pseudomonas aeruginosa* ATCC 27853 and *Escherichia coli* ATCC 25922 as the control strain⁸.

Screening for suspected Extended Spectrum Beta Lactamase (ESBL) production

The isolates were screened for resistance to 3rd generation cephalosporins according to the 2020 CLSI guidelines⁹. In this method, 3rd generation cephalosporins (cefotaxime (30 µg) and ceftazidime (30 µg)) discs (Oxoid, UK) were placed on the surface of Mueller Hinton Agar (Oxoid, UK) plates inoculated with each isolate and then incubated for 16-18 hours at 35-37°C after which zones of inhibition were read off. Isolates showing zones of inhibition ≤ 27 mm in

plates inoculated with each isolate and then incubated for 16-18 hours at 35-37°C after which zones of inhibition were read off. Isolates showing zones of inhibition ≤ 27 mm in diameter for cefotaxime or ≤ 22 mm for ceftazidime were considered as suspected ESBL producers. These isolates were then tested using the Combined Disc Method for phenotypic confirmation of ESBL production. The screening test was quality controlled using a strain of *Escherichia coli* ATCC 25922.⁹

Phenotypic confirmation of Extended Spectrum Beta Lactamase (ESBL) production (Combination Disc Test)

The *A. baumannii* isolates which were suspected of producing ESBLs were then subjected to confirmatory ESBL testing using the combination disc technique¹⁰. Ceftazidime (30 µg) and cefotaxime (30 µg) were used alongside their combinations with clavulanic acid. Standard disc diffusion procedure was followed as described earlier and plates were incubated at 35-37°C for 16-18 hours. Following incubation, a 5 mm increase in a zone diameter for either antimicrobial agent tested in combination with clavulanate versus the zone diameter of the agent when tested alone was confirmatory for ESBL production¹¹.

Molecular Detection of CTX gene

Bacteria DNA from the confirmed *A. baumannii* isolates were extracted using the boiling method for DNA extraction previously described by De Medici *et al.*¹⁴. The Gene encoding CTX group beta-lactamases were detected using conventional PCR reactions that were based on the protocols published previously by Iroha *et al.* (2012)^[24]. The primers used were designed and supplied by (Inqaba, SA) and are listed in Table 1. The PCR conditions were as follows: Initial denaturation at 94°C for 5 minutes; followed by 32 cycles of denaturation at 95°C for 30 seconds; annealing at 54°C for 1 minute; extension at 72°C for 2 minutes, then final extension at 72°C for 5 minutes.

Primer	Sequence (5' 3') ^a	Location	Product Size
CTX-M (F)	CGCTTTGCGATGTGCAG	blactx-M	517bp
CTX-M (R)	ACCGCGATATCGTTGGT	blactx-M, reverse primer	

Key: CTX-M = Cefotaximase Munich
 The products were resolved on a 2.0% agarose gel at 100V for 30 minutes and visualized on a blue light trans- illuminator at 280 nm.

Out of the 210 Gram negative bacilli isolated in the course of the study, the prevalence of *A. baumannii* was 10 (4.8%) (Table 2). Out of the 10 *A. baumannii* isolated in the study, 4 (40%) were obtained from urine, and 3 (33%) were from swab samples. (Table 3). The *A. baumannii* isolates were most resistant to amoxicillin-clavulanic acid (80%) and cefuroxime (80%). They were least resistant to ciprofloxacin (33.3%) and Piperacillin-tazobactam (33.3%) (see Figure 1). The CTX gene was detected in 3/10 (30%) of the *A. baumannii* isolates. (Figure 2).

Table 2: PREVALENCE OF ACINETOBACTER BAUMANNII AT NNAMDI AZIKIWE UNIVERSITY TEACHING HOSPITAL NNEWI, ANAMBRA STATE SOUTHEASTERN NIGERIA

Total No of Isolates cultured	No of <i>A. baumannii</i>	Prevalence (%)
210	10	4.8

Table 3: DISTRIBUTION OF ACINETOBACTER BAUMANNII ACCORDING TO SAMPLE USED

Total No of <i>A. baumannii</i>	No in Urine (%)	No in HVS (%)	No in Wound Swab (%)
10	4 (40%)	2 (20%)	4 (40%)

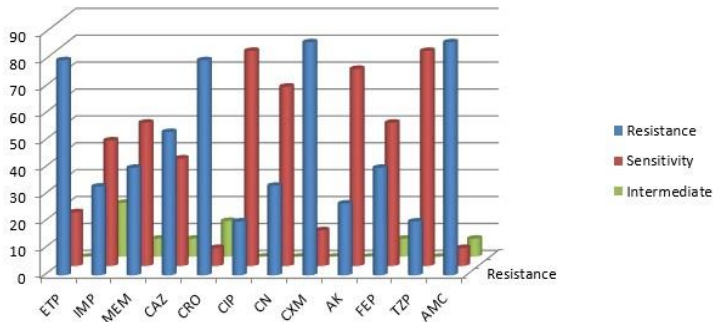


Figure 1: Antibiogram of the *A. baumannii* isolates. ETP=Etarpenem; IMP=imipenem; MEM=Meropenem; CAZ = Ceftazidime; CRO = Ceftriaxone; CIP=Ciprofloxacin; CN=Gentamycin; CXM=Cefexime; AK=Amikacin; FEP=Cefepime; TZP=Tazobactam piperacillin; AMC=Amoxicillin clavulanic acid.

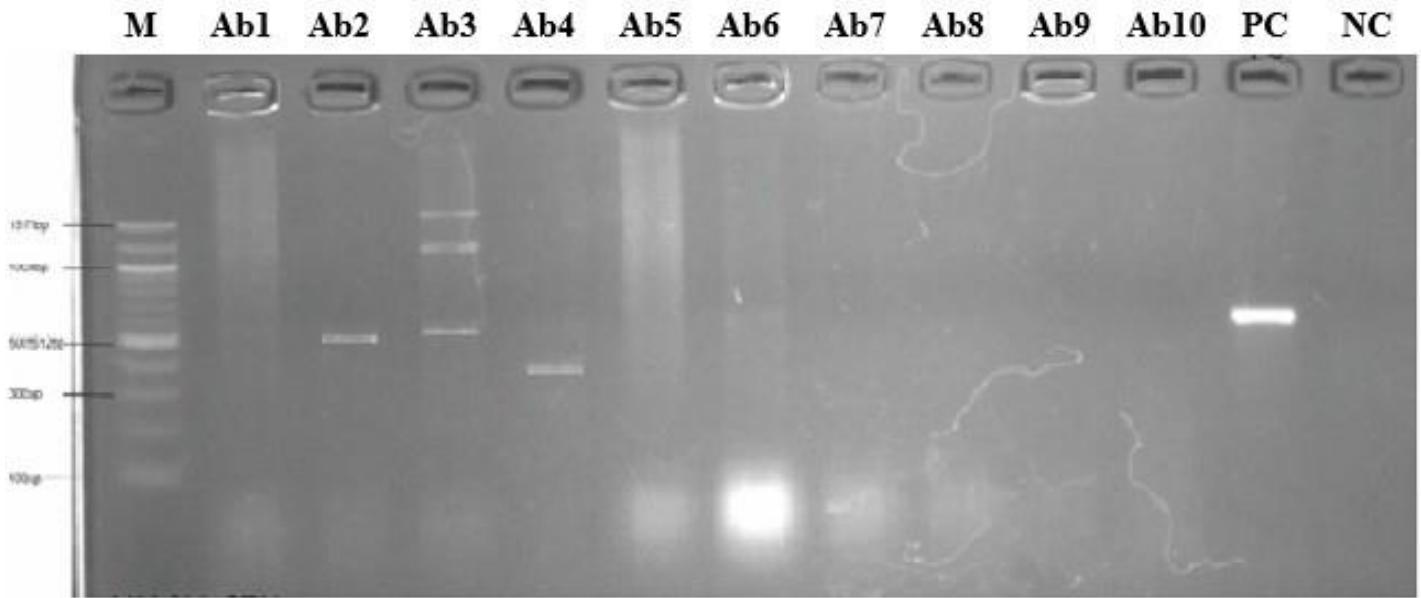


Figure 2: Agarose gel electrophoresis showing the amplified CTX gene from *A. baumannii* isolates AB1-AB10. M = Marker, Ab = *Acinetobacter baumannii*, PC = Positive control, NC = Negative control.

Discussion

Acinetobacter baumannii as one of the leading causes of health care associated infections can be easily contacted because it is found everywhere and spread from person to person. Antibiotic resistant *A. baumannii* has emerged as one of the most problematic hospital acquired pathogens around the world¹³. The emergence of this multidrug strain has gained attention due to its role in mortality and its potential threat to society, particularly in healthcare institutions. While several studies have been conducted on the organism, relatively few have been conducted in Nigeria, particularly in the southeastern region. It has been identified as a cause of nosocomial infection.

This study found that *A. baumannii* occurred at a rate of 4.8%. This is lower than 79% prevalence found by Nwadike *et al.*⁷ in their study, which only examined blood samples. In contrast, this study used samples from various sources (e.g. blood, urine, swab, aspirate). Neetu *et al.*¹⁰ found a prevalence of 72% in their study, which is also higher than 4.8% found in this research. It is possible that higher prevalence in these other studies may be due to the use of more accurate identification techniques. This study also used a reliable identification method.

Furthermore, a prevalence of 25.4% and 8.4% were obtained by Parisa *et al.* and Hilina *et al.*^{13,15} for *A. baumannii*, which is way higher than that of this study, probably because the study was carried out within a longer period of time and their samples were collected from two different hospitals. That is, the more time given to research, the more chances of obtaining organisms. Also, different environmental practices (e.g. hygiene, proper health care services etc.) play a role in the presence and survival of micro-organisms. Zahra *et al.*¹⁶ also discovered a very high prevalence (30%) of *A. baumannii*, although, it was from air, water and inanimate surface samples. *A. baumannii* is know

to be ubiquitous in nature (e.g. CDC 2010 etc) and is also known to be resistant to several disinfectants hence the possibility of isolating a large number from the environment.

According to the site of infection, swab samples showed the highest prevalence (40%) of *A. baumannii* followed by urine (30%) but this is contrary to previous studies^{3,11}, and Alkali *et al.*¹ who reported their highest prevalence to be in urine and suction respectively¹⁷. Methodology used by each study varies and this could be the reason for the differences in result.

About 80% of the isolates were resistant to cefexime, and amoxicillin/clavulanic acid; ceftriaxone, (66.7%); ceftazidime (40%), cefepime 33.3%; while ciprofloxacin, gentamycin, amikacin, tazobactam-piperacillin had few organisms that are resistant. This resistance to cephalosporins is similar to a study done by Velma *et al.*²¹ in which about 80% of the organism were highly resistant to some cephalosporins. This study showed a high sensitivity pattern to ciprofloxacin but however, is different from the result obtained by Odewale *et al.*⁸. The report by Odewale *et al.*⁸ showed 78.3% resistance to ciprofloxacin although their study population was specifically patients with nosocomial infections

unlike the present study where all patients were recruited. The CTX-M family members hydrolyze cefotaxime and ceftriaxone better than ceftazidime, and they are inhibited more by tazobactam than by clavulanic acid, although point mutations leading to increased activity against ceftazidime can occur. CTX-M enzymes have disseminated rapidly worldwide and are now among the most prevalent ESBLs in Europe and South America²². CTX-M gene was detected in three of the

A. baumannii (AB2, AB3, and AB4) isolates at 500bp, 1000bp, 1517bp respectively. (Figure 5) These isolates happen to be the ones obtained from urine and swab samples. This result is similar to findings made by Nwadike *et al.*¹⁸ and Alkali *et al.*^{7,11} because they were isolated from moist environment and it proves that *A. baumannii* is a known cause of urinary tract infection (UTI) and wound infections. CTX-M β -lactamases produced by *A. baumannii* strains is plasmid-mediated hence the wide spread and long-time survival in hospitals. The CTX-M gene activity conferring resistance to cefotaxime and ceftazidime (Essam *et al.* 2015)⁹.

Conclusion

Multidrug resistant *A. baumannii* was prevalent in the study area, although the rate of CTX production was relatively low. To effectively address the problems caused by this organism, it is essential to strictly follow good infection prevention and control measures in the hospital setting.

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SOCIO-ECONOMIC STATUS OF STROKE SURVIVORS AND PEOPLE LIVING WITH OSTEOARTHRITIS IN PORT HARCOURT METROPOLIS, RIVERS STATE

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ABSTRACT

Background: Socio-economic status (SES) is an important determinant of health, and one of the major factors that determine treatment and rehabilitation outcomes of debilitating chronic conditions such as stroke and osteoarthritis (OA).

Aim of the Study: This study determined and compared SES of stroke survivors and people living with osteoarthritis (PLWOA) in Port Harcourt Metropolis, Rivers State.

Material and Methods: The study design was comparative cross-sectional. A multistage sampling technique was used to select 78 stroke survivors and 186 PLWOA from the two strata making up Port Harcourt Metropolis – Port Harcourt City Local Government Area (PHALGA) and Obio-Akpor Local Government Area (OBALGA). Kuppuswamy's socio-economic scale was used to measure the current SES of the two groups from June 2019 to January 2020. Data were analyzed using the IBM SPSS version 24. Chi-square test statistic was used to compare the proportion of stroke survivors with low, middle and high SES and that of PLWOA. P-value ≤ 0.05 was considered statistically significant.

Results: Results revealed that majority of stroke survivors and PLWOA were males, 55 (70.5%) and 106 (57%) respectively and within 51-60years of age. The proportions of stroke survivors with low, middle and high SES were 26.1%, 56.5% and 17.4% compared to 41.7%, 49.7% and 8.1% respectively of those of PLWOA. The difference observed between these proportions was statistically significant (Chi-square = 10.272, P-value = 0.006).

Conclusion: The study concluded that most stroke survivors and PLWOA in Port Harcourt metropolis were of middle SES, and that low SES was higher in PLWOA than in stroke survivors.

Keywords: *Socio-economic status, stroke, osteoarthritis, Port Harcourt*

INTRODUCTION

Socio-economic status (SES) is described as a complex measure of an individual's economic and social standing¹. It is one of the recognized key factors that have both social and medical implications, and is more frequently used to depict an economic difference among individuals and the society as a whole². It is a very important determinant of health and often based on income, education, and occupation³.

Erreygers² posited that as a general rule, wealthy individuals tend to be in better health than people of poorer status. Socio-economic status has been largely reported to have significant health impact on a multitude of diseases^{4,6}. Some of the measures of SES among others include level of education, family background and education of parents, current occupation, net income, household, income, and wealth⁷. Individuals are usually separated into groups based on these metrics; from least advantaged to most advantaged, or low, medium, or high SES⁷. Cookson et al⁶ established a link between SES and individual health status. Individuals with relatively low SES may not have very good access to care services, or even transportation to get healthcare. As a result of this, such individuals may not be able to adequately take care of their health; others may not have sufficient education to realize the effect certain conditions have on their health. The stress related to individual's socioeconomic status alone may impact his or her health⁸. There is a strong association between SES and health⁹. Low socioeconomic status is a global problem and major social determinant of health¹⁰. Socio-economic status is one of the major factors that determine treatment and rehabilitation outcomes of debilitating chronic conditions¹¹. It has been reported that about two-thirds of all countries worldwide have felt the effect of low SES¹⁰. In Sub-Sahara Africa, low SES has been linked to poor living conditions as well as poor treatment outcomes⁵.

It is believed that a good SES is a strong social predictor for individuals to have a better economic, social status, and live a healthy and successful life. Globally, low SES has been responsible for more than 60% of all deaths, and two-thirds of this is in the Sub-Sahara African region¹².

Stroke and osteoarthritis are both chronic non-communicable diseases of major public health concerns¹³. They are both diseases of disabilities associated with substantial morbidity as well as socio-economic problems among sufferers¹⁴. Onwuchekwa et al¹⁵ reported that the prevalence of stroke in Nigeria is common in rural area, and it is very frequent among the elderly population. In another study, Akinkpelu et al¹⁶ explained that in Nigeria, one out of every five individual aged 40 years and above usually have symptomatic osteoarthritis, and the prevalence is at 19.6%. With the growing population in Nigeria and the socio-economic challenges, the poor people in most communities in Nigeria are suffering from a

Hence, the aim of this study was to determine and compare the socio-economic status (SES) of stroke survivors and people living with osteoarthritis (PLWOA) in Port Harcourt Metropolis, Rivers State.

MATERIAL AND METHODS

Study Area

The study area was Port Harcourt Metropolis, Rivers State. Port Harcourt is also the capital and largest city in Rivers State. It is located in south-south region of Nigeria, lies along the Bonny River and is part of the Niger Delta area of Nigeria. It has two major local government areas; The Port Harcourt City Local Government Area (PHALGA) and Obio-Akpor Local Government Area (OBALGA).

Study Design

The study adopted a comparative cross-sectional research design.

Study Population

The study population was stroke survivors and people living with osteoarthritis (PLWOA) in Port Harcourt Metropolis, Rivers State.

Sample Size Determination

Sample size was determined using the formula for comparative studies:

$$2 (Z\alpha + Z\beta)^2 \times P (1-P) / (P1 - P2)^2 \text{ (17)}$$

Where

$Z\alpha$ = value for α error at desired confidence level of 95%. P-value is 0.05 (two-tailed test). In this case, $Z\alpha = 1.96$.

$Z\beta$ = value of β error which is 1-statistical power. At statistical power of 80% and a β error of 20%, $Z\beta = 0.84$.

$$= 0.55$$

$$P = (P1 + P2) / 2 = (0.78 + 0.55) / 2 = 1.33 / 2 =$$

$$0.67$$

Imputing these values into the formula above, we have:

$$N = 2 (1.96 + 0.84)^2 \times 0.67 (1 - 0.67) / (0.78 - 0.55)^2$$

$$= 15.68 \times 0.22 / 0.23^2$$

$$= 3.45 / 0.05$$

$$N = 69$$

For both groups (stroke and OA), we have $69+69 = 138$
After adjusting for 10% non-response, we have minimum
sample size per group = 76.

Sampling Method

The sampling method used for this study is a multistage sampling technique for both stroke survivors and people living with osteoarthritis.

Sampling for stroke survivors:

Stage1: Stratification of Port Harcourt Metropolis into 2 strata (PHALGA and OBALGA) by non-proportionate stratified sampling technique. PHALGA stands for Port Harcourt City Local Government Area while OBALGA stands for Obio-Akpor Local Government Area. They are the Local Governments that make up Port Harcourt Metropolis. This was followed by allocation of sample size to both local government areas. Since the minimum sample size per group was 76, a sample of 38 was allocated to both PHALGA and OBALGA.

Stage2: Selection of all communities in both PHALGA and OBALGA by cluster sampling. There were a total of 28 communities in PHALGA and 64 in OBALGA.

Stage 3: Selection of 10 communities in PHALGA and 30 communities in OBALGA by cluster sampling.

Stage 4: Selection of households in selected communities by cluster sampling. There are 640 households in the selected 10 communities in PHALGA and 1,858 households in the selected 30 communities in OBALGA. A total of 34 households were selected from the 640 in PHALGA while 50 households were selected in OBALGA by cluster sampling.

Stage 5: Selection of adult male or female (aged 40 and above) in selected households by simple random sampling. In PHALGA, 34 individuals were selected while 50 individuals were selected in OBALGA. Information was incomplete for 4 individuals in PHALGA and 2 in OBALGA. The total number of individuals (stroke survivors) finally selected in PHALGA are 30 and 48 in OBALGA, making it a total sample of 78 stroke survivors for the study.

Sampling for People living with Osteoarthritis (PLWOA):

Stages 1 and 2 were applicable for stroke survivors

Stage 3: Selection of 15 communities in PHALGA and 40 communities in OBALGA by cluster sampling.

Stage 4: Selection of households in selected communities by cluster sampling. There were 990 households in the selected 15 communities in PHALGA and 2,830 households in the selected 40 communities in OBALGA. A total of 77 households were selected from the 990 in PHALGA while 113 households were selected in OBALGA.

Stage 5: Selection of adult male or female (aged 40 and above) in selected households by simple random sampling. In PHALGA, 77 individuals were selected while 113 individuals were selected in OBALGA. Information was incomplete for 1 individual in PHALGA and 3 individuals in OBALGA. The total number of individuals (PLWOA) finally selected in PHALGA are 76 and 110 in OBALGA, making it a total sample of 186 PLWOA for the study.

Study Instrument

The research instrument was a Semi-Structured Questionnaire (SSQ) containing two Parts (I - II). Part I consisted of socio-demographic features while Part II consisted of research questions on SES of the participants. The questions on SES were adapted from Kuppuswamy's socio-economic scale. The Kuppuswamy's scale is commonly used to measure socio-economic status (SES) in urban and rural areas³. This scale was devised by Kuppuswamy in 1976 and consists of a composite score which includes the education, occupation and income per month, yielding a score of 3–29³. Section A (Education) has seven categories with 1 as the lowest score, and 7 the highest. Section B (Occupation) also has seven categories with 1 as the lowest score and 10 as the highest. Section C (income per month) has seven categories with 1 as the lowest score and 12 as the highest. It is scored as low, middle and high¹⁸. Scores 5-10 means low SES, scores 11-25 means middle SES while scores 26-29 means high SES.

Administration of the Instrument

The data used for study was obtained through administration and retrieval of the instrument. The questionnaire was administered to participants by the principal investigator and four trained research assistants who carefully explained the purpose of the study to the respondents. An introductory letter (participant's information sheet) explaining the purpose of the study was dully attached to the instruments. Participants were made to sign the consent form before they were admitted for the study.

Ethical Consideration

Ethical approval for the study was obtained from University of Port Harcourt Ethical Research Committee. The reference number of the ethical clearance letter is UPH/CEREMAD/REC/MM61/050. An informed consent letter was signed by participants before they were admitted for the study. All the information provided by the participants was treated with high level of trust and confidentiality. The study did not pose any risk to participants.

Data Analysis

The data collected were collated, coded and analysed using the computer software (Statistical Package for Social Science [SPSS] package) version 24.

Descriptive statistics was used to express the variables (categorical variables) in proportions. Chi-square test statistic was used to compare the proportion of stroke survivors with low, middle and high socio-economic status and that of people living with osteoarthritis (PLWOA). P-value ≤ 0.05 was considered statistically significant.

Results

Table 1 gives a description of the socio-demographic characteristics (Age, Sex, Marital Status, Education, Religion, Ethnicity and Occupation) of the participants (Stroke survivors and PLWOA). The results showed that out of 78 stroke survivors and 186 PLWOA, 55 (70.5%), 106 (57%) were males, while 23 (29.5%), 80 (43%) were females respectively. Majority 37 (47.4%), 71 (38.2%) were between the ages of 51-60years. Also, majority 65 (83.3%), 149 (80.1%) of the participants were married. The level of education among the participants showed that those with secondary education were the majority 36 (25.6%), 118 (63.4%) for both stroke survivors and PLWOA respectively. For religion, majority of the stroke and PLWOA 59 (75.6%), 129 (69.4%) respectively were Christians. The ethnicity of the participants showed that Igbo represented the majority with 25 (32.1%), 47 (25.3%) for stroke survivors and PLWOA respectively. Lastly, the participants' occupation showed that majority of them were into Trading which represents 25 (32.1%), 60 (32.3%) for stroke survivors and PLWOA respectively.

Table 2 revealed that the proportions of stroke survivors with low, middle and high SES were 23 (26.1%), 39 (56.5%) and 16 (17.4%) compared to 78 (41.7%), 93 (49.7%) and 15 (8.6%) respectively of those of PLWOA. The difference observed between these proportions was statistically significant (Chi-square = 10.272, P-value = 0.006).

Table 1: Socio-demographic Characteristics of Stroke survivors (n=78) and PLWOA (n=186)

Categories	Stroke survivors (n=78)		PLWOA (n=186)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Sex				
Male	55	70.5	106	57
Female	23	29.5	80	43
Age				
40-50 years	9	11.5	37	19.9
51-60 years	37	47.4	71	38.2
61-70years	28	35.9	68	36.6
71 and above	4	5.1	10	5.4
Marital status				
Single	6	7.7	22	11.8
Married	65	83.3	149	80.1
Divorced/separated	4	5.1	10	5.4
Widowed	3	3.8	5	2.7
Education				
No formal education	20	25.6	23	12.4
Primary	4	5.1	11	5.9
Secondary	36	25.6	118	63.4
Tertiary	18	46.2	34	18.3
Religion				
Christianity	59	75.6	129	69.4
Islam	7	9	7	3.38
Others	12	15.4	50	26.9
Ethnicity				
Igbo	25	32.1	47	25.3
Yoruba	4	5.1	0	0
Hausa	4	5.1	10	5.4
Ikwere	15	19.2	47	25.3
Ijaw	9	11.5	21	11.3
Ogoni	5	6.4	33	17.7
Etche	9	11.5	19	10.2
Kalabari	7	9.0	9	4.8
Occupation				
Trading	25	32.1	60	32.3
Civil service	22	28.2	54	29
Farming	13	16.7	25	13.4
Public service	1	1.3	1	0.5
Apprenticeship	2	2.6	13	7
Retired	15	19.2	33	17.7

Table 2: Socio-economic status of stroke survivors (n=78) and people living with osteoarthritis (PLWOA) (n = 186)

SES Categories (Kuppuswamy's Socio-economic scale)	Stroke survivors n (%)	Participants PLWOA n (%)	X ²	Df	P-value
Low	23 (26.1)	78 (41.7)	10.272	2	0.006*
Middle	39 (56.5)	93 (49.7)			
High	16 (17.4)	15 (8.6)			

* Statistically significant

DISCUSSION

This study found out that low SES was higher in PLWOA than in stroke survivors, the observed difference being statistically significant. On the other hand, majority of stroke survivors and PLWOA were of middle socio-economic class while a much smaller percentage was of high SES. Although no study which specifically compared SES among stroke survivors and PLWOA was found, some studies have investigated the influence of SES on these conditions separately and also on the general population. Adedoyin et al¹⁹ investigated the influence of socio-economic status of adult Nigerians on casual blood pressure. They found out that hypertension was higher among those in the lower socio-economic class, and concluded that low SES was associated with development of hypertension among Nigerian adults. Hypertension is a risk factor for stroke. Therefore, the finding of the present study which showed that majority of the stroke survivors and PLWOA were of middle socio-economic class, followed by those of low SES agrees with that of Adedoyin and colleagues¹⁹. This finding is also similar to those of^{4,20-24}. The design of the study is, however, at variance with most of these studies. Wang et al²⁰ and Heely et al²¹ for instance, looked only at the influence of SES on stroke mortality but could not attempt to compare it with another condition of disability. A study conducted in the United States reported that PLWOA constituted a high level of individuals of SES²². This study which was a longitudinal population-based study carried out in North Carolina, focused only on SES and OA. Therefore, no comparison was made with other diseases of disabilities. Addo et al⁴ and Cox et al²⁵ reported an association between low SES and stroke while Cleveland et al¹⁸ found OA and

baseline morbidities to be higher in individuals of low SES among participants in the United Kingdom. These findings are however, similar to the assertion made by Kim et al²⁴ that low SES existed among stroke survivors globally.

The finding of this study is also at variance with a widely held belief which expects low SES to be higher among stroke survivors. It may, however, be confounding to find in this study that low SES was higher among PLWOA than in stroke survivors.

The reason for this could be that less economic and emotional support are being given to PLWOA by families, friends, communities, organizations, and the government since it is generally believed that OA is usually not as disabling as stroke.

CONCLUSION/RECOMMENDATION

The study has clearly demonstrated that most stroke survivors and PLWOA in Port Harcourt Metropolis, Rivers state are people of middle socio-economic class. Also, low SES was higher in PLWOA than in stroke survivors. Therefore, there is need for Government at all levels to provide decent jobs and basic social amenities to alleviate the living standard of people in our communities especially individuals with debilitating chronic conditions as low socio-economic status (SES) has been linked to stroke survivors and PLWOA in the study.

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THE PREVALENCE OF INTESTESTINAL PARASITES AND IMPACT OF CRYPTOSPORIDIUM INFECTION AMONG DIARRHOEAL - INFECTED HIV PATIENTS VISITING THE SPECIALIST HOSPITAL, BENIN-CITY, EDO STATE, NIGERIA

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Abstract

Background of the study: Diarrhea is one of the world's worst health problems, especially in immunocompromised persons.

Aim: The study's main goal was to determine the prevalence of intestinal parasites and the clinical impact of *Cryptosporidium parvum* in HIV-positive diarrhea patients at the Specialist Hospital in Benin City, Edo State, south-central Nigeria.

Materials and methods: stool concentration and modified Zehl-Neilson staining was used to evaluate 196 stool samples for intestinal parasites.

Results: A total of 196 HIV/AIDS-related diarrhea patients (116 women and 80 men) were examined for intestinal parasites. The overall parasite prevalence, density, and age prevalence among diarrhea-infected HIV/AIDS patients were 21.35% and 5.0%, respectively, with *Ascaris lumbricoides* (5.6%), *Cryptosporidium parvum* (5.1%), and *Entamoeba histolytica* (5.1%) being the second most frequent intestinal parasites surveyed.

HIV-infected people of all ages had 5.0% *Cryptosporidium*-related diarrhea. Patients aged 46–55 years had 2.5% of all cases, whereas those aged 6–15 years, 16–25 years, and 56–60 years had 0%. *Cryptosporidium* was more common in women (4.0% vs. 1.0%) than in men.

Both groups showed a statistical difference (P 0.05). Regimen 1A had the most *cryptosporidium* (3.1%). HIV-related diarrhea was more common among patients with CD4 levels below 350 (4.1% vs. 1.0%, respectively) compared with CD4+ > 350 (136 individuals), who made up the bulk of those tested with a statistical difference between groups. HIV patients with only bloody diarrhea had a 3.1% prevalence of cryptosporidium, compared to 0% in those with bloody diarrhea and mucus or only mucus; the odd ratio (OR) was 1.06 (95% CI 0.20–85.27) with P> 0.05. *Cryptosporidium* oocysts have been found in HIV-infected patients' feces at the Specialist Hospital in Benin City, Edo State, suggesting a relation to HIV diarrhea, particularly in the late stages of illness. It causes 5.0% of diarrhea in this population.

Conclusion: Cryptosporidiosis is frequent in HIV-infected diarrhea patients. Thus, HIV and immunosuppressed patients' diarrhea treatments should incorporate this study's findings.

Keywords: *diarrhea, intestinal parasites, HIV/AIDS*

Introduction

Diarrhea is one of the most serious health problems that people with weakened immune systems can face. Over 50 million people have died worldwide from it^{1,2}. Diarrhea, also known as "loose stools," occurs when regular bowel movements are disrupted, most commonly by an increase in bowel transit time, stool consistency, or stool volume^{1,2}. Two common causes of acute diarrhea are excessive alcohol consumption and ingesting contaminated food or water, and regardless of treatment, attacks typically resolve within a day or two [1] and [2]. If diarrhea lasts for a long time, it could be a sign of something more serious, such as an intestinal disorder caused by bacteria, viruses, and parasites^{1,2}. Diarrhea caused by protozoan parasites has been a concern for humans since at least the nineteenth century, when it became a threat to humans, apes, rodents, and insects^{1,2}. The most common parasites that can cause diarrhea are *Giardia lamblia*, *Entamoeba histolytica*, *Balantidium coli*, *Isospora belli*, *Cyclospora cayetensis*, *Microsporidia*, and *Cryptosporidium parvum*³⁻⁸. Chronic diarrhea is experienced by 70% of HIV-positive Africans⁹. Diarrhea is a common HIV symptom and has affected 0.9% to 14.0% of people in outpatient studies with low CD4 cell counts and homosexual males as risk factors. The apicomplexan protozoan parasite *Cryptosporidium* causes the disease cryptosporidiosis, whose commonest routes of transmission are the feculo-oral route and contaminated water¹⁰. People with weakened immune systems, such as those suffering from HIV/AIDS, succumb to the disease's symptoms and eventually die. Symptomatic treatments include rehydration, electrolyte correction, and pain relief. Symptoms typically appear after a week of incubation and include red, watery diarrhea, abdominal pain, vomiting, and fever^{11,12}. Because the parasite *Cryptosporidium* is so widely distributed throughout the environment and is disseminated by the ingestion of these organisms (and others), the prevention and control of this disease have become a major public health issue. Techniques for prevention include things like improved filtration systems, consistent water quality testing, and public education about the disease's symptoms and preventative measures¹³. Cryptosporidiosis remains a major opportunistic infection and an important source of morbidity and mortality in people living with HIV/AIDS in underdeveloped countries due to the lack of a universal treatment program and inadequate access to care.

There is no one who is immune to the ripple effects of cryptosporidium. It causes half of all parasitic illnesses spread by water (50.8%). Diarrhea caused by *Cryptosporidium* accounts for 8–19% of cases in low-income regions¹⁵. A recent study discovered oocysts in the urine of 10% of low-income individuals, and less than 5% live in developed nations, where the youngest victims are those under the age of 9. Those that are susceptible to cryptosporidium infection are travelers, swimmers, cattle handlers, homosexual partners, and those caring for children¹⁷. There is a possibility of considerable weight loss, along with nausea, vomiting, watery diarrhea, stomach cramps, an upset stomach, a low-grade fever, and fatigue¹⁷. Some of the issues are dehydration, inadequate absorption, pancreatitis, and anorexia^{18, 19, 20, 21}. *Cryptosporidium* is very fatal in infants, the elderly, and those with impaired immune systems, with symptoms like cholecystitis and cholangitis²⁰. Diarrhea of a milder, self-limiting kind can be caused by parasite infections in otherwise healthy patients and in immunocompromised persons, such as those with HIV/AIDS, *Cryptosporidium* spp. can cause severe, persistent, and sometimes deadly diarrhea and wasting²². In the industrialized world, the AIDS epidemic has been greatly diminished by highly active antiretroviral therapy (HAART) over the past 20 years. However, drug-resistant HIV variations and the failure or discontinuation of HAART in these patients have been associated with the re-emergence of *Cryptosporidium* spp. Even though HAART is effective, those with advanced AIDS may still experience symptoms²³. Although ART is accessible in certain developing nations, treatment remains out of reach in the vast majority of countries where HIV/AIDS is prevalent²³. Seventy-six percent of AIDS patients and one hundred percent of HIV-positive people in underdeveloped countries suffer from chronic diarrhea in the absence of ART^{24,8}. Diagnosis can be made by checking stool samples for parasite ova. Use of metronidazole, sewage treatment, frequent handwashing, and the use of bottled water are all effective preventative strategies²⁵.

Materials and methods

Study Area

This is a cross-sectional study on the occurrence and impact of *Cryptosporidium* infection and other intestinal parasites among diarrhoeal-infected HIV-positive patients.

It was conducted at the Specialist Hospital, Benin City, Edo State, one of the centers owned by the Edo State Ministry of Health. HIV/AIDS patients visit the Comprehensive HIV/AIDS Services Center established by the Global HIV/AIDS Initiative Nigeria (GHAIN), Edo Zone, as part of an ongoing prospective cohort study. The hospital serves a large number of HIV/AIDS patients from within and outside the metropolis, including referred patients from other health facilities, NGOs, other related agencies, and organizations within the state, as well as voluntary visitors from the neighboring states of Delta and Ondo. According to the 2006 Nigeria census, there were 11,471,888 people living in the urban area of Benin City, which serves as the capital of Edo State. Its coordinates are 6.340 degrees north, 5.60 degrees east, and 87.88 meters in elevation. Participants are largely of African descent and come from a range of educational backgrounds.

Study population

For this study, we enrolled 196 HIV/AIDS patients with diarrhea, of whom 116 were female and 80 were male. The sample size was determined using a formula in line with a previous prevalence of 15.0% of *Cryptosporidium* in humans in Nigeria^{26,27}.

Inclusion and exclusion criteria

The study population included HIV patients presenting with diarrhoea in a specialist hospital in Benin City, Edo State, categorized as HIV positive patients presenting with diarrhoea only, HIV and tuberculosis co-infected patients presenting with diarrhoea, both HIV positive and co-infected with CD4 below or above 350, and both HIV positive and co-infected on different drug combination codes referred to as regimens as follows:

- 1.1a (AZT, 3TC, and EFV) for TB/HIV co-infected
- 2.1b (AZT, 3TC, and NVP) for HIV infection only.
- 3.1c (TDF-FTC-EFV) for those with Hb 8 g/dl.
- 4.1d (TDF, FTC, NVP)
5. 1e, (TDF, 3TC, EFV) alternate first line due to side effects.
- 6 1f (TDF, 3TC, NVP) for pregnant clients and others

Patients of all ages who tested positive for HIV and who presented with diarrhea during follow-up visits were included in the study. However, HIV-positive patients who did not present with diarrhea, who did not have their consent sought, or who did not show a willingness to participate in this study, were not. The study was designed to determine the occurrence and impact of cryptosporidium infection and other intestinal parasites among diarrheal HIV-positive patients. The study instruments used for this study were hospital general request and report forms, ART, PMTCT, HCT Laboratory, Clinic, and Pharmacy Registers. Other instruments were clinical evaluations and pharmacy order forms.

Sample Collection

Stool samples were collected in UV-safe, wide-mouth plastic containers along with information on the subjects' ages, sexes, and the types of stool they passed. Samples were examined as they were collected.

Parasitological Technique (direct wet preparation)

Stool samples were examined by direct techniques as described. The appearance of the specimens was noted, including the color, consistency (formed, semi-formed, or watery), the presence of blood and mucus, and the presence of worms or their segments. A drop of fresh physiological saline was placed on a glass slide. A piece of wood was used to pick a small amount of the specimen, which was mixed with the saline to make a smooth preparation. This was then covered with a cover slip and examined microscopically under x10 and x40 objectives for the presence of parasite cysts, trophozoites, eggs, or larvae²⁵.

In a centrifuge tube containing 4 mL of formalin-saline solution, about 2 g of feces were emulsified thoroughly. The fecal suspension was sieved, and 2 ml of ether was added and shaken. After that, the mixture was centrifuged for 2 minutes at 1000 rpm. Using an applicator stick, the debris layer was loosened and, together with the supernatant, poured away. The sediment was re-suspended by tapping the bottom of the tube, and smears were then made with the sediment^{28,25}.

The smears made with sediment were stained by the modified Ziehl-Nelson staining method²⁸. The smear was fixed by heat, flooded with carbol fuchsin solution, and heated gently until steam rose.

After 5 minutes, this was rinsed with tap water. In order to remove the color, 1% acidic alcohol was used until the film turned yellow.

It was washed with water and counterstained with malachite green for 3 minutes.

It was washed with water, bottled, dried, and examined under an oil immersion lens for the presence of oocysts of *Cryptosporidium*^{28,25}.

Ethical Clearance

Ethical clearance was obtained from the Edo State Ministry of Health, Benin City. Permission and consent were sought from patients, the heads of a specialist hospital in Benin City, the Edo State governor, and relevant stakeholder groups supporting the facility where the study was conducted. All information collected from patients who participated in the study was kept strictly confidential. Patients' records were kept confidential within the research team and those who needed access for the research to proceed.

Statistical Analysis

Descriptive statistics of frequency and percentages were used to present the results. The levels of association between the variables used in this study were determined using the Chi-square test. The statistical significance was set at $p < 0.05$.

Results

A total of 196 HIV/AIDS patients with diarrhea visited the Specialist Hospital in Benin City for treatment and follow-up investigations for intestinal parasites. Out of this number, 116 (59.4%) were females, and the remaining 80 (41.0%) were males. Female patients (4.0% vs. 1.0% prevalence) more frequently tested positive for *Cryptosporidium*. Both groups were statistically different from one another ($P < 0.05$). Diarrheic HIV/AIDS patients of varying ages show the *cryptosporidium* age distribution in Table 1.0. It was observed that overall age prevalence was 5.0%, which was highest among those aged 45–55 years (2.5%), followed by the age group 36–45 (1.5%). Out of this number, 116 (59.4%) were females, and the remaining 80 (41.0%) were males. Female patients (4.0% vs. 1.0% prevalence) more frequently tested positive for *Cryptosporidium*. Both groups were statistically different from one another ($P < 0.05$). Diarrheic HIV/AIDS patients of varying ages show the *cryptosporidium* age distribution in Table 1.0. It was observed that overall age prevalence was 5.0%, which was highest among those aged 45–55 years (2.5%), followed by the age group 36–45 (1.5%), and then those aged 26–35 (1.0%), 116 (59.4%) were females, and the remaining 80 (41.0%) were males. Female patients (4.0% vs. 1.0%

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Table 2.0 showed the overall parasite prevalence density among diarrheal HIV/AIDS patients. It was observed that the prevalence rate was 21.35% (42/196) with *Cryptosporidium parvum* (5.1%), *Ascaris lumbricoides* (5.6%), Hookworm (2.55%), *Schistosoma mansoni* (1.5%), *Trichuris trichura* (1.5%), and *Entamoeba histolytica* (5.1%). Table 3.0 showed the prevalence of *cryptosporidium* among diarrhoeal infected HIV/AIDS patients on an ART regimen. Patients with HIV and tuberculosis co-infection on regimen 1A had a higher prevalence of *cryptosporidium* (3.1%), followed by those on regimens 1D and 1F (1%) and 1B, C, and E (0%), respectively. 1A and 1F differ significantly at the 95% confidence limit, whereas 1B and 1C do not.

Table 4.0 showed the percentage of HIV/AIDS patients with diarrhea who also had *cryptosporidium* infection. It was observed that patients with CD4 350 have the highest prevalence of (4.1%) compared with patients with CD4 >350 with a prevalence of (1.0%). ($p < 0.05$). Table 5.0 showed the prevalence of *cryptosporidium* in the stool consistency of diarrhea-infected HIV/AIDS patients. It was observed that the prevalence of *cryptosporidium* was highest with diarrheal stools mixed with blood (3.1%), OR 1.06, 95% CI 0.20-85.27, $P > 0.05$ compared with diarrheal stools mixed with mucus (0.0%).

TABLE1: PREVALENCE OF CRYPTOSPORIDIUM BY AGE AMONG DIARRHOEAL- INFECTED HIV/AIDS PATIENTS

Age groups (yrs) Positive	No Examined % Prev.	Male(A)		Female(B)		
		No % Prev Positive	% Prev.	No Examined	No	
6-15	10	0	0.0	3	0	0.0
16-25	2	0	0.0	15	0	0.0
26-35	20	0	0.0	30	2	1.0
36-45	25	1	0.5	50	2	1.0
46-55	20	1	0.5	15	4	2.0
56 -60	3	0	0.0	1	0	0.0
Total	80	2	1.0	116	8	4.0

Mean age 33.7, SD 9.5, Median 30

TABLE 2: DISTRIBUTION OF OTHER INTESTINAL PARASITES ISOLATED FROM STOOL OF DIARRHOEL-INFECTED HIV/AID PATIENTS

Parasite types	Number tested	Frequency	% infected
<i>Cryptosporidium Parvum</i>	196	10	10 (5.1)
<i>Ascaris lumbricoides</i>	?	11	11(5.6)
<i>Hook worm</i>	?	5	5 (2.55)
<i>Schistosoma mansoni</i>	?	3	3 (1.5)
<i>Trichuris trichura</i>	?	3	3(1.5)
<i>Entamoeba histolytica</i>	?	10	10(5.1)
Total	196	42	42 (21.35)

TABLE: 3 PREVALENCE OF CRYPTOSPORIDIOSIS AMONG DRUGS COMBINATION REGIMEN

REGIMEN	No Tested Percent positive	No.	positive
1A	140	6	3.1 %
1B	3	0	0.0 %
1C	2	0	0.0 %
1D	9	2	1.0%
1E	3	0	0.0 %
1F	39	2	1.0 %
Total	196	10	5.1 %

Confidence limits: 0.41 - 5.7 %, 0.16 - 4.73 %, and 15.07 - 28.76 %

TABLE 4: PREVALENCE OF CRYPTOSPORIDIOSIS IN RELATION TO HIV PATIENTS CD4 GROUP

CD4GRP	No tested Percent positive	No	positive
<0 - 350	136 (4.1%)	8	
>350 - 700	60 (1.0%)	2	
Total	196 (5.1 %)	10	

C. I = 2.38% - 10.44%, P<0.05

TABLE 5: PREVALENCE OF CRYPTOSPORIDIUM IN RELATION TO STOOL CONSISTENCY

	Diarrhoea with Blood		Total	
	Yes	No	NO.	%
Cryptosporidium	10 (3.1 %) 3.1 %	0	6	
No Cryptosporidium	0 (0.0%) 96.9 %	190	190	
Total	6 100 %	190	196	

OR 1.06, 95% CI 0.20 -85.27, P >0.05.

Discussion

Death and illness are still caused by parasitic illnesses in developing nations, especially among HIV/AIDS patients²⁹. Biological illnesses are among the many that HIV/AIDS patients may experience. Morbidity and mortality from AIDS are exacerbated by opportunistic bacterial, viral, and parasitic infections³. HIV and helminths are typically found together because they both have an effect on the immune system. People in Africa who are HIV positive often suffer from debilitating diarrhea. Infected persons with HIV all around the world suffer from diarrhea because to *Cryptosporidium*^{4,30,31}. This research was conducted in Benin-City, Edo State, South-South, Nigeria to determine the prevalence of intestinal parasites and clinical impact of *Cryptosporidium* infection among diarrhoeal- infected HIV patients. A total of 189 patients with HIV, who were suffering from diarrhoea had negative results for *Cryptosporidium* in their stool samples when examined using a modified Ziehl Nelsen staining method^{21,44,45,32}. Parasite prevalence was found to be 21.35 percent overall and 5 percent for *Cryptosporidium* among HIV-positive individuals using the same diagnostic method. It was observed that the parasite (*Cryptosporidium*) is responsible for diarrhoea in HIV-positive people of all ages^{5,32-34}. In contrast to previous studies³⁵, this study found that 5 percent of people with diarrhea also had *Cryptosporidium*. Patients with HIV/AIDS and diarrhea had a prevalence of 4.1% for those with CD4+ <350 and 1.0% for those with CD4+ >350 (P < 0.05). HIV patients with low CD4+ cell counts are more likely to get opportunistic infections^{36,37}. According to the results of this study, the three most prevalent parasites are *E.histolytica* (5.1%), *A.lumbricoides* (5.6%), and *Cryptosporidium* (5.6%). Intestinal parasites such *Ascaris lumbricoides*, hookworm, *Giardia intestinalis*, *Entamoeba histolytica*, and *Taenia trichiura* should be ruled out in HIV-positive persons. *Cryptosporidium* infections have been reported by people living with HIV type 1¹⁶. The results of this research indicate opportunistic infections caused by *Cryptosporidium species* are common. Females (4%) were more likely to be infected with *Cryptosporidium* than males (1%). One possible explanation is that, as shown in other regions, females are disproportionately affected by HIV-1^{30,40,35}. Because of their increased propensity for sexual activity, women of reproductive age have a higher HIV/AIDS prevalence than typical. However,

men are more likely to contract *Cryptosporidium*^{41,25,42}. There was a 2.5% increase in prevalence between the ages of 46 and 55 compared to the rest of the age groups (P < 0.05). Variation in prevalence by age may have causes in the community's exposure, practices, and behaviors. However, studies conducted in tropical areas have shown that the most susceptible age range is between 15 and 26.

It is not known how *Cryptosporidium* causes diarrhea, Inflammation can be altered by co-pathogens like *Cryptosporidium*. Previous work done by Scholars from Southeastern Nigerian university on *Cryptosporidium* observed histologic change of gastrointestinal mucosa and the anatomic location of the infection has been shown to influence the severity of symptoms^{1,41,43}. Cryptosporidiosis is an HIV opportunistic disease that can be spread by contaminated water, food, and animals, and its prevalence varies greatly from place to country. Children in postsecondary institutions in north central Nigeria have an unusually high prevalence of cryptosporidiosis^{23,30}.

Researchers in both developing and developed countries observed a range of 11.4%-18.4% when studying the prevalence of *Cryptosporidium* in diarrhoea patients, therefore the 5% prevalence found here is in line with those findings. Thirty-eight (38%) of HIV-positive Haitians have *Cryptosporidium* infection. The small sample size of this study may explain the low prevalence, or the excellent immune responses of individuals on anti-retroviral medication may be to blame. The most common combination was the regimen 1A, which consists of Zidovudine, Lamivudine, and Efavirenz, and accounted for 3.0% of all cases. This population is at a higher risk for opportunistic infections^{16,47,48,36} due to the high prevalence of tuberculosis among them. The majority of the clinic's patients with diarrhea were part of this group, too.

Although the vast majority of reviews of the literature link cryptosporidiosis and mucus in the stool, this study only observed diarrhea with blood. One limitation is that just one stool sample was analyzed from each subject. This suggests that the true scope of the infection may have been underreported³¹. The cyst may have been removed by centrifugation with only formal ether concentration, rather than flotation with zinc sulfate. Most people living with HIV who are on ART rarely experience diarrhea because of their enhanced immune response.

Oocysts of the parasite *Cryptosporidium* have been found in the feces of HIV-positive patients at the Specialist Hospital in Benin's HIV-positive City. It's the root cause of diarrhea for 5% of the locals. The highest risk of *Cryptosporidium* (3.0%) was seen in TB/HIV co-infected patients, who had CD4 levels that were often below 350. Stool samples revealed cryptosporidium, and they were bloody and watery, indicating that the diarrhea was bloody. Researchers in this study analyzed the correlation between CD4 count and antiretroviral medication regimen in order to ascertain the incidence of Cryptosporidiosis in people with HIV and diarrhea.

Conclusion

Diarrhea is one of the most serious health problems that people with weakened immune systems can face and Over 50 million people have died worldwide. From this study, it is clear that HIV/AIDS- diarrheal- induced patients are prompt to *Cryptosporidium* infection as a result of weak immune system, which reported 5% diarrheal cases due to *Cryptosporidium* infection. TB/HIV co-infected patients exhibited the highest rate of *Cryptosporidium*, likely because to inadequate immunity, and all cryptosporidium was from CD4 <350 patients. Hence, all *Cryptosporidium* was from bloody diarrhoea.

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THE USE OF GENE XPERT MTB/MTB RIF ASSAY IN THE DIAGNOSIS OF EXTRA-PULMONARY TUBERCULOSIS AT NAUTH, NNEWI

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Abstract

Introduction: About 15–20% of active tuberculosis cases may spread outside the lungs to affect other parts of the body causing what is known as extra pulmonary tuberculosis (EPTB). Cases of Extra Pulmonary Tuberculosis are equally prevalent in all the Tuberculosis high burden zones. Information on Extra pulmonary Tuberculosis is scarce in Nigeria despite being high burden TB country. Existing tests for diagnosis of extra pulmonary Tuberculosis are limited in accuracy and turn-around time and often require invasive procedures and special expertise.

Aim: This study aimed to assess the utility of the Gene Xpert MTB/RIF in the diagnosis of extra pulmonary Tuberculosis and document the burden of Extra Pulmonary TB in NAUTH, Nnewi, Nigeria.

Materials and Methods: Extra pulmonary samples (comprising pleural aspirates, ascetic fluids, cerebrospinal fluids, gastric lavage, pus, pleural fluids, scrotal aspirates, hydrocele fluids and biopsy materials) taken from 288 patients accessing the Nnamdi Azikiwe University Teaching Hospital, Nnewi were examined using Ziehl Neelsen smear microscopy and Xpert MTB/RIF assay.

Results: Gene Xpert MTB/RIF assay detected MTB in 18 (6.3%) of 288 EPTB suspects against 8 (2.8%) of 288 detected by Ziehl Nelsen AFB microscopy.

Conclusion: The inclusion of Gene Xpert MTB/RIF assay method in routine diagnostic protocol for EPTB is a welcome development due to its faster turnaround time and higher sensitivity compared to smear microscopy

Key words: *Extra pulmonary tuberculosis, ZN microscopy, Gene Xpert MTB/RIF, Aspirates*

Introduction

Tuberculosis (TB) is a chronic airborne infection caused by various strains of mycobacterial organisms collectively termed *Mycobacteria tuberculosis* complex. It most commonly (in about 90% of cases) occurs in the lungs as pulmonary tuberculosis (PTB), but in about 15–20% of active cases, the infection may spread hematogenously outside the respiratory system, and affect other organs of the body, causing other kinds of TB generally known as "extra pulmonary tuberculosis" (EPTB). Sometimes both PTB and EPTB could coexist and many organs may be affected simultaneously. The most notable extra-pulmonary infection sites include the pleura (tuberculous pleurisy), central nervous system (tuberculous meningitis), lymphatic system (scrofula of the neck), genitourinary system (urogenital tuberculosis), and the spine bones and joints (Pot's disease), among others^{1,2}.

Reported prevalence of EPTB varies, among other factors, according to geographical regions, socio-demographic factors and patient sub groups. According to a systematic review by Zumla³, EPTB occurs in 10-42 % of TB patients depending on the region, ethnic background; age, socio-demographic factors, and immune status of the patients as well as the genotype of *Mycobacteria tuberculosis* strain; socio-demographic determinants, geographical location, study population, study designs, method of diagnosis are also responsible for the variation in prevalence of EPTB⁴. The presence of co-existing HIV infection has been shown to increase the incidence of EPTB to as high as 62%⁵. The prevalence of EPTB also varies across studies, and it depends on variation of the.

Unlike PTB, EPTB is not infectious^{6,7}. Due to its minimal risk of infection, EPTB receives less attention than PTB. However, the clinical diagnostic challenges and attendant laboratory diagnostic challenges and delayed treatment associated with EPTB gives it a greater potential for morbidity and mortality compared to PTB⁴. EPTB can pose some clinical and laborator

A major challenge in the diagnosis of EPTB is the frequently atypical clinical presentation simulating other inflammatory and neoplastic conditions.y diagnostic challenges. This is most probably why information on EPTB is inadequate. This situation is especially prevalent in many African countries, including Nigeria, despite being one of the 22 countries with highest burden of tuberculosis in the world.

Depending on the organs affected, EPTB can present with a variety of signs and symptoms. Thus, EPTB requires high index of clinical suspicion for its diagnosis⁵. Often, patients are started on anti-tuberculosis treatment empirically based on suggestive symptoms, clinical observations and/or experiences. The laboratory diagnosis of EPTB is also challenging as many forms of EPTB are pauci-bacillary and require invasive diagnostic sampling. Getting adequate specimens can pose a risk of harm to the patient. Clinical samples are obtained from relatively inaccessible sites. This can also decrease the sensitivity of diagnostic tests. Tissue biopsy which is the most effective method of diagnosing EPTB is invasive and sometimes inaccessible. The more easily accessible body fluids, such as pleural, peritoneal, and pericardial fluids, do provide valuable diagnostic clues in EPTB patients, but the number of *Mycobacteria* in these specimens is often low⁸, and usually undetectable with currently available diagnostic methods.

The conventional smear microscopy has a low sensitivity (0%-40%), negative results cannot be definitive⁹. The other available methods also have one or other shortcomings. The reported yields of mycobacterial culture vary from 30% up to 80%, but it usually takes 2-8 weeks to receive the results, such a prolonged turn-around-time is too slow to help treatment decisions. Culture also is cumbersome and requires a highly equipped laboratory and biosafety cabinets level 11/111 which is not commonly available in most of resource limited settings¹⁰.

Tuberculin skin test (TST) and IFN- γ releasing assay (IGRA) may be supportive methods for diagnosing EPTB, but they have limited diagnostic value. The interpretation of TST reactivity can be complicated by cross-reactivity with previous Bacilli Calmette-Guerin (BCG) vaccination. Factors like HIV infection, poor nutritional status, recent viral or bacterial infections, or vaccination with live virus can reduce response to TST. Like the TST, IGRA cannot distinguish between latent infection and active pulmonary TB or EPTB, and negative results cannot entirely exclude the disease¹¹. Diagnosis that is based on histological evidence could also be problematic because loss of host immune function can result in histopathologic findings demonstrating greater suppurative response but less well-formed granulomas¹². Additionally, the granulomas can be seen also in nontuberculous mycobacterial disease, fungal infections, brucellosis, or syphilis, so cautious interpretation is required¹³.

Due to these diagnostic challenges many patients receive the wrong diagnosis. This can lead to unnecessary anti-tuberculosis treatment or poor treatment outcomes or patient not treated at all and subsequently increased morbidity and/or mortality. These problems particularly affect resource-limited settings which usually have high tuberculosis burden¹⁴. The Gene Xpert MTB/RIF assay method which is a nucleic acid amplification test (NAAT) based on the principle of nested real-time polymerase chain reaction (PCR) has been found useful for the rapid molecular diagnosis of EPTB due to its speed, sensitivity and specificity. A systematic review and meta-analysis had reported that Xpert MTB/RIF has an overall sensitivity of 83.1% and a pooled specificity of 98.7% for the diagnosis of EPTB^{15, 16}. Its hands-on operation is easy and requires minimal technical expertise. The results are obtained within a short period of 2 hours. The technique is not prone to cross-contamination and requires minimal biosafety facilities^{17, 18}. The World Health Organization¹⁹ formulated new guidelines advocating and recommending the use of Gene Xpert over conventional tests for diagnosis of EPTB¹⁶. In line with the global recommendations, the National Tuberculosis and Leprosy Control Programme (NTLCP) has recommended the use of Xpert MTB/Rif assay for diagnosis of EPTB in Nigeria²⁰ and of which the TB (DOTS) center, Nnamdi Azikiwe University Teaching Hospital Teaching Hospital (NAUTH), Nnewi has quered in. It was therefore, the aim of this study to assess the utility of the Gene Xpert MTB/RIF in the diagnosis of EPTB and also document the burden of EPTP in NAUTH, Nnewi.

Materials and Methods

The study population comprises a total of 288 extra pulmonary TB suspects accessing the TB Directly Observed Treatment Short course (DOTS) center of NAUTH, Nnewi between June 2017 and June 2020. Geographically, Nnewi with a population of 391,227 falls within the tropical rain forest region of southeastern Nigeria, and coordinates in latitude 6°1'0"N and longitude 6°55' 0"E²¹. The hospital is a tertiary health facility and referral center accessed by patients resident in Nnewi and its environs. Various extra pulmonary samples, comprising 146 pleural aspirates, 50 ascetic fluids, 47 cerebrospinal fluids, 17 gastric lavage, 7 pus, 2 chest fluids, 2 scrotal aspirates, 2 hydrocele fluids and 5 biopsy materials, were taken from the patients at different clinics of the hospital based on presenting clinical signs and symptoms and were examined using Xpert MTB/RIF assay and Ziehl Neelsen AFB smear microscopy. Smears measuring 1x2 cm in diameter were made from centrifuged

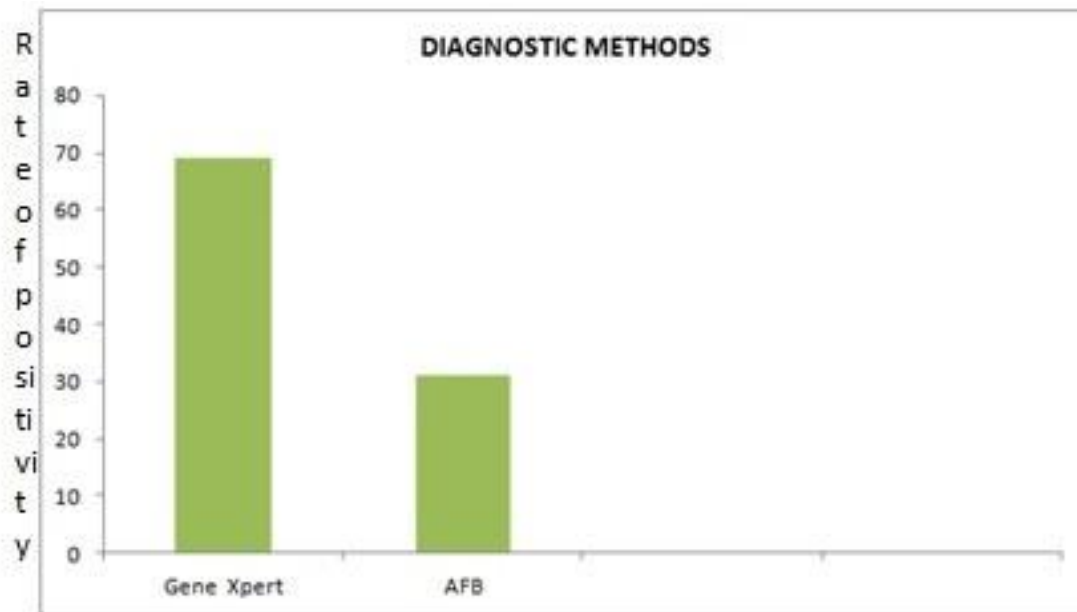
deposits of a portion of the extra pulmonary samples and stained with Ziehl- Neelsen stains. Each stained smear was examined under ×100 oil objective lens and graded according to the International Union Against Tuberculosis and Lung Disease and WHO system: a smear test result was positive if at least one or more acid fast bacilli (≥ 1 AFB/100 hpf) was detected^{22, 23}. The remaining portion of each sample was diluted 2:1 and analyzed by real time PCR process using the Gene Xpert MTB/Rif machine according to the standard operating procedure. The primers and probes in the Gene Xpert MTB/RIF assay use fluorogenic target-specific hybridization to detect the amplified DNA. The results are interpreted from measured fluorescence signals, enabling a semi-quantitative estimate of the mycobacterial load as: MTB not detected (Negative) or MTB detected/RIF resistance not detected (Positive) or MTB detected/RIF resistance detected (MDRTB), or MTB detected Rif resistance indeterminate, accordingly²⁴.

Results

Gene Xpert MTB/RIF assay detected TB in 18(6.3%) of 288 EPTB suspects against 8(2.8%) of 288 detected by Ziehl Neelsen AFB microscopy as shown in Figure 1. Gene Xpert MTB/RIF detected *Mycobacterium tuberculosis* (MTB) most predominantly in pleural aspirates (15), followed by ascetic fluids(2) and pus aspirates(2) while Ziehl Neelsen smear microscopy detected acid fast bacilli (AFB) in 6 pleural aspirates and 2 pus aspirates respectively as shown in Table 1. The gender distribution showed that males have a higher rate (66.7%) of EPTB infection in this study than females (33.3%).

Table 1 Comparison of Gene Xpert MTB/RIF Assay and AFB microscopy for diagnosis of EPTB.

Sample type	Total no of samples	No positive with Gene Xpert	No positive with AFB microscopy
Pleural aspirate	146	14	6
Gastric lavage	14	0	0
Ascetic fluid	50	2	0
CSF	47	0	0
Pus	7	2	2
Bone marrow aspirate	6	0	0
Oral	3	0	0
Scrotal fluid	2	0	0
Chest fluid	2	0	0
Tissue Biopsy	5	0	0
Hydrocele fluid	2	0	0
Vertebrate fluid	2	0	0
Peritoneal fluid	2	0	0
TOTAL	288	18	8



Discussion

The Gene Xpert MTB/RIF assay is a highly sensitive, specific and fast assay that can now be conveniently used for diagnosis of EPTB. In this study, Gene Xpert MTB/RIF assay detected TB in 9(6.3%) of 144 EPTB suspects. The positivity rate of 6.3% recorded in this study is similar to what were obtained in some few previous studies done in Nigeria as shown here: Prevalence rates of 2.9% was previously reported in a study carried out in Anambra and Abja states²⁵, 5% in Ebonyi state²⁶, 2.0% in Delta state²⁷ and 9.5 % in Oshogbo, Western Nigeria²⁸. Much higher prevalence rates of 11.4% in Zaria, North Western Nigeria²⁹, 14.4% in Maiduguri, North Eastern Nigeria³⁰ and 21.4% in Benin City, South-South Nigeria³⁰ have been documented. The observed differences could be due to differences in study design, preprocessing methodologies and in input volumes, study populations (adults, children, HIV infected) and using different diagnostic methods of microscopy, gene Xpert or culture. There are also differences bordering on ethnic background, age, underlying disease conditions and genotype of the *Mycobacterium tuberculosis* strains. The methodology and sensitivity of test methods are important issues. For instance, with Gene Xpert MTB/RIF assay which was used for this study, fluid specimens having small sample sizes across a range of various specimen types might be over diluted and could affect the test results. In very pauci-bacillary samples adequate number of bacilli may not be captured and lysed for PCR. Gene Xpert also is reported to be affected by presence of inhibitors to PCR like blood, salts, proteins or cellular debris in fluid specimens. These inhibitors are said to interfere with the amplification enzymes in the PCR process³¹.

In this study the positivity rate was higher with Gene Xpert MTB/RIF assay which detected TB in 18(6.3%) of 288 EPTB suspects against 8(2.8%) of 288 detected by Ziehl Nelsen AFB microscopy. Comparable efficacy was observed for EPTB samples in other studies using Gene Xpert MTB/RIF assay and AFB smear microscopy. The overall prevalence of Gene Xpert MTB/RIF assay positive EPTB cases was 8.8% against 2.5% of smear positive cases using fluorescent microscopy in a referral hospital in North Eastern Ethiopia⁴. Also in agreement were other previous studies by Hillemann *et al*³² and Tortoli *et al*³³ and Shagufta *et al*³⁴ respectively.

Males have a higher rate (66.7%) of EPTB infection in this study than females (33.3%) A plausible reason for this male predilection may be due to the general trend of males being at greater increased risk for TB acquisition than the females in this environment. The males who are usually the breadwinners are mostly traders and artisans and in this part of the world trading is done in overcrowded environment which could be a predisposing factor for tuberculosis infection³⁵. Data on other clinical co-morbidities, socio-demographic and behavioral risk factors for EPTB were not captured in the TB (DOTS) laboratory register and were not considered in this study. Patients' bio data were limited. The low frequencies of the different forms of EPTB in this study may be attributed to the small sample size of this study which in itself could be a result of underutilization of the Gene Xpert MTB/RIF facility by some clinics of this hospital.

Conclusion and Recommendation

In conclusion, Gene Xpert MTB/RIF assay performs comparatively much better than the conventional Ziehl Neelsen smear microscopy as reported variously. This report provides additional local data to support the introduction of the utility of Gene Xpert in the diagnosis of EPTB in Nigeria. The Gene Xpert MTB/RIF assay is a very useful addition to the spectrum of diagnostic methods available for diagnosis of both pulmonary and extra pulmonary tuberculosis. Aside its high sensitive and specificity, it has a highly improved turnaround time (TAT) of about two hours compared to other methods, an advantage that enables the same day diagnosis and the same day treatment.

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KNOWLEDGE AND PERCEPTION OF PRE-AND POST-OPERATIVE PHYSIOTHERAPY INTERVENTIONS AMONG MEDICAL DOCTORS IN TERTIARY HOSPITALS IN ANAMBRA STATE

Authors

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ABSTRACT

Background: Physiotherapy interventions reduce the length of hospital stay and also exert beneficial effects on physical fitness and post-operative outcomes across various surgical fields.

Aim: To determine the knowledge and perception of medical doctors on pre-and post-operative physiotherapy intervention, and the influence of age, gender, place of basic training/primary medical practice, and present career status on the variables.

Methods: 102 medical doctors (29 females and 73 males) working in the two tertiary hospitals in Anambra State, who gave their consent were consecutively recruited. Each of the participants responded to the self-reported questionnaire. Obtained data were summarized using the descriptive statistics of mean and standard deviation. Alpha level was set at >0.05 .

Results: Mean knowledge of pre-and post-operative physiotherapy interventions was found to be 8.87 ± 1.66 and a perception score of 5.30 ± 1.72 . Knowledge of pre-and post-operative physiotherapy had no significant correlation with their perception ($p=0.629$). The study also showed participants from institutions that trained physiotherapists had a significantly higher knowledge of the pre-and post-operative physiotherapy referrals than their counterparts that trained in institutions without physiotherapy ($p=0.025$).

Conclusion: Medical doctors in this study had good knowledge of pre-and post-operative physiotherapy interventions but a poor perception of pre-and post-operative physiotherapy interventions. Participants from institutions that trained physiotherapists had a significantly better knowledge of the pre-and post-operative physiotherapy.

Key words: *Knowledge, perception, physiotherapy intervention, surgery, referrals*

Introduction

The scope of physical therapy is dynamic and patient/client and societal health needs are the concern as well as identifying and maximizing quality of life and movement potential within the spheres of promotion, prevention, treatment/intervention, habilitation, and rehabilitation. Physiotherapy interventions are aimed at the prevention of impairments, activity limitations, participation restrictions, disability, and injury including the promotion and maintenance of health, quality of life, workability, and fitness in all ages and populations (World confederation for physical therapy)¹. These interventions include but are not limited to: therapeutic exercise, functional training in self-care and home management, manual therapy techniques, airway clearance techniques, integumentary repair and protection techniques, electrotherapeutic modalities, physical agents and mechanical modalities, patient-related instruction, coordination, communication, and documentation². Physiotherapy has its application in all most all disciplines of surgery such as orthopedics, neurology, cardiothoracic, oncology, obstetrics and gynecology, general surgery, plastic surgery, and cosmetic surgery³.

Studies have shown that long periods of physical inactivity prior to and after surgery tend to induce loss of muscle mass, deconditioning, pulmonary complications, and decubitus, which can lead to decreased quality of life, increased morbidity, longer hospitalization, and even death⁴⁻⁵. Prior to surgery, physiotherapy interventions reduce the length of stay both in the intensive care facilities and in the hospital wards and it also exerts beneficial effects on physical fitness and postoperative outcomes across various surgical fields⁶⁻⁸. The major problems found in assessing a patient who has had a surgical procedure include: pain, reduced lung volume, muscle atrophy, reduction in functional residual capacity, reduction in partial pressure of oxygen (PaO₂), decreased cardiac output, deep vein thrombosis, and atelectasis³. These problems are addressed by postoperative physiotherapy interventions which are designed to be preventive and therapeutic while improving and maintaining the health of the patient⁹. Medical doctors are essential Healthcare professionals when it comes to referrals for physiotherapy services¹⁰. Medical doctors show profound influence on other health professions¹¹⁻¹². In Nigeria, the practice of physiotherapy on a first-contact basis is not common; physiotherapists depend largely on referrals from medical doctors in different areas of medical practice¹³.

According to Vishal et al¹⁴, appropriate referrals to the physiotherapist can only be made if the referring surgeon has sufficient knowledge about what physiotherapy can offer the referred patient. Odebiyi et al¹³ recognized two types of physician-to-physiotherapist referral models in Nigeria: referral to take over management and referral for co-management.

Knowledge has been shown to be vital in generating appropriate actions by providing the background for articulating possible courses of action which will yield the intended result¹⁵. Although there have been studies on the knowledge and perception of physiotherapy among medical doctors, there has been no study on the knowledge and perception of pre-and post-operative physiotherapy interventions among doctors. Paul and Mullerpatan¹⁶ review of physiotherapy awareness across the globe, reported low awareness among the general public. Physiotherapy plays an important role in the surgical journey by encouraging early ambulation and promoting the return of function of the patient¹⁷⁻¹⁸. Medical doctors who trained in Nigeria have been reported to have poor knowledge and awareness of the physiotherapy profession compared with their counterparts who trained in the developed countries¹⁹. They appear not to possess adequate knowledge and understanding of physiotherapy practice, roles, and services^{13,20}. Furthermore, in a survey involving 180 medical residents in India showed that the knowledge of medical residents about the role of physiotherapy pre-and post-surgical procedures was that: physiotherapy was 50% beneficial postoperatively, 48% pre-operatively, and 2% for both. The above findings show a lack of knowledge regarding the importance of pre-operative physiotherapy. This could be due to an assumption that post-operative chest physiotherapy and mobility is the only indication to minimize the effects of deconditioning post-surgery²¹. The result of a study done by Oke and Kubeyinje²² showed that percentage of total annual hospital admissions being referred for in-patient physiotherapy services prior to and after surgery was quite low. They reported that this may be attributed to ineffective communication between surgeons and physiotherapists, and inadequate knowledge of the components of physiotherapy among the physicians/surgeons. This study is therefore aimed to determine the knowledge and perception of pre-and post-operative physiotherapy interventions among medical doctors in a selected tertiary hospital in Anambra state.

Material And Methods

Participants

A total of 102 medical doctors (29 females and 73 males) were consecutively sampled from the two tertiary hospitals in Anambra State, were recruited for this study. Sample size was calculated using G*power 3.0.10 software. A sample size of 102 participants has 85% power of detecting an effect size of 0.3 at an alpha level of 0.05.

Questionnaire Design

The questionnaire was adapted from a previous work by Odunaiya et al. (2013). The questionnaire was pilot-tested among doctors outside the research location (Nnamdi Azikiwe University Teaching Hospital, Nnewi and Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka) to ensure the questions were clear and easily understood by the participants. Thereafter, questions were modified to assess the knowledge and perception of pre-and post-operative physiotherapy interventions among medical doctors.

The questionnaire is a 32-item self-reported questionnaire with four sections. Section A collects data such as age group, sex, present career status, number of completed years of medical practice before specialization training, number of years of post-specialization practice for both consultants and senior registrars respectively, and place of basic medical training. Sections B and C bordered on general knowledge and perception of the pre-and post-operative physiotherapy treatment provided by physiotherapists. Section D is about the referral style of respondents. The options provided for the closed-ended questions were 3 Likert responses which are: Yes, No, and Not Sure.

The highest possible score for knowledge is =11. The score was ranked good (≥ 6) and poor (<6). Higher scores reflected good knowledge while lower scores denoted poor knowledge. The highest possible score for perception was 12. The score was ranked good (≥ 7) and poor (<7). Higher scores denoted good perception and lower scores denoted poor perception.

Procedure for Data Collection

Ethical approval was obtained from the Ethics Review Committee of the hospital (at Nnamdi Azikiwe University Teaching Hospital, Nnewi, and Chukwuemeka Odumegwu Ojukwu University teaching hospital, AmakuAwka) before the commencement of the study.

The informed consent of the participants was obtained prior to the administration of the questionnaire. The questionnaire was distributed by the researcher to the respondents and their confidentiality was fully ensured by using their initials instead of their full names.

Data Analysis

The descriptive statistics of mean and standard deviation were used to summarize the knowledge and perception of pre-and post-operative physiotherapy interventions amongst medical doctors. Inferential statistics of Kendall's tau correlation, chi-square, independent sample t-test, and one-way ANOVA test were used in testing the hypotheses. The alpha level was set at <0.05 .

Results

Majority of the participants were either intern (34.2%) or medical officers (28.4%), within the age range of 21 years to 30 years, trained in the South-eastern Nigeria (81.4%), and have practiced for at least 2 years. The demographic characteristics of the participants were shown in Table 1. The mean and standard deviation of the participants' knowledge (8.87 ± 1.66) and perception (5.30 ± 1.72) showed that the participants had good knowledge about pre-and post-operative physiotherapy interventions and poor perception about the services.

Fifty-one participants (50.0%) were trained at either an institution that offers concurrent physiotherapy academic training or an institution without an entry-level physiotherapy programme.

There are two models of physiotherapy referral: with prescription (medical directive model) and without prescription (consultation model). The present study found that 58% of the participants referred with prescription, while 42% of the participants referred without prescription. The participants 32 (31.4%) tend to refer patients requiring physiotherapy intervention to a private physiotherapy clinic, 51 (50.0%) general and state hospitals' physiotherapy clinics, and 19 (18.6%) private or home services. None of the participants referred any physiotherapy patient to health instructors.

A Chi-square analysis was completed on the dataset to determine any significant association between the referral models and the institution of undergraduate medical training among the participants. There was no significant association between the referral model and school attended, $\chi^2(1) = 0.362, p = 0.547$ (Table 2).

*The participants' knowledge of the pre-and post-operative physiotherapy interventions had no significant correlation with their perception of the services ($\tau = 0.036, p = 0.629$) and years in practice ($\tau = 0.079, p = 0.325$) (Table 3). Table 4 showed that there was no significant gender difference in the knowledge of the pre-and post-operative physiotherapy interventions ($t = 0.637, p = 0.526$). Participants from institutions that trained physiotherapists had a significantly higher knowledge of the pre-and post-operative physiotherapy interventions than their counterparts that trained in institutions without physiotherapy academic training ($t = 2.278, p = 0.025$). Similarly, participants who used the consultation referral model had a significantly higher knowledge of the pre-and post-operative physiotherapy interventions than their counterparts that used the prescription model ($t = 2.042, p = 0.044$). Furthermore, a one-way ANOVA (Table 5) showed a significant difference in the knowledge of the pre-and post-operative physiotherapy interventions across career statuses, $F(4, 97) = 2.964, p = 0.023$. The pairwise post hoc test showed that **medical officers were significantly more knowledgeable than interns ($MD = 1.29, p = 0.017$)**.*

Table 1 Respondents' Demographic Characteristics

Parameter	Frequency (%)
N	102 (100)
Sex	
Female	29 (28.4)
Male	73 (71.6)
Age Range in years	
21– 30	51 (50.0)
31 – 40	33 (32.4)
41 – 50	10 (9.8)
Above 50	8 (7.8)
Region Trained	
South East	83 (81.4)
South West	8 (7.8)
South South	4 (3.9)
North West	2 (2.0)
North Centre	2 (2.0)
Abroad	3 (2.9)
Practice Years	
0 – 2	50 (49.0)
3 – 5	26 (25.5)
6 – 8	15 (14.7)
Above 8	11 (10.8)
Job Rank	
Intern	33 (32.4)
Medical officer	29 (28.4)
Registrar	14 (13.7)
Senior registrar	17 (16.7)
Consultant	9 (8.8)
Practice Setting	
COOUTH	40 (39.2)
NAUTH	62 (60.8)
Knowledge	8.87 ± 1.66 †
Perception	5.30 ± 1.72 †

† variables reported as mean ± standard deviation.

Ranges: Knowledge (0 – 11), Perception (0 – 12)

COOUTH = Chukwuma Odumegwu Ojukwu University Teaching Hospital

NAUTH = Nnamdi Azikiwe University Teaching Hospital

Knowledge = knowledge of pre-and post-operative physiotherapy

Perception = perception of pre-and post-operative physiotherapy

Table 2 Association between referral method and type of institution

Parameter	Referral Mode		Total	χ^2 -value	p-value
	Without prescription	With prescription			
Institution with No physiotherapy training	No	23	28	0.362	0.547
	Yes	20	31		
Total		43	59		

Table 3: A matrix table showing Kendall’s tau Correlation between age, knowledge, perception, and practice years (N = 102)

Parameters	Knowledge tau (p-value)	Perception tau (p-value)	Practice Years tau (p-value)
Age (years)	0.119 (0.143)	0.040 (0.624)	0.743 (<0.001) *
Knowledge	–	0.036 (0.629)	0.079 (0.325)
Perception	–	–	-0.068 (0.392)

* tau is significant at $p < 0.05$.

Table 4: T-test values for differences in mean knowledge and perception between sexes, type of institution of undergraduate training, and mode of referral

Parameter		N	Mean±SD	Mean Diff	t-value	p-value
Knowledge	Female	29	9.03±1.7	0.23	0.637	0.526
	Male	73	8.80±1.6			
Institution trains PTs also		51	9.24±1.6	0.74	2.278	0.025 *
	Institution not training PTs	51	8.50±1.6			
Refer without prescription		43	9.26±1.6	0.68	2.043	0.044 *
	Refer with prescription	59	8.58±1.6			
Perception	Female	29	5.31±1.9	0.01	0.024	0.981
	Male	73	5.30±1.7			
Institution trains PTs also		51	5.31±1.6	0.02	0.057	0.294
	Institution not training PTs	51	5.29±1.8			
Refer without prescription		43	5.77±2.1	0.80	2.373	0.020 *
	Refer with prescription	59	4.97±1.3			

* t-test is significant at $p < 0.05$. PTs = physiotherapists

Table 5: ANOVA results for differences in knowledge and perception across career statuses

Parameter	N = 102	Mean	S.D	(df ₁ , df ₂)	F-value	p-value
Knowledge				(4, 97)	2.964	0.023*
Intern	33	8.25	1.59			
Medical officer	29	9.55	1.23			
Registrar	14	8.46	1.74			
Senior registrar	17	9.24	1.76			
Consultant	9	8.83	2.15			
Perception				(4, 97)	0.837	0.505
Intern	33	5.47	1.55			
Medical officer	29	5.59	2.20			
Registrar	14	4.86	1.39			
Senior registrar	17	4.82	1.09			
Consultant	9	5.39	2.04			

* F-statistic with p-value < .05 is significant. Medical officers were significantly more knowledgeable than interns (MD = 1.29, p = 0.017).

Discussion

The present study aimed at determining the level of knowledge and perception of pre-and post-operative physiotherapy interventions among medical doctors practicing in tertiary hospitals in Anambra State. One hundred and two doctors of which about three-quarters were males participated in the study. With regard to years of experience and professional status, the majority of the respondents were interns and medical officers who had just practiced for two years or less. The demography of the present study is appropriate for the study's aim and objectives. The study aimed to explore the levels of knowledge of participants and how gender, and place of basic medical training may have influenced their knowledge and perception of pre-and post-operative physiotherapy intervention. Furthermore, the percentile level of participants' perception of pre-and post-operative physiotherapy and their mode of referral was used to assess their perspectives regarding the physiotherapy interventions.

The present study found that the participants had a good knowledge of the physiotherapist's intervention in the pre-and post-operative conditions. This is in agreement with the report of Odunaiya et al¹⁹, who reported that medical doctors had knowledge about the roles of physiotherapy.

Nonetheless, the participant's knowledge of the pre-and post-operative physiotherapy interventions had no significant correlation with their perception and years in practice. There was no significant gender difference in the knowledge of the pre-and post-operative physiotherapy interventions, this is similar to the findings of Vincent-Onabajo et al¹⁰ but contrary to the findings of Odebiyi et al¹¹, who reported that male doctors were more knowledgeable. Participants from institutions that trained physiotherapists as well as medical doctors had a significantly higher knowledge of the pre-and post-operative physiotherapy interventions than their counterparts that trained in institutions without physiotherapy training and this are similar to the findings of Odebiyi et al²⁰. The possible reason for this could be because of the presence of physiotherapy training programmes present in the various institution of training these participants with higher knowledge, which might have increased the possibility of participants coming in contact with physiotherapy students or going on ward rounds with physiotherapy students. According to the World health organization (WHO), a healthcare professional's knowledge of the expertise and capabilities of other professionals is essential for effective teamwork and enhances appropriate referral patterns and better coordination of care.

Appropriate referrals can only be made if the referring surgeon/doctor has adequate knowledge about what physiotherapy can offer patients. Similarly, participants who used the consultation referral (without prescription) model had a significantly higher knowledge of the pre-and post-operative physiotherapy interventions than their counterparts that used the medical directive referral (with prescription) model. These outcomes agree with the reports of Aiyesah et al²³ who reported high referrals from the surgical unit. Oke and Kubeyinje²² also reported that the high consultation referral model from the surgery unit may be attributed to the fact that the doctors in these units were more knowledgeable about the roles and interventions of physiotherapy in their patients' care, probably due to regular interactions between doctors and physiotherapists in these units of the hospital. Furthermore, there was a significant difference in the knowledge of the pre-and post-operative physiotherapy interventions across career statuses, this report agrees with the findings of Odunaiya et al¹⁹, who reported that present career status significantly influenced the knowledge of physiotherapy interventions. Senior registrars demonstrated better knowledge than registrars and medical officers were significantly more knowledgeable than interns. It is expected that those medical officers might have worked together with physiotherapists and perhaps gained some knowledge about physiotherapy scope of practice, roles, and interventions more than the interns freshly coming out of basic medical schools.

Another aim of the study was to determine the perception of the participants about pre-and post-operative physiotherapy. In this study, it was discovered that the participants had a poor perception of pre- and post- operative physiotherapy interventions, this is in agreement with the report of Abd El Baky²⁴, who reported a poor perception of physiotherapy by physicians and medical students in Sudayr region. The researcher suggests that the perception of pre-and post-operative physiotherapy interventions can be improved by inter-professional courses and better interaction between physiotherapists and medical doctors. Participants' perceptions of pre-and post-operative physiotherapy interventions did not significantly correlate with their knowledge or years of practical experience. There were no significant gender differences in participants' perceptions of pre-and post-operative physiotherapy interventions.

Similarly, there was no significant difference in perceptions between participants in institutions that train physiotherapists and physicians and their colleagues trained in institutions without physiotherapy training. Perceptions of pre-and post-operative physiotherapy interventions did not differ significantly across career status.

However, participants who used the consultation referral model (without a prescription) had a better perception of the pre-and post-operative physiotherapy interventions than their counterparts that used the medical directive model (with a prescription). Odebiyi et al²⁰ found that the majority of the respondents who received some form of introductory lectures in physiotherapy during their medical training graduated from medical schools with a physiotherapy training programme. This category of respondents believed that physiotherapists are trained enough to determine the right treatment for their patients; they also felt comfortable enough to refer patients for physiotherapy through the consultation model.

Odebiyi et al¹³ identified two distinct physician-to-physiotherapist referral models in Nigeria: co-management and referral to take over management. In both cases, some physicians referred to the physiotherapist to review the patient and develop a therapy plan (consultation model), while others requested the therapist to use specific physiotherapy modalities and techniques (medical directive model; with prescription). The present study found that 58% of the participants used the medical directive model; this result is consistent with that of Odebiyiet al²⁰ and Ahmad et al²⁵. The observation that most such prescriptions are incorrect has been reported in previous studies²⁶⁻³⁰.

Conclusion

There was a poor perception of the pre-and post-operative physiotherapy services among the respondents. The respondents' knowledge and perception were found to be influenced by their institution of graduation, and this ultimately affected both how they used physiotherapy and their mode of referral for physiotherapy. Both the physiotherapist and the physician must have a solid understanding of their different responsibilities in pre-and post-operative interventions in order to work effectively as part of a multidisciplinary surgical team.

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JOB SATISFACTION AMONG NURSES IN TERTIARY HEALTH INSTITUTIONS IN EDO STATE NIGERIA

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ABSTRACT

Background: There is a likelihood of ineffective health care services with insufficient nurses having job dissatisfaction as a result of the recent increase in emigration among health workers, particularly nurses.

Aim: To ascertain the level of job satisfaction, and the influence of selected demographic variables on job satisfaction among nurses in Edo State, Nigeria.

Material and methods: A cross-sectional study design was employed. An adapted self-administered questionnaire was utilized to obtain information from 326 nurses who were consecutively sampled from the tertiary hospitals in Edo State, Nigeria. Mann-Whitney U test, Kruskal-Wallis, and Spearman's rank order correlation tests were used to analyze data, with level of significance set at < 0.05.

Results: The results revealed mean score of participants = 30.36, i.e. they were neither dissatisfied nor satisfied with their jobs. There was no significant correlation between job satisfaction and demographic data (institution, age, gender, marital status, spouse's residence, and year of service), although cadre (p=0.05), academic qualification (p= 0.05) were potent predictors of job satisfaction..

Conclusion: There is neither job satisfaction nor dissatisfaction among nurses in tertiary hospitals Edo State, with only cadre and academic qualifications possibly correlating with job satisfaction.

Key words: *job, satisfaction, nurses, tertiary-health-institutions.*

INTRODUCTION

In recent time, there have been alarming reports on the rate at which health workers are leaving Nigeria. It was revealed that the United Kingdom (UK) Nursing and Midwifery Council (NMC) recorded a seven thousand two hundred and fifty-six (7,256) increase in Nigerian nurses on their permanent register as of March 2022, the highest in a half decade ¹. The importance of Nurses in the healthcare delivery cannot be over-emphasized. There are 29 million nurses and midwives worldwide², and 240,000 of them are in Nigeria ³. However, this number may not be sufficient to care for the teeming population of the nation. Compared to an anticipated total of 800,000 nurses and midwives, Edet, Asuquo, Akpabio, Samson-Akpan, and Ojong ⁴ reported a 60,000-nurse shortage. However, research has showed that a growing number of nurses are leaving Nigeria or the nursing profession ⁵, which may be primarily due to concerns with job satisfaction

Job satisfaction is defined as an employee's likes (satisfaction) or dislikes (dissatisfaction) toward his or her job⁶. It measures the extent to which each employee views different aspects of their work in relation to their contentment. It is also the extent to which the end result of an employee's work meets his or her expectations⁷. It is an indispensable variable that determines the effectiveness and productivity of the employee⁸. Nurses are the most populous work force in the health sector, and having their optimum input depends on the level of satisfaction they derive from their institution, and 90% of direct care is provided by nurses⁹, demonstrating their indispensable roles and responsibilities.

Nurses who are not satisfied with their working environment tend to withdraw from patients¹⁰, and this attitudinal change to their professional duties may be detrimental to patient outcome and the institution. Withdrawal of services due to failure to achieve desired elements of job satisfaction could be the nurse's way of expressing their dissatisfaction, and this significant indicator describing nurses' feelings about their professional job requires immediate attention¹¹ to avoid irreversible loss of the best hands to a sister health institution within or outside the shores of Nigeria. Thus, this study aimed at ascertaining the level of job satisfaction among nurses in the tertiary health institutions in Edo State, and identifying the association between each of gender, marital status, cadre, years of service, nursing qualification, and spouses' residents and job satisfaction among nurses.

The instrument employed for data collection has two sections (A and B). Section A represents the demographic data, while Section B is a modified version of that used by Warr, Cook, & Walls (1979) with 10 items to determine the level of job satisfaction among the participants. The distribution and collection of questionnaires from consenting nurses were done at their duty posts and offices across the three shifts by the researcher within six weeks (October 4th to November 19th, 2021). The minimum and the highest scores any participant could obtain were 10 and 50, respectively.

MATERIAL AND METHODS

A cross-sectional survey design was employed, and a modified self-administered questionnaire was used for data collection. Data collection from the nurses in Edo State's tertiary health institutions lasted six weeks. Proportionate stratified and random sampling techniques were employed to accurately represent each cadre of nurses and avoid bias in the distribution of the questionnaire. The inclusion criteria for the respondent were,

1. The nurse must be registered with the Nursing and Midwifery Council of Nigeria.
2. The length of service in the selected health institutions must be at least a year.
3. There must be voluntary consent to participate in the study.

The instrument employed for data collection has two sections (A and B). Section A represents the demographic data, while Section B is a modified version of that used by Warr, Cook, & Walls (1979) with 10 items to determine the level of job satisfaction among the participants. The distribution and collection of questionnaires from consenting nurses were done at their duty posts and offices across the three shifts by the researcher within six weeks (October 4th to November 19th, 2021). The minimum and the highest scores any participant could obtain were 10 and 50, respectively.

Data Analysis

The results were presented in tables, mean and standard deviation. The decision mean on the Likert scale was 30. The Mann-Whitney U test and Kruskal-Wallis test were used to test the association between the demographic variables and job satisfaction at the < 0.05 level of significance.

RESULTS

The demographic characteristics of the 310 respondents out of the 326 who completed and returned their questionnaire is presented in Tables 1 and 2. The majority, 269 (66.8%), were female, with 41 (13.2%) being male. In terms of age, 18.7% were between the ages of 21 and 30, 47.1% were between the ages of 31 and 40, 22.3% were between the ages of 41 and 50, and 11.9% were between the ages of 51 and 60. Regarding length of service, 32.3% of the respondents had worked between 1 and 5 years, 20.0% (6–10) years, 28.1% (11–15) years, 9.0% (16–20) years, and 10.0% (20 years and above). Concerning the cadre of respondents, 20.0% were NOII, 11.3% were NOI, 21.3% were SNO, 12.9% were PNO, 12.6% were ACNO, 13.9% were CNO, 7.1% were ADN, and 1.0% were DDNS). In terms of academic credentials, the majority of respondents (42.9%) held a BNSc, followed by 134.2% (RN/RM), 18.4% (RN+Post Basic), and only 0.3% (PhD). The minimum age of the nurses was 21 years, while the maximum age was 59 years. The mean age of the nurses working in the two selected tertiary hospitals is approximately 39 years. The lowest level of job satisfaction was 12, while the maximum was 49. The average mean score of job satisfaction in this study was 30.36. However, the decision mean score was 30; hence, the respondents were neither dissatisfied nor satisfied with their job.

The association between gender, institution of work, and the level of job satisfaction among nurses working in tertiary institutions was investigated using the Mann Whitney U test. The test revealed that there was no insignificant difference in the job satisfaction level between male nurses and female nurses ($p = 0.894$; $p = 0.333$). The results are presented in Table 3.

The association of marital status, spouses' residence, years of service, and cadre with the level of job satisfaction among nurses working in tertiary institutions was investigated using the Kruskal Wallis test. The test showed that there is no statistically significant difference in the job satisfaction level across the five levels of marital status, spouses' residence, and years of service ($p > 0.005$ in all cases). However, there was a significant association of cadre, and nurses qualification with job satisfaction ($p = 0.020$; $p = 0.039$). The results are presented in Table 4.

Table.1: Demographic characteristics of the participants

Variable	Classification	Frequency	Percentage
Gender	Male	41	13.2
	Female	269	88.8
	Total	310	100.0
Age	21 – 30	58	18.7
	31 – 40	146	47.1
	41 – 50	69	22.3
	51 – 60	37	11.9
	Total	310	100.0
Years of Service.	1 -5	100	32.3
	6 – 10	62	20.0
	11 – 15	87	28.1
	16 – 20	28	9.0
	25 and above	33	10.6
	Total	310	100.0
Cadre	NOII	62	20.0
	NOI	35	11.3
	SNO	66	21.3
	PNO	40	12.9
	ACNO	39	12.6
	CNO	43	13.9
	AND	22	7.1
	DDNS	3	1.0
	Total	310	100.0
Academic Qualification	RN/RM	106	34.2
	RN + Post Basic	57	18.4
	BNSC	133	42.9
	PGD/MSC	13	4.2
	PhD	1	0.3

Table 2: Descriptive Statistics

Variable	Minimum	Maximum	Mean	Std Dev.
Age	21.00	59.00	38.82	+8.58435
Job Satisfaction	12.00	49.00	30.36	±7.45331

Decision rule:

< 30 not satisfied

>30 satisfied

Table 3: Association between gender and institution with level of job satisfaction among Nurses working in tertiary health institutions in Edo State

Variable	categories	N	Mean Rank	Sum of Ranks	Mann-Whitney U Test stat	p-value
Gender	Male	41	153.77	6304.50	5443.5	0.894
	Female	269	155.76	41900.50		
	Total	310				
Institution	ISTH	144	150.22	21631.50	11191.500	0.333
	UBTH	166	160.08	26573.50		

Table 4: Association between marital status, spouse’s residence, years of work experience, cadre and nurses’ qualification with level of job satisfaction among Nurses working in tertiary health institutions in Edo State.

Variable	Categories	N	Mean Rank	Kruskal-Wallis test	p-value
Marital status	Single	69	175.70	5.134	0.274
	Married	236	149.46		
	Divorce/Separated	1	201.00		
	Widow	3	165.83		
	Widower	1	111.00		
	Total	310			
Spouse’s residence	Same as wife/Husband	212	151.68	4.501	0.105
	Far from that of Wife/Husband	35	141.77		
	Not concern for single	63	175.97		
	Total	310			
Years of work experience	1 -5 years	100	164.93	1.816	0.770
	6 – 10 years	62	149.91		
	11 – 15 years	87	153.47		
	16 – 20 years	28	145.57		
	25 years and above	33	151.21		
	Total	310			
Cadre	NOII	62	183.40	16.603	0.020*
	NOI	35	147.43		
	SNO	66	132.86		
	PNO	40	138.03		
	ACNO	39	182.29		
	CNO	43	155.09		
	AND	22	138.86		
	DDNS	3	183.83		
	Total	310			
Nurses’ qualification	RN/RM	106	163.10	10.070	0.039*
	RN + Post Basic	57	143.25		
	BNSC	133	161.25		
	PGD/MSC	13	99.50		
	PhD	1	11.00		
	Total	310			

Table 5: Correlation of Job Satisfaction and selected Socio-Demographic variables using the Spearman Rank Order Correlation coefficient

Demographic Variables	Spearman Rank Correlation Coefficient	p-value
Job satisfaction vs Age	-0.069	0.225
Job satisfaction vs Gender	0.008	0.894
Job satisfaction vs Nurses Qualification	-0.061	0.287
Job satisfaction vs Cadre	-0.059	0.297

Discussion

The participant's job satisfaction score was found to be mean score of 30.36, whereas the decision mean for this study was 30. The difference of 0.36 is insignificant, and as such, the respondents cannot be said to be satisfied. Given this, it can be said that the nurses from the selected hospital were neither satisfied nor dissatisfied with their job, i.e. the participants are mostly indifferent about their jobs. This finding is neither consistent with nor in disagreement with the results of previous studies^{12,5,13,14,15}, who found that nurses were satisfied with their jobs. This study found that gender possibly had no influence on job satisfaction; that is, whether the person is male or female had no bearing on whether they are satisfied or not with their jobs. This finding is in agreement with previous that reported no association between gender and job satisfaction^{5,16,17}. However, this contradicts the finding of Olatunji and Mokuolu¹⁸.

The findings show that the facility (ISTH and UBTH) where the participants are working did not influence their job satisfaction. No previous study was found that investigated differences in job satisfaction among nurses in different facilities. However, the findings were inconsistent with a similar study in an academic setting by Agbonifoh and Agbonifoh, whose study indicated job satisfaction among staff at the University of Benin but not among those at Benson Idahosa University¹⁹. The study revealed that there was no relationship between marital status and job satisfaction which suggests that there was no possibility of the marital status of the nurses significantly influencing their level of job satisfaction. Also, none of the marital status subgroups (single, married, divorced/ separated widow, and widower) influenced the participants' level of job satisfaction in line with the findings of previous studies²⁰, although a previous study conducted at the Federal Medical Centre, Ido-Ekiti found that marital status significantly influenced job satisfaction¹⁸. However, singles seemed more likely to be satisfied.

However, singles seemed more likely to be satisfied than married and divorced people²¹, the reason being that singles are likely to have fewer elements that await their income.

The finding indicated that there was no relationship between spouses' residence and job satisfaction. This suggests that regardless of whether a nurse is staying under the same roof as the partner, is far from the partner, or is alone (as in the case of a single), does not influence their job satisfaction. It interesting to know that some of the respondents whose partners are not in the same location but stay more than 50 kilometers away from the spouse's place of work may not want to disclose their real opinion in this case. Anecdotally there have been reports of nurses, particularly females, requesting transfers based on marriage to be closer to their husbands and immediate families after having their appointments confirmed. The results show that the number of years nurses have worked has no effect on their level of job satisfaction, indicating that it may not be a predictor of job satisfaction. This finding is inconsistent with that of some previous studies^{18,20}. However, respondents who were within 1–5 years of service had the highest mean scores, which implies the nurses in this group are less dissatisfied than others. There is a significant difference in job satisfaction among the different cadres of nurses. This finding is in contrast with a previous study whose study revealed no relationship between the designation of nurses and their level of job satisfaction¹⁶. Being in the higher cadres seemed to influence levels of job satisfaction. In terms of qualifications, the study found that nursing education has an impact on job satisfaction. This effect is more pronounced among those with professional and academic qualifications. This finding does not corroborate with some studies which found that professional qualification is a potent predictor of job satisfaction^{20,21}.

In recent times, almost every professional certificate holder in nursing is returning to school to obtain a degree in Nursing which is now the basic academic qualification required for a nurse to reach the peak of their career in tertiary health institutions, and this may serve as good ground to start and obtain a postgraduate certificate. This study did not find a significant correlation between each of age, gender, nursing qualification, and cadre with job satisfaction. This implies that none of the selected demographic characteristics may influence the participant's level of job satisfaction. This finding is consistent with that of a previous study which revealed no relationship between the designation of nurses and their level of job satisfaction¹⁶. Even so, the current findings are consistent with Akhbari et al²², whose findings show that there is a significant difference between gender and job satisfaction, but in contrast to that of Ayalew et al¹⁷, who reported no association between gender and job satisfaction.

Conclusion

The participants in this study were indifferent concerning their job satisfaction, with only the professional cadre and qualifications correlating with job satisfaction among nurses in the selected institutions.

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