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All manuscripts must be submitted in MS Word or RTF format using Times New Roman font size 10

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2. Letters to the editor (Up to 400 words).
3. Scientific letters (Less than 600 words); one table or graph and not more than 5 references.
4. Review/CPD articles (Up to 1800 words).
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Acknowledgments

In a separate section, acknowledge any financial support received or possible conflict of interest. This section may also be used to acknowledge substantial contributions to the research or the preparation of the manuscript made by the persons other than the authors.

References

Cite references in numerical order in the text, in the superscript format. Do not use brackets. In the references section, references must be numbered consecutively in the order in which they are cited.

References should be according to the format set forth in the Uniform Requirements for Manuscripts Submitted to Biomedical Journals by the International Committee of Medical Journal Editors: (BMJ 1991; 302: 338-01 or N. Engl J. Med 1991; 324: 424-28).

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The following are sample references:

Standard journal article

List first authors:

Halpern SD, Ubel PA, Caplan AL. Solid organ transplantation in HIV-infected patients. N Engl J Med 2002; 347: 284-7.

More than six authors:

Rose ME, Huerbin MB, Melick J. et al. Regulation of interstitial excitatory amino acids concentrations after cortical contusion injury. Brain Res 200, 935: 40-6.

Books and other monographs:

Murray PR, Rosenthal KS, Kobayashi GS, Pfaller MA. Medical Microbiology. 4th ed. St Louis: Mosby; 2002.

Editor(s), Complier(s) as Author:

Gilstrap LC 3rd, Cunningham FG, Van Dorsten JP, editors. Operative obstetrics 2nd ed. New York: McGraw-Hill, 2002.

Chapter in a Book:

Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in human solid tumors. In: Vogelstein B, Kinzler KW, editors. The genetic basis of human cancer. New York: McGraw-Hill; 2002. p.93-113.

Dissertation

Borkowski MM. Infant sleep and feeding: a telephone survey of Hispanic Americans [dissertations]. Mount Pleasantn(MI): Central Michigan University; 2002.

Worldwide Web (www)

Dushay J, Abrahamson MJ. Insulin Resistance and Type 2 Diabetes; A Comprehensive Review. Available at http://www.medscape.com/viewarticles/501 569 (accessed 20 July, 2007)

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LETTER FROM THE EDITOR

In the past 3 years, the core of our world has been shaken, core tenets of the practice of medicine hitherto believed infallible have given way to emergent best practices. It behoves the 21st Century doctor due diligence to ensure that the sweeping tide of change, discomfiting as it is, does not leave him bewildered and vulnerable. It is to this end that the Jos Journal of Medicine presents her newest publication, the Vol 16 No 1, that We as Doctors are informed and kept abreast of the wind of change that bellows around us.

Words would not describe our sincere appreciation to the esteemed members of the JJM's Editorial Team who have worked tirelessly with great enthusiasm and passion for the continuation of this project.
Our Editorial Advisers have shown unrivaled commitment and expertise in this publication and so, our deepest gratitude would not be withheld.

To our indispensable publication team, you have outdone yourselves again and it is worthy of note that your patience and dedication to this edition of JJM will not be forgotten! You kept us on our toes and ensured that each article was reviewed, scrutinized and submitted as at when due.

Our unreserved appreciation goes to the Nigerian Association of Resident Doctors (NARD) and her formidable leaders for their proactive performance to ensure the best working conditions of her members amidst storms weathered. The Executive Officers of the ARD JUTH Chapter, ably led by Dr. Noel Nnaegbuna, without whom what we do would not be sustained, have not ceased to avail themselves to ensure a seamless process of production.

Finally, special thanks goes to our esteemed authors and to you, our readers, for your keen interest in our journal. We hold you all in high regard and we would not hesitate to respond to questions, comments, suggestions and comments that may arise. Our journal remains indexed in the African Journal Online (AJOL). Articles and other correspondences can be forwarded to us via mail at editorjjm@gmail.com.

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CONTENT

QUALITY OF TYPE 2 DIABETES CARE BASED ON LIPIDS CONTROL IN SUB-SAHARA AFRICA: A SYSTEMATIC REVIEW

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ABSTRACT:

Background:

Diabetes mellitus is a growing medical concern in sub-Saharan Africa (SSA). Currently, urbanization and shifting epidemiological patterns are making this condition increasingly prevalent in this developing region.

The quality of care provided to diabetics based on lipid control in Africa may not be optimal. Nevertheless, there is little evidence to support these claims. Systematically assessing and summarizing the existing literature related to quality of care for patients with type 2 diabetes mellitus (T2DM) was necessary, while also identifying any gaps in information and exploring possible barriers to care in an SSA context.

A systematic overview of the available evidence on diabetes care in this region will be able to help policy makers and health care providers make well-informed decisions.

Aim and Objectives:

By addressing the following questions, the systematic review examined the existing management of type 2 diabetes in sub-Saharan Africa:

i. How good is the current control of type 2 DM in SSA based on indicator outcome of lipid levels?
ii. Have implemented strategies, treatment or interventions improved the outcome of type 2 DM in sub-Saharan African countries?

Methods:

A systematic review of quantitative studies was carried out. It was done on a population of people with type 2 diabetes in sub-Saharan Africa. We considered all ages, gender, ethnicities, racial backgrounds, migration statuses, education levels, and socioeconomic backgrounds. In addition to cross-sectional, experimental and quasi-experimental studies,observational studies and reviews were also included. The review focused exclusively on full papers and not abstracts. Conference proceedings, editorials, and case reports were not included in the review. Search strategies were developed using two databases - MEDLINE via PubMed (1946 to February 2013) and EMBASE via Ovid (1974 to April 2013).Search strategy included lipids, cholesterol, and lipoproteins, as well as terms related to these. Reference lists from derived papers were searched and experts contacted. As the primary outcome of interest, we extracted and summarized data on lipid control measures. Process-related outcomes, such as frequency of lipid level documentation, were secondary outcomes. Duration and complications as related to lipids control of diabetes were also considered.

Also assessed were the interventions or implementation approaches used in the studies or the data collected. Study quality was assessed using the Effective Public Health Practice Project's quality assessment

tool.

Results:

The review identified and included ten published studies. These were all cross-sectional studies. Interventions focused on diabetes management and preventing complications were the most consistent, followed by drug treatment, then dietary measures. Target levels of total cholesterol were not met in 18% to 43% of patients across studies. Patients who did not meet the target levels of LDL-C were 66.1% to 73.5%, while 35% to 85% of patients did not meet target levels of HDL-C. Forty percent to 60% of patients did not meet target levels of triglycerides.

Conclusion:

The quality of care for type 2 diabetes in sub-Saharan Africa is sub-optimal based on lipid control. Consequently, quality of care needs to be improved in this region. The quality of care in this region is likely to be improved by a variety of interventions, mainly secondary prevention strategies, and implementation strategies. The local population would benefit from targeted interventions and strategies. A consideration of factors impeding quality of care must also include barriers to good diabetes management.

Keywords:

Type 2 Diabetes Mellitus, Lipids, Sub-Sahara Africa

INTRODUCTION:

Diabetes mellitus is defined by the World Health Organization (WHO) as a metabolic disorder involving prolonged hyperglycaemia and changes in carbohydrate, fat, and protein metabolism as a result of impairments in insulin secretion or insulin action or both.[1] Over 90% of diabetes cases in sub-Saharan Africa are due to type 2 diabetes (T2DM).[2,3] The common cause of T2DM is insulin resistance or impaired insulin sensitivity, along with reduced insulin secretion.[4]

Because of its mild or non-existent symptoms, T2DM may go unnoticed for many years and may lead to severe long-term complications. A combination of genetic and environmental factors, such as a high-calorie diet and physical inactivity, may lead to the development of T2DM. Alcohol, smoking, and certain medications may also contribute to the development of the disease. In this systematic review, T2DM was considered due to its higher prevalence compared to people with Type 1 DM (T1DM).Therefore, poor management and control of T2DM may have greater public health consequences.

The number of people with T2DM worldwide was estimated at 171 million in 2000. By 2030, this number is expected to reach 366 million.[5]Sobngwi and colleagues[6] noted that diabetes prevalence ranges from 1% in rural areas to 6% in urban areas of Africa. A systematic review conducted by Hall[7] on the epidemiology and public health implications of diabetes in sub-Saharan Africa found that the prevalence rate ranged from 1% in rural Uganda to 14% in urban Kenya.

Sub-Saharan Africa is experiencing an increase in diabetes mellitus cases. Increasing urbanization and epidemiological transition are contributing to the prevalence of this condition in this developing region.[5,6,8,9] In sub-Saharan Africa, there are very few data on prevalence of diabetes. The prevalence of diabetes in sub-Saharan Africa could reach 23.9 million by 2030due to a projected increase of 98% every decade.[5,6]

With its attendant complications, type 2 diabetes mellitus has a negative impact on quality of life for individuals and their families.[10]Individuals, families, and governments will incur additional costs to treat patients and manage complications.

Having diabetes, increases the risk of morbidity and mortality primarily because it is associated with microvascular and macrovascular complications. In Africa, Mbanya and Sobngwi[11] found that 16-55% of diabetics had retinopathy, while newly diagnosed patients accounted for 21-25% of this.The fact that most persons are asymptomatic and individuals have been undiagnosed for long periods and have poor blood glucose control,could explain the presence of complications at diagnosis. T2DM care is sub-

optimal in SSA, based on this evidence. In populations with poor blood glucose control, the highest prevalence of retinopathy is observed in T2DM patients with poor glycaemic control.[11] Peripheral neuropathy usually occurs after a diagnosis of type 2 diabetes, while nephropathy is associated with poor blood glucose control, high blood pressure and retinopathy.[11] The same study noted that diabetic complications accounted for 30.8% of outpatient care costs at a major city hospital in Tanzania. On the average, US $138 was spent per patient annually, which is 19 times more than the average government expenditure on health.

Patients with T2DM or metabolic syndrome X, which includes dyslipidaemia, hypertension, and central obesity, are most likely to develop macrovascular complications. The combination of these factors can greatly increase cardiovascular risk. Those with T2DM are at greater risk of developing cerebrovascular disease, coronary artery disease, and cardiomyopathy.[11,13,14] African populations with an increased prevalence of dyslipidaemia are at higher risk of cardiovascular events.[11,15]

SSA is also experiencing an increase in T2DM prevalence due to factors similar to those affecting worldwide rates. An analysis of a modelling study showing an increase in diabetes prevalence and plasma glucose in Mauritius[16] concluded that most of the increase was due to modifiable factors, rather than changes in mortality rates.

Risk factors that can be modified include cultural and social changes. Consequently, poor dietary habits, sedentary lifestyles, obesity and other unhealthy behaviours may worsen T2DM, increase the risk of complications or even lead to the development of the disease. The aging population and ethnicity are two factors not modifiable. Complications associated with these changes need to be prevented or delayed.[19,20] Among the interventions recommended are healthier eating, increased physical activity, avoiding cigarette smoking, and structured education. Medicine may also help. In T2DM patients, these measures attempt to control three important indicators: blood glucose, blood pressure, and lipids.[20] Yet, despite some achievements (2007), only about 15% of adults with T2DM met all three targets at the same time.[21,22] These findings may reflect the poor effectiveness or implementation of the recommended strategies or poor compliance to these strategies. Thus, improvements in the quality of care among T2DM patients may be impeded.

According to the Diabetes Foundation (DF) Report on Implementing National Diabetes Programmes in sub-Saharan Africa, the current approach to managing diseases in SSA is focused on acute infectious diseases. However, similar approaches cannot be used to treat chronic diseases like diabetes. In addition to long-term follow-up and treatment for diabetic patients, continuous self-management is necessary. Several interventions are currently being carried out to improve the quality of diabetic patients' care in order to achieve better outcomes.[23]

The effectiveness of these interventions in reducing T2DM is still unclear. A lack of follow-up of outcomes may account for the lack of certainty here. Clinical outcomes such as blood pressure as a measure of control were considered in this systematic review. Additionally, interventions may not work due to barriers such as poor feasibility, efficacy, or acceptability. Between ideal and actual interventions in management, clinicians are currently at odds.[24,25] Patient self-management and clinician behaviour may contribute to inadequate control of these indicators.[21,26] It may still be difficult to change patients' behaviour on healthy lifestyles.

The Diabetes Foundation report[23] suggests a few key areas where good quality of care can be achieved for diabetic patients. In addition, prevention strategies - primary, secondary, and tertiary - are essential, as are access to diagnostic tools and infrastructure, drug supply and procurement, affordability of medicine and care, skills of health care workers, adherence by patients to management and community engagements.[23] Due to the increasing prevalence of T2DM and its health and economic consequences, it is important that effective strategies are implemented as soon as possible.

Diabetes care in Africa is reportedly sub-optimal. However, the evidence to support these claims[17] is unclear. For effective advocacy and action in this region, it is crucial to understand the extent of the disease burden. Despite this, little effort has been made to give policy makers and health care providers a systematic overview of the evidence available on diabetes care in sub-Saharan

Africa.[17]

In order to identify the gaps and explore the barriers to care in the SSA context, it was necessary to systematically assess the quality of care among patients with T2DM in existing studies. Screening for type 2 diabetes, for instance, has important implications for individual health and public health policy, according to the IDF guidelines.[27] Diabetes should be detected and treated early in order to minimize complications.There is also evidence that published national guidelines for type 2 diabetes management come from relatively resource-rich countries whereas they may be of limited practical use in less well-resourced countries like Africa.

Based on the scoping of the literature, we determined that limiting the systematic review to a single research question may yield very few studies, thus rendering the systematic review infeasible. As a result, we sought to address more than one interrelated topic related to diabetes care. The aim of the review was to examine the existing quality of management of type 2 diabetes in SSA by addressing the following questions:

- How good is the current control of type 2 DM in SSA based on indicator outcome of lipid levels?
- Have implemented strategies, treatment or interventions improved the outcome of type 2 DM in sub-Saharan African countries?

METHODOLOGY:

This study is a systematic review of quantitative research on T2DM in SSA. Using the PRISMA reporting guidelines, a systematic review protocol was developed.[28] A systematic review with no primary data collection did not require ethical approval.

Study Selection:

Inclusion:

People in SSA with T2DM made up the population. The review included participants of all ages, genders, ethnicities, residences, localities, immigration status, educational background, and socioeconomic status.The studies included cross-sectional, quasi-experimental, experimental, observational, and review studies. All studies including lipid levelsand/or it's control as outcome indicator were included. Only papers written in English were included. We included only full papers, not abstracts.

Exclusion:

In most cases, case reports are not representative of the target populations under study and were therefore excluded. We also excluded conference proceedings and editorials for pragmatic reasons. Upon consultation of their titles and abstracts, papers that failed to meet the inclusion criteria were excluded. Papers that presented partially available data were also excluded.

Outcome Measures:

Using lipid levels as the primary outcome measure, control was assessed. Documentation of lipid levels was the process measure. In addition to screening for diabetes and its complications, educating patients on management and prevention of complications were also considered secondary outcome measures.Also considered were individuals taking or administered medications including anti-lipid medications.

Information sources and search strategy:

MEDLINE and EMBASE were explored since both are large medical and biomedical databases relevant to the review topic. The search in Medline covered articles from 1946 to February 2013 while the search in Embase covered articles from 1974 to April 2013 to enable a detailed search to the period of the review. Population, indicators, comparators, and outcomes (PICO) were considered in reference to the review questions. A PICO deconstruction of the review questions was used. Two reviewers carried out the search. As a result of possible differences in database MeSH headings or dictionaries, the search strategy developed for one search database (Medline via PubMed) was adapted for a second database (Embase via Ovid). We searched the reference lists of the database-derived papers for relevant studies. An expert on the research topic also provided relevant papers.

Before being fully screened, the title and abstract of each study were reviewed and assessed against the inclusion criteria. Each paper was reviewed independently by two reviewers. The flow chart in Figure 1 shows the number of papers identified and screened in order to determine which papers are eligible for review.

Data Extraction and Quality Assessment

We extracted data from each study based on

the following criteria: 1) study type, 2) participant characteristics, 3) country and setting (tertiary, secondary or primary hospitals), 4) intervention strategies, 5) complications among newly diagnosed and undiagnosed T2DM patients or data collected on these 5) outcomes measurements (Table 1). Among the data extracted were summary statistics from papers.

Modifications were made to the tables based on the evidence available. An assessment of study quality was based on a combination of components in a quality assessment tool developed by the Effective Public Health Practice Project - EPHPP.[29,30] Due to the type of studies included in the review, this tool had limitations. Cross-sectional studies, for example, made it difficult to assess blinding techniques and withdrawal from follow-up. In order to explain results differences across studies, quality assessments were used.

Data Synthesis:

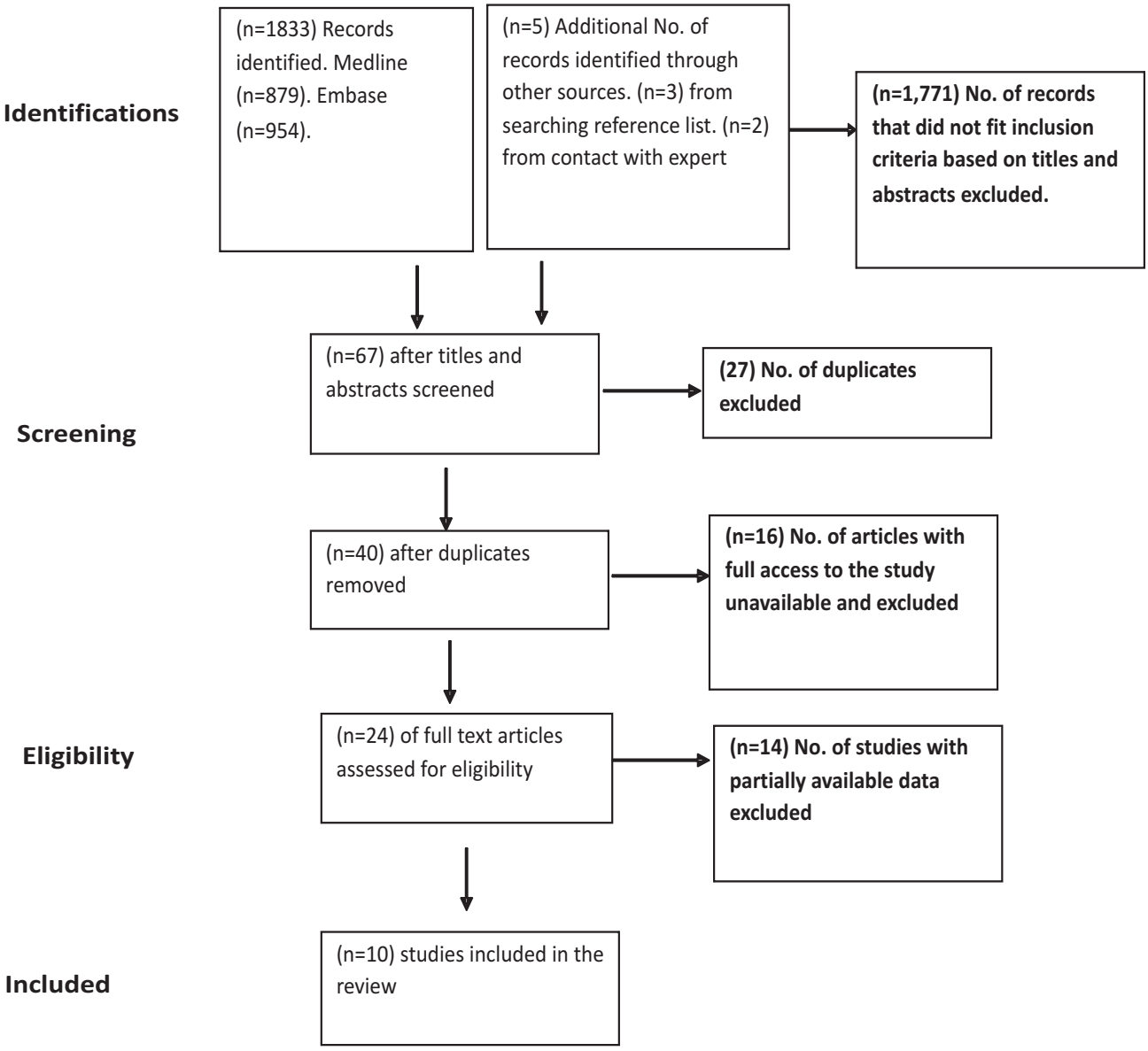
The findings were summarized and explained using narrative synthesis. Based on lipid control, the extracted data was grouped and summarized into types of studies and clinical outcomes.

RESULTS:

Types and characteristics of studies:

Table 1 shows the types and characteristics of studies. Ten studies were considered eligible and included in the review (Figure 1).

Figure 1: Flow Chart of Study Selection Process.



There were only cross-sectional studies[31-40] in the papers reviewed. No primary preventive measures or screening studies were found. Selection was to studies describing mainly secondary preventive measures of T2DM.

The studies were all conducted in tertiary hospitals or medical centres with theexception of two. One study was conducted in a primary health centre, while the other was conducted at specialized clinics. In these studies, a variety of methods were employed, including retrospective review of patients' records and assessment during the study, as well as prospective methods. One cross-sectional study was comparative.[40] In some studies, type 2 diabetic patients were specifically included, while other studies used a mixed diabetic population predominantly comprised of type 2 diabetics. Study samples ranged from 62[38] to 2352[40]. Some studies had a higher percentage of males, while others had a greater percentage of females. The average age varied between 48 and 56 years across studies, as did the age ranges.

Table 1 summarizes the interventions, strategies, and outcomes, as well as the data collected by the project.

Table 1: Summary of Type of Study Design, Interventions, Outcome measures and data collected

Ref/Date of Study	Type of Study	Country	Sample Size	Population Characteristics	Intervention/ Implementation strategies/ Data collected	Outcomes Observed/ documented
1.Gudina et al/2009	Cross-sectional	Ethiopia	329	-M:F = 1.46:1 Mean (SD) = 48.4 (15.1) -TH	-Diabetes health education -Review of charts for treatment of diabetes and causes of admission -Drug treatment for dyslipidemia	-follow-up visits -Mean duration of DM -Assessment of Diabetes related complications -Clinical outcomes
2.Okafor/Ofoegbu 2011	Cross-sectional	Nigeria	233	42.1% males attending diabetic clinic in a TH	Degree of adherence to therapeutic measures	-Duration of DM -Clinical outcomes
3.Chineye et al/2008	Cross-sectional	Nigeria	531 (95.4% T2DM)	39.4% Males, Multicentre study including 7 tertiary health centres	-Clinic visits and clinical assessment -Patient self-monitoring -Diabetes education received by patient -Use of medications -Eye examination, lower limb examination. -cerebral stroke, neuropathy, myocardial infarction, renal failure	-Mean duration of DM -Frequency of clinic visits and assessment -Adherence to dietary measures and exercise -Assessment of diabetic complications and cardiovascular risk factors

4. Joseph et al 2009/10	Cross-sectional	Cameroun	205	Male=43.6%. Mean Age=57 Age Range= 29-85 Tertiary health centre	Regular chronic care with follow-up appointments	-Drug treatment rates -Mean duration of diagnosed diabetes -Assessment of cardiovascular risk factors and diabetic complications	TC, HDL, LDL	Selective non-random sample of participants that may not be representative of the population
5. Isezuo SA/2002	Cross-sectional	Nigeria	254	Males=154(60.6%) Outpatients and Inpatients in a TH	Laboratory assessment of components of the metabolic syndrome	Metabolic syndrome, obesity, microalbuminuria, hyperuricae-mia	HDL-C, LDL-C, TC	Data collection methods not clearly stated
6.Christopher OA.	Cross-sectional	Nigeria	218	Males=58.7% Mean Age=52±5.8yrs. Range=36-62yrs	-Use of medications -Dietary measures	Duration of diabetes. Drug therapy. BMI, Microalbuminuria	HDL-C, TG	Statistical methods not clear
7. Berhane et al	Cross-sectional	Eritrea	429	Age=57.4±11.8	-Dietary treatment -Medications	-Assessment ofcomplica-tions -Lipid levels	TC, LDL-C, TG	Poor standardized lipid levels

8.Vezi/Naido2002/03	Cross-sectional	South Africa	62	Age (Range) in years Males:49 (34-72) Females:50(33-69)	-Routine clinical examination and follow-up visits	-Assessment of liver, renal and thyroid function tests -lipid levels -Obesity	HDL-C, LDL-C, TC, BMI	-Methodology not clear
9. Isezuo et al, 2003	Cross-sectional	Nigeria	120		Use of medications	- lipids levels -Obesity	LDL-C, HDL-C, TG, BMI	Unclear sampling method. Poorly discussed population characteristics
10. Sobngwi et al	Cross-sectional Multi centric	Tanzania, Kenya, Cameroun Ghana, Senegal, Nigeria	2352	Adult population registered for management of DM Mean age=53.0±16.0	-Medications - Treatment for hyperlipidaemia especially with Statins	-Duration of diabetes -Assessment of Cardiovascular risk factors and diabetes complica-tions -Clinical outcomes	TC, HDL-C, TG, BMI	Lack of standardization of biological measure-ment Study was limited to best level of care.

All studies looked at lipid control as a primary outcome. Diabetes education, lifestyle modifications, and medication were all part of the intervention. The intervention was carried out following a clinical algorithm. Across the studies,[31-40] questionnaires, interviews, or a review of records were used to collect data about intervention strategies. Data on diabetes education seemed most consistent, followed by data on drug treatment, then dietary measures. Some of the strategies used to control diabetes included patient self-monitoring, treatment algorithms, chart reviews, clinic visits, and laboratory assessments. Secondary outcome measures included mean diabetes duration, therapeutic adherence, diabetic complications (e.g., retinopathies, neuropathies) and cardiovascular risk factors (such as smoking habit). Most studies did not take clinical guidelines into account. As a measure of lipid control, ADA and IDF guidelines were used as reference values for the indicator outcome.

Table 2: Summary of Lipid control

Ref/dates of study	Setting	Country	Sample size	Population characteristics			Lipid control indicators (Levels of TC, LDL, HDL, TG measurement) mmol/L				Process outcomes (Frequencyof lipid measurement documentation)
				% Male	Age (years)		TC Mean(SD)	LDL-C Mean(SD)	HDL-C Mean(SD)	TG Mean(SD)	
					Mean (SD)	Range					
1.Gudina et al 2009	TH	Ethiopia	329	M:F 1.46:1	48.4 (15.1)	15-82					
2.Okafor/Ofoegbu, 2011	TH	Nigeria	233	42.1			5.3(1.28) >5.2=38.2%	3.12(0.9) >2.6=73.5%	1.22(0.42) <1.4=61.8%	1.56(0.81) >1.7=40%	
3.Chineye et al, 2008	TH	Nigeria	531	39.4	57.1 (12.3		4.9(1.1)		1.2(0.6) >1.0=23.7%	<1.7= 39.3% <2.3= 45.6%	
4.Joseph et al, 2009/10	TH	Cameroun	205	43.6	57	29-85	1.82(0.46) <2.0=68.9	1.15(0.44) <1.0=38%	0.49 (0.2) <0.4=63.6%		
5.Christopher OA, 1999-2001	TH	Nigeria	218	58.7	52(5.8	36-62	4.37(0.67)				

6. Isezuo, 2002	TH	Nigeria	254	60.6			4.85(0.73)	2.61(0.55)	1.25(0.33)	4.38(0.99)
7.Berhane et al-Received 2008	TH	Eritrea	429		57.4	11.8	>5.18= 43.4%	>4.17= 15.3%		>5.18= 28.2%
8.Vezi/Naidoo 2002-2003	TH	South Africa	62		M-49 F-50	34-72 33-69	M=4.8 F=5.0	M=2.7 F=3.1 ≥2.6=66.1 %	M=0.99 F=1.2 <1.03=34 %	M=2.7 F=1.8 ≥1.69= 57.1%
9.Isezuo et al 2003	TH	Nigeria	120				4.36(1.32) >5.2=17.5 %	2.37(1.22) >3.5=12.5 %	1.20(0.55) <0.9=22.5 %	1.79(0.56) >1.75=25 %
10.Sobngwi et al 2008	Specialized Clinics	Tanzania Kenya Cameroon Ghana Senegal Nigeria	2352				4.9(1.2)		1.3(0.7)	1.2(0.7)
										Dyslipidemia= 57.5%
										29% East Africa to 72% Central Africa

TC=Total CholesterolLDL-C=Low Density Lipoprotein-CholesterolHDL-C= Low Density Lipoprotein-Cholesterol TG=TriglyceridesSD=Standard DeviationTH= Tertiary HospitalPHC=Primary Health Centre

Process measures were infrequently reported. In one study,[40] frequency of dyslipidaemia was recorded in 57.5% of patients during the period of study. In another,[39] frequency of lipid measurements in the previous year was 28.5% in East Africa, 72% in Central Africa, 48.2% in West Africa and 45.1% in total. Dyslipidaemia had varying definitions, and different aspects of the lipid profile were used with variations in thresholds.

Total cholesterol was most commonly used across all the studies with target levels of good control at <5.2mmol/L. However, despite the fact that this was not met in an estimated 18% to 43% of patients (in eight of the studies), the mean total cholesterol level was approximately 4.0-5.5 mmol/L. The mean LDL-C levels ranged from 1.15mmol/L[34] to 3.12mmol/L. Poor LDL-C control that did not meet levels of <2.6mmol/L was seen in 73.5% of patients in one study[32] and 66.1% of patients in another study.[38] The other studies had variable measures of LDL-C and target levels documented. Except for one study with mean HDL-C level of 0.49,[34] the mean HDL-C levels were from 1.0mmol/L to 1.3 mmol/L. Twenty percent to 65% of patients had less than 1.0mmol/L of HDL-C value. The target value for triglycerides of <1.7mmol/L was found in 40% to 60% of patients. The mean value for triglyceride was from 1.56mmol/L[32]to 4.38mmol/L.[36]

DISCUSSION:

High lipid levels directly relate to insulin resistance and hyperglycaemia. Insulin resistance and hyperglycaemia will usually lead to an overproduction of lipoproteins from the liver - especially those rich in triglyceride, decreased clearance of such lipoproteins and in some cases, altered postprandial lipoprotein metabolism. Good glycaemic control could improve lipid profile levels among type 2 diabetes patients.

This review found that lipid levels control was relatively poor for personswith type 2 diabetes in sub-Saharan Africa. This may likely be, in part, due to higher rates of poor glycaemic control in this region.[2] In most studies reviewed, less than half of patients met the clinical outcomes.

From the studies, it may be inferred that lipid control was better achieved in tertiary health centres than primary health centres.The studies were mostly cross-sectional, sometimes difficult to interpret and of low quality mainly due to methodological discrepancies and poor reporting. In settings where healthcare was still developing, multiple interventions and implementation strategies were documented. However, some of these may still have improved clinical outcomes. Interventions and implementation strategies in type 2 diabetes care, including lipid levels control, are generally poor and inadequate in SSA when compared to more developed societies.[2] However, considering the genetic makeup, study settings, health care facilities, differences in interventions, strategies for their implementation, clinical guidelines for management and target levels, intervention effectiveness may have varied between the regions studied. Furthermore, baseline measurements were unlikely to be equal and may have been affected by other diseases of high prevalence in these regions. This is consistent with many national guidelines that include treatment algorithms that are based on available evidence, locally available drugs, and prescribing regulations.[41] IDF's updated guideline contains a generic algorithm that has been designed for countries to adapt to their specific needs.[41] While inconsistent in this review, regular clinic visits, self-monitoring by patients and clinic records and charts may be effective measures in developed countries. In this study, poor utilisation of these interventions may have contributed to suboptimal outcomes. This review documented similar clinical outcomes to that documented in the review conducted by the Cooperation Council for the Arab States of the Gulf.[42]For example, the LDL-C levels in three studies in this review was similar in comparison to 2.6mmol/L in the Gulf

Nonetheless, lipid levels in this reviewwere generally higher than in some studies from the UK,[43-45] the USA[46,47], and Australia.[48] It was noted that these countries have higher standards of healthcare and some clinical outcomes in this review met the UK Quality and Outcomes Framework targets.[49]Studies in other countries[43-46]documented process outcomes more frequently than those in this review. In developed societies, process measures and outcomes of diabetes, including cardiovascular risk factors and complications, can also be measured.[43,46]

Despite the fact that this study did not actively look for barriers to improved care in these regions, it may suffice to say that these barriers

contributed significantly to the suboptimal indicator levels found in this review. Based on the studies, these would include poor adherence to therapeutic measures, poor health seeking behaviours, poor access and affordability to quality healthcare services, ineffective use of medications and health care facilities, and difficulty with lifestyle changes. Most of these factors are related to patients. The reviewed studies indicate that clinician factors include poor patient registration, inadequate chart keeping, poor diabetes education, and oversight in testing or managing risk factors. In contrast with other reviews discussing interventions and barriers to diabetes management,[50] patients' and clinicians' attitudes and beliefs, cultural factors, and organisational factors were not explicitly discussed.

There was a major limitation to the reviewed studies due to their heterogeneity. Populations varied, as did outcome measures. Studies were conducted in different health systems with different study settings. Because there is no universally accepted definition of high-quality diabetes care and the diabetes care programmes differ widely, meaningful comparisons could not be made.

It was difficult to evaluate complex interventions and to base them on evidence. A few countries in sub-Saharan Africa were included in the review. There was no standardization of clinical outcomes in most of the studies. Most studies did not include primary prevention programmes. The studies reviewed were cross-sectional and of moderate to low quality. Many methodological discrepancies were evident. However, no study was excluded due to difficulty assessing quality. As a consequence of the low number of papers returned by the different searches in each database, fewer papers were eligible for review.

Conclusion:

Based on the findings of this review, the quality of care for type 2 diabetes based on lipid controlin sub-Saharan African countries is suboptimal. Thus, this region must improve its healthcare quality. This study did not identify high quality studies, and thus assessment of their quality may have been impaired. Therefore, a higher standard of research in this region would be necessary if future research is to be of a relatively high standard.

Several interventions were identified in this study, mainly secondary prevention strategies, which may improve quality of care in this region. There is a good chance that the implementation strategies identified in this review would contribute effectively to improving quality of care.

Although, there are standard international, national, and regional guidelines involved in diabetes care, there may be little or inadequate adherence to these guidelines. However, further standardization of processes and clinical outcomes based on current studies may be necessary to permit comparisons and quality of care audits.

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ASSESSMENT OF MATERNAL HEALTH SERVICES UTILIZATION AND ITS ASSOCIATED FACTORS AMONG WOMEN OF REPRODUCTIVE AGE IN AN URBAN COMMUNITY OF JOS, PLATEAU STATE.

Eugene Chidi Eugene , Suleiman Mshelia & Onoja Martha

Uptake of maternal healthcare has remained worrisome despite the availability of maternal health services. This is especially so in sub-Saharan Africa, despite high maternal mortality records, and has been worsened by the socioeconomic situation of the women. This sub-region accounted for two-thirds of global maternal deaths in 2017. Provision, as well as access to high quality maternal care has been identified as a vital means of reducing the maternal mortality. The study sought to assess the level of maternal health service utilization among women of reproductive age and to identify the factors associated with it.

The study utilized a cross-sectional study design. A total cluster sampling of all eligible women was done following house mapping of the selected community. Data collected was analysed using SPSS version 23. Descriptive analysis was done to show frequencies and proportion, and bivariate analysis was done to show associations. Ap-value of ≤ 0.05 was considered statistically significant.

The mean age of the women was 32.4 ± 9.1. More than two-third of the total women attended a minimum of 4 antenatal visits in their last pregnancy and about 76% of the women delivered in the hospital/clinic.However, 6.7% of the women had no antenatal visit throughout the 9 months of their previous pregnancy.Age was found to be significantly associated with antenatal care uptake ($p < 0.05$), as uptake increased with age. Marital status was also found to be significantly associated with antenatal care uptake($p = 0.001$). Religion, however, was significantly associated with place of delivery. Educational status was found to be associated with both antenatal uptake and place of delivery($p = 0.037$ and $p = 0.000$ respectively).

Although a high proportion of women utilized maternal health services in the study population, the proportion who do not utilize maternal health services may contribute to poor maternal health indices. We recommended further exploration in line with the associated factors, to identify any possible prediction and hence, guide prioritization and degree of possible intervention.

INTRODUCTION

Relative to the interest on improving the standard of and access to maternal health services, the influence of women's socio-economic situation on maternal care use has received little attention. More worrisome is the relatively low uptake of maternal care, in developing countries, amidst high maternal mortality records.[1]

Although maternal mortality reduced globally by near to 38% between 2000 and 2017,[2] sub-Saharan Africa continues to experience high maternal deaths. The sub-region accounted for about two-thirds of maternal deaths worldwide in 2017. Records indicate that among the 15 countries that were considered as hot spots of maternal mortality, 8 were from sub-Saharan Africa. These countries include Somalia, Central Africa Republic, Democratic Republic of Congo, Chad, Guinea, Zimbabwe, Nigeria and Ethiopia.[2,3]

Access to high quality care before, during and after childbirth has been identified as a vital and effective means of reducing maternal mortality.[2] Emphasis has been placed on the importance of antenatal care to maternal and child survival. Antenatal care helps women to get set for delivery and understand warning signs during pregnancy and childbirth. [2]It is an avenue for micronutrient supplementation, identification and treatment of

covert illnesses in pregnancy like preeclampsia, prevention of mother-to-child transmission of conditions like HIV/AIDS and immunization against preventable diseases. In a bid to ensure adequate care for women during pregnancy, WHO at some point recommended at least four antenatal visits for every pregnant woman which has been reviewed upward to eight visits throughout the period of pregnancy[4]. In 2016, the organization developed and published 39 recommendations which are related to five interventions aimed at ensuring a positive pregnancy experience for women[5]. Such interventions include nutritional interventions, maternal and foetal assessment, preventive measures, interventions for common physiological symptoms and health system interventions to improve utilization and quality of antenatal care[5]. However, antenatal care utilization among women in sub-Saharan Africa has been below the global rate. It has been shown that globally, 86% of pregnant women access antenatal care with a skilled professional at least once, while 65% receive at least 4 visits. Only 52% of pregnant women in sub-Saharan Africa receive at least four visits[6]. Low utilization of antenatal care has been linked to factors such as unplanned pregnancy, previous pregnancy complications, poor autonomy, lack of husband's support, increased distance to health facility, not having health insurance and high costs of services. [7]Other factors that influence antenatal care (ANC) utilization include maternal age, maternal education, place of residence, household wealth, region, exposure to mass media, number of living children, knowledge of danger signs, previous obstetrical history and quality of care, among others.[8-13]

Conditions amenable to intervention by skilled health providers are involved in about 80% of maternal deaths, and thus, to date, the core strategy for optimizing maternal health has been to increase access to maternal health services, including ANC and hospital delivery. Underutilization of available maternal health services can pose a danger to the women and the population at large. Assessing the level of uptake, the reasons for such and the factors that influence the degree of maternal services utilization will guide public health actions targeted at increasing the uptake of these life-saving services. Hence, a holistic approach to increasing maternal health service utilization should give attention to the demand, as well as the supply side of health care delivery.[1]To this effect, this study aims at assessing the level of maternal health service utilization among women of reproductive age and to identify the factors associated with it.

METHODOLOGY

The study was carried out in Maiadiko, an urban community in Rayfield, Jos South Local Government Area of Plateau State. The area was purposively selected for the rich mix of both Christians and Muslims in that community and for the presence of a primary healthcare centre in the same community. All women of reproductive age between ages 15-49 years were selected for the study. Women who have never been pregnant were excluded from the study.

A cross sectional study design was conducted and data were obtained at a point in time. An electronic semi-structured interviewer-administered,adapted questionnaire was applied through the open data kit (ODK) to obtain quantitative data.

The sample size for the study was calculated using the formula for sample size determination for cross sectional study design. The formula had n as the minimum sample size, Z is the standard normal deviation at 95% confidence interval which is 1.96, d is the precision at 0.05, q is 1-p (complementary for p) and p is the proportion of women who utilized maternal services.[14]

A total cluster (comprising all eligible women from all the household in the selected cluster), door-to-door administration of the electronic questionnaire was done following house mapping of the community. Face-to-face interview of all eligible women was carried out by the researchers and their trained assistants and the data generated were automatically uploaded to the Kobo-tool-box server in real time. Variables that were measured include independent variables like the socio-demographics of the women and dependent variables like maternal health service utilization (hospital delivery and antenatal care visits) and reasons for delivery outside the hospital. Data cleaning was done in Excel Spreadsheet and subsequently coded and analysed using SPSS version 23. Descriptive analysis was performed to show the prevalence of maternal health services

utilization, frequencies and percentages of the independent variables (the socio-demographics, wealth index and parity) and the dependent variables (place of last delivery and number of antenatal care visits in the last pregnancy). Bivariate analysis was done to show any association between the dependent and independent variables. A p-value of $\leq$ 0.05 was considered statistically significant.

RESULTS

The mean age (±Standard Deviation) of the women

Table 1
Socio-demographic Variables. n = 150

Variables	Frequency	Percentage (%)
AGE		
15-19	3	2
20-24	33	22
25-29	26	17.3
30-34	24	16
35-39	25	16.7
40-44	17	11.3
45-49	22	14.7
EDUCATIONAL STATUS		
None	15	10
Primary	42	28
Secondary	63	42
Tertiary	30	20
MARITAL STATUS		
Single mothers	17	11.3
Married	125	83.3
Widowed	3	2
Divorced/Separated	5	3.3
RELIGION		
Christianity	69	46
Islam	81	54

Close to half of the women (44.7%) have had between 2 to 3 previous pregnancies with 77.3% of the total women having attended a minimum of 4 antenatal visits in their last pregnancy. About 76% of the women delivered in the hospital/clinic [Table 2].

Table 2
Place of last delivery n = 136

Place of delivery	Frequency	Percentage
Home	30	22.1
Hospital	103	75.7
Others	3	2.2

Table 3 shows the various reasons given for choosing to deliver outside the hospital/clinic.

Table 3
Reasons for delivery outside the hospital/clinic (Home delivery). n=30

Reasons	Frequency	Percentage
Claims delivery is usually easy for her	3	10
Claims to have some experience in self-delivery	1	3.3
Has birth attendant in the neighbourhood	2	6.7
Delivery happened during religious crisis	1	3.3
It happened late at night	2	6.7
Labour was swift	10	33.3
Lack of proper midwife attention in last pregnancy	1	3.3
No reason	9	30
The will of God	1	3.3

A high proportion of the women had up to four antenatal visits in their last pregnancy. However, 9 (6.7%) of the women had no antenatal visit throughout the 9 months of their previous pregnancy. [Table 4]

Table 4
Number of antenatal visits in the last pregnancy. n = 135

Number of antenatal visits	Frequency	Percentage
Nil visit	9	6.7
1-3 Visits	10	7.4
>3 Visits	116	85.9

Table 5

Quality of maternal health services in the community PHC as perceived by the women. n = 150

Quality of maternal service	Frequency	Percentage
Good	118	78.7
Fair	31	20.7
Poor	1	0.7

Table 6
Utilization of the PHC for treatment

	Frequency	Percentage (%)
Very often	1	0.7
Often	74	49.3
Rarely	62	41.3
Never13	8.7	

On bivariate analysis, more than 90% of the women in the highest age range of 45-49 years had up to 4 antenatal visits while majority of those in the lowest age bracket (15-19 years) never attended any antenatal session. The proportion of women who had no antenatal visit decreased as the age group increased and age was found to be significantly associated with antenatal care (ANC) uptake ($p < 0.05$). In regards to delivery, age was not significantly associated with place of delivery. The other factor that was also found to be significantly associated with ANC but not with place of delivery was marital status ($p = 0.001$). Religion however was significantly associated with place of delivery but not with ANC uptake, with Christians more likely than Muslims to deliver in the hospital ($p = 0.019$). The only socio-demographic factor that was found to be significantly associated with both ANC utilization and place of delivery was educational status $p = 0.037$ and $p = 0.000$ respectively). [Tables 7-10].

Table 7
Factors associated with maternal health services utilization among respondents. n = 150
Age Variable

Variables	ANC Visits				
	Nil visit	1-3 visits	>3 visits	P-Value	Fishers Exact
15-19	2[66.7%]	0[0%]	1[33.3%]	0.012	21.98
20-24	10[30.3%]	3[9.1%]	20[60.6%]		
25-29	7[26.9%]	2[7.7%]	17[65.4%]		
30-34	1[4.2%]	2[8.3%]	21[87.5%]		
35-39	2[8%]	0[0%]	23[92%]		
40-44	1[5.9%]	2[11.8%]	14[82.4%]		
45-49	1[4.5%]	1[4.5%]	20[90.9%]		

Place of Last Delivery

AGE GROUP	Home	Hospital/Clinic	Others	P-Value	Fishers Exact
15-19	1[50.0%]	1[50.0%]	0[0%]	0.82	8.50
20-24	4[16.7%]	19[79.2%]	1[4.2%]		
25-29	5[22.7%]	16[72.7%]	1[4.5%]		
30-34	4[16.7%]	20[83.3%]	0[0.0%]		
35-39	6[24.0%]	18[72.0%]	1[4.0%]		
40-44	6[35.3%]	11[64.7%]	0[0.0%]		
45-49	4[18.2%]	18[81.8%]	0[0.0%]		

Table 8
Factors associated with maternal health services utilization among respondents. n = 150
Marital Status

ANC Visits					
MARITAL STATUS	Nil visit	1 ¯3 visits	>3 visits	p-Value	Fishers Exact
Single mothers	14[82.4%]	1[5.9%]	2[11.8%]	0.000	45.46
Married	10[8.0%]	9[7.2%]	106[84.8%]		
Widowed	0[0.0%]	0[0.0%]	3[100.0%]		
Divorced/Separated	0[0.0%]	0[0.0%]	5[100.0%]		

Place of Last Delivery

	Home	Hospital/Clinic	Others	P-Value	Fishers Exact
Single mothers	2[40.0%]	2[40.0%]	1[20%]	0.057	11.70
Married	25[20.3%]	96[78.0%]	2[1.6%]		
Widowed	2[66.7%]	1[33.3%]	0[0.0%]		
Divorced/Separated	1[20.0%]	4[80.0%]	0[0.0%]		

Tables 9
Factors associated with maternal health services utilization among respondents. n = 150
Educational Status

ANC Visits EDUCATIONAL STATUS	Nil visit	1-3 visits	>3 visits	P-Value	Fishers Exact
None	3[20%]	0[0%]	12[80%]	0.037	12.16
Primary	2[4.8%]	5[11.9%]	35[83.3%]		
Secondary	9[14.3%]	4[6.3%]	50[79.4%]		
Tertiary	10[33.3%]	1[3.3%]	19[63.3%]		

Place of Last Delivery

	Home	Hospital/Clinic	Others	P-Value	Fishers Exact
None7[46.7%]	8[53.3%]	0[0.0%]		0.000	20.37
Primary	15[35.7%]	27[64.3%]	0[0.0%]		
Secondary	8[14.0%]	47[82.5%]	2[3.5%]		
Tertiary	0[0.0%]	21[95.5%]	1[4.5%]		

Table 10
Factors associated with maternal health services utilization among respondents. n = 150
Religion

ANC Visits RELIGION	Nil visit	1-3 visits	>3 visits	P-Value	Fishers Exact
Christianity	14[20.3%]	5[7.2%]	50[72.5%]	0.382	1.97
Islam10[12.3%]	5[6.2%]	66[81.5%]			

Place of Last Delivery

	Home	Hospital/Clinic	Others	P-Value	Fishers Exact
Christianity	7[11.7%]	51[85.0%]	2[3.3%]	0.019	7.26
Islam23[30.3%]	52[68.4%]	1[1.3%]			

DISCUSSION

The study reflects a high utilization of both delivery services and ANC (maternal health services) in this urban population. The high utilization of maternal health services among urban dwellers was corroborated by other studies that revealed similar findings. [8,15,16] However, among the single mothers and women within the youngest age group, there was a sharp drop in the utilization of the maternal services. This could be due to the stigma associated with single parenting in this part of the world (on the part of the single mothers) and lack of awareness of the immense benefit of regular utilization of maternal services (on the part of the young mothers). This finding is worrisome so, despite the increased and known risk of poor maternal outcome in these categories of mothers.[17] However, another study conducted in the same Plateau State of Nigeria showed that age is not associated with maternal services utilization.[18] A recent systematic review that pooled various predictors of maternal health services utilization identified maternal age as a strong factor that influence service utilization.[16] This calls for public health approaches that will address the issue of stigmatization both at the community and the facility level. Additionally, the use of older women as mentor mothers for younger women will be critical in persuading them to utilize such services. One important tool that the older women can use is

anecdotal stories of a positive maternal service experience.[19] This technique can also be used to increase the utilization of facility-based services.

The place of education in understanding the importance of maternal services uptake reflected in this study. Educational status of the women was associated with increased uptake of maternal health services as also substantiated in other studies.[20,21] There is therefore increased call for the girl child education as a distant yet proven approach in improving maternal health outcomes through maternal services utilization.

This study was limited by the fact that it was a cross sectional study so could not show temporal relationship between the socio-demographics of the women and maternal health services utilization. Also, there is provision for expanding the scope of the explanatory variables in subsequent studies in order to identify other possible associations and hence, inform policies and public health actions.

CONCLUSION

This study has shown high utilization of maternal health services among the study population. Albeit, the roughly one-quarter of the study participants who do not utilize maternal health services may contribute to poor maternal health indices. The identified associated factors such as age of the women, marital status, religion and educational status should be further explored in order to deliver tailored intervention to additionally increase service uptake among the study population. We recommend further exploration to identify any possible prediction by the identified factor and hence, guide prioritization and degree of possible intervention.

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HUMAN HEALTH RISK ASSESSMENT OF HEAVY METALS IN DUST SAMPLES OF QUARRY CLUSTERS IN UMUOGHARA QUARRY INDUSTRY, EBONYI STATE, NIGERIA

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ABSTRACT

Background:
Heavy metals exert toxic effects on body systems with the degree of toxicity directly dependent on the daily intake. The safety of workers from heavy metal exposure has not been adequately evaluated despite the presence of many quarry industries.

Objective:
This study seeks to determine the inhalational risks of heavy metals in the dusts of Umuoghara quarry industry in Ebonyi State.

Methodology:
Three quarry dust samples each from four clusters of the study location were subjected to atomic absorption spectrometer to determine the concentrations of Cadmium (Cd), Zinc (Zn), Lead (Pb), Copper (Cu), and Nickel (Ni). The estimated daily intake (EDI), hazard quotient (HQ), hazard index (HI) and incremental lifetime cancer risks (ILCR) of the heavy metals were calculated.

Results:
The results showed high concentrations of the heavy metals in the dust samples. The EDI of the heavy metals was found in the order of Ni> Pb> Cd for carcinogenic and Zn>Ni>Cu>Cd>Pb for non-carcinogenic. The HQ and HI of the heavy metals were normal (<1). The ILCR was also normal ($\leq 10^{-5}$). There was no significant difference (P>0.05) in the concentration of the heavy metals in the dusts of the four clusters.

Conclusion:
The result showed permissible limits of the heavy metals in the quarry dust which may not pose any non-carcinogenic or carcinogenic risk to the quarry workers. However, as toxicity is dependent on dose, duration and type of heavy metal exposure, there is a need for adherent use of personal protective measures and periodic medical check-ups by the workers with close monitoring by relevant authorities.

Key words:
Health risk assessment, Health effects of heavy metals, quarry dusts, Umuoghara quarry industry.

INTRODUCTION

A quarry is an open pit mine from which rock minerals are extracted through various processes that comprise of removal of the topsoil, drilling, blasting with explosives and use of machinery to crush and grade rock materials for transportation.[1] These Industrial activities result in release of dust pollutants and particles and influx of metals into the atmosphere, which can be transported by wind and water into the biotic targets.[2] Sources of heavy metals include coal combustion, pesticides, cements, large scale industrial operations such as oil refineries, foundries, chemical industries, including quarrying, among others.[1] These heavy metals attain higher concentrations and accumulate in dangerous quantities and finally pose danger to the ecosystem including human, plants and other animals.[3,4]The quarry dust particles very often contain heavy metals whose toxic effects can be divided into carcinogenic and non-carcinogenic.[5]

The factors associated with the health risks include the particle size, concentration, composition, and extent of exposure and these are usually considered in evaluating the health risks. Health risk assessment involves evaluating the risk of exposure to certain chemical agent(s) to a population, taking into consideration the characteristics of the agent and the target system(s) it affects. The model for health risk assessment begins with formulation of a problem, followed by identification of hazard, characterization of hazard, assessment of exposure and then risk characterization.[6]The following assessment methods would be utilised in this study- estimated hazard quotient (HQ), hazard index (HI) and incremental lifetime cancer risk (ILCR).

Quarrying raises various environmental concerns such as land pollution, emission of dust, noise and ground vibrations which pose danger to the workers and occupants of quarry sites. Quarry dust particles contain many harmful substances in their chemical structure which can be associated with many negative effects on human health. The toxic effects which may be neurotoxic, carcinogenic, mutagenic, or teratogenic can be implicated in a wide range of health disorders in acute, chronic,or sub-chronic forms. The exposure of the dust particles to the human body causes severe health problems such as respiratory, pulmonary, ocular and dermal.[7,8]

In Nigeria, quarrying and extraction of limestone by opencast methods for construction activities have intensified in the last few decades. Yet, there is dearth in information on the impact of limestone and other mineral explorations on the surrounding environment in terms of heavy metals pollution in Nigeria. There is need to investigate the baseline concentrations of toxic heavy metals within the vicinity of quarry sites. This will form a database on pollution status of the toxic heavy metals within the surrounding environment of quarries and serve as reference point for future studies and health risk assessment. Such assessment is of utmost importance especially in areas rich in solid materials like Ebonyi state which lies within the lead-zinc field of the Eastern cretaceous (chalky) belt of Nigeria.

Heavy metals exist naturally but are introduced in the environment through anthropogenic activities. **They** accumulate in the environment and can easily penetrate the body system through various pathways and especially the respiratory route. Heavy metals are bio-accumulative, and at toxic levels are hazardous to health, hence, the necessity for close monitoring of heavy metal concentration in quarry dusts to limit the risks. The expected findings will serve as tool for adopting strategies needed for prevention and to save the population from metal toxicity. This study aimed to identify the levels of five common heavy metals in the quarry dusts of different site clusters and establish the risks associated with the exposure.

MATERIALS AND METHODS

Study site: The study was conducted in Ebonyi state, a South Eastern state in Nigeria. The state is richly endowed with numerous mineral resources such as Zinc, Lead, limestone, and granite.[9] The study took place at the quarry industry located at Umuoghara, a densely populated Community in Ezza North Local Government Area (LGA) of Ebonyi State. The quarry industry has about 300 crushers unevenly arranged in four clusters with about 250 workers found at the sites daily. These figures are dynamic, but has remained as the average for more than ten years.[10]The stones commonly quarried at the Umuoghara quarry industrial site are mainly the granites (igneous), limestones (sedimentary), baked shales (sedimentary), slaty shales (metamorphic) and the pyroclastics.[1] The major occupations of the inhabitants of Umuoghara are farming, trading, and stone quarrying. Although pockets of mining have been going on within the area, it was only recently that quarrying activities assumed prominence to compliment the State Government's drive for more revenue.[10] Stone quarrying is currently the most notable economic activity going on in the area.

Sampling method: To ensure that the dust samples were true representation of the Umuoghara quarry dust, the four clusters served as the stone crushing sample collection points. The first two clusters- left and right from the quarry road were labelled A and B, while the two clusters behind, left and right were labelled C and D. Clusters A, B, C and D had 77, 76, 73 and 74 crushers, respectively. A simple random sampling by balloting (drawing without replacement) was used to select three crushers per cluster from where the dust samples were obtained.

Sample collection, preparation, and analysis: Three quarry dust samples were collected from each of the four clusters using clean sampling sheets of paper. Test locations were mildly excavated around the selected crushing plants. Clean sampling papers were placed on those locations to ensure quality dust deposit during crushing operation and samples were obtained from the deposits in the test locations. The samples were placed in clean polythene bags and transferred to the laboratory.

Samples were dried using oven dry method at 75°C for 2 days and then ground to fine powder. From the powdered sample, 0.5g was digested in a mixture of 5 ml of HCl and 0.5 ml of Conc.HNO_3 in a conical flask under a fume hood. The content was continuously heated gently at 70 – 90°C for 2 hours on a hot plate until dense white fume appeared. It was then heated strongly for 30 minutes and thereafter cooled, filtered, and diluted with 25 ml of distilled water. Using the American Society for Testing and Materials (ASTM) method, the final solution was however analyzed with the Varian AA240 atomic absorption spectrometer (AAS).[11]
Atomic absorption spectrometer's working principle is based on the sample being aspirated into the flame and atomized when the AAS's light beam is directed through the flame into the monochromator and onto the detector that measures the amount of light absorbed by the atomized element in the flame.[12] The amount of energy of the characteristic wavelength absorbed in the flame is proportional to the concentration of the element in the sample which reflects the standards of known concentration.[12]

Ethical consideration: Ethical approval was obtained from the ethics committee of the Ministry of Health, Ebonyi State, Nigeria, and permission was gotten from the quarry site owners.
Measurements and definition of variables: Variables measured/determined were the intake rate (estimated daily intake (EDI); hazard quotient (HQ); non-carcinogenic index - hazard index (HI); carcinogenic index in the form of incremental lifetime cancer risk (ILCR).

(i) **The intake rate** (Estimated Daily Intake, EDI)

Inhalational Exposure Concentration (EDI Inh) = $\frac{C \times InhR \times EF \times ED\ (mg/m^3)}{PEF \times BW \times AT}$

(Where: C = Concentration of chemical (mg/m^3); EF = Exposure frequency (days/year, average reference value = 150 for children and adult, soil); ED = Exposure duration (30 years average reference value for adult, soil); InhR= Respiratory Frequency (average reference value = 20 m^3/d, for adults); PEF = Atmospheric dust reduction factor (m^3/Kg) (average reference value=1.36×10^9 m^3/kg, for adults); Body Weight (BW) =70kg(average reference value for adults, soil); Average time (*AT*) a) For carcinogens = 365 × 70 days(average reference value for adults/children, soil), b) For non-carcinogens =365 × ED (average reference value for adults/children, soil).[6,13]

ii) **Hazard quotient (HQ):** This is the ratio of the estimated exposure to a substance (EDI) and the level at which no adverse effects are expected which is the reference concentration. A hazard quotient less than or equal to 1 indicates that adverse effects are not likely to occur, and thus can be considered to have negligible hazard. HQs greater than1 may be said to be unsafe.[14]

HQ = $\frac{\text{Exposure Concentration (EDI)}}{\text{Reference concentration (RFD)}}$

HQ < 1 safe; HQ > 1 unsafe.

iii) the **Hazard index (HI):** This is a measure of potential risk of adverse health effects from a mixture of chemical constituents in various quarry dust samples. It is the summation of HQs for multiple substances and/or multiple exposure pathways. Non-carcinogenic impacts may be said to occur when HI?>?1.[15]

HI = HQPb+HQCd+HQZn+HQCu+HQNi.

HI < 1 safe; HI > 1 unsafe.

iv) **Incremental lifetime cancer risk (ILCR)*:*** This is used to identify probable cancer risks due to exposure to a specified dose of heavy metal. **Cancer risks** will be considered highly negligible when **the** estimated **ILCR** is $\leq 10^{-5}$; however, if **the ILCR** is greater than 10^{-5}, **the risk** assessment should either be repeated in a refined manner or **risk** management measures taken.[13]

ILCR=EDI×CSF
where, CSF is the cancer slope factor and is defined as the risk generated by a lifetime average amount of one mg/kg/day of carcinogenic substance.

Statistical analysis:
Data collected were analyzed using Kruscal-Walis test to compare the means at 5% level of significance

RESULTS

Metal concentration in quarry dusts

Table 1 shows mean concentration of heavy metals in the quarry dust. The result shows that across the four clusters, Zinc has the highest mean concentration (3.224mg/L),while Lead has the lowest mean concentration (0.045?mg/L).There was no significant difference in the mean concentration of the heavy metals of the four clusters of the quarry site.

Table 1: Mean concentration heavy metals in quarry dust

	Cluster A Mean±SD	Cluster B Mean±SD	Cluster C Mean±SD	Cluster D Mean±SD	k-w	p-value
Lead	0.045±0.022	0.056±0.023	0.057±0.020	0.056±0.020	1.05	0.789
Nickel	1.436±0.709	0.769±0.165	0.956±0.130	1.902±1.270	3.51	0.319
Copper	0.715±0.410	0.427±0.53	0.317±0.14	0.592±0.429	3.21	0.361
Zinc	2.447±1.461	1.625±0.297	1.081±0.090	3.224±3.327	4.13	0.248
Cadmium	0.261±0.150	0.080±0.059	0.011±0.006	0.014±0.012	5.59	0.133

Estimated daily intake (EDI)

Table 2 shows the mean values of the inhalational carcinogenic and non-carcinogenic estimated daily intake (EDI) of heavy metals concentration. The average daily exposure of metals via inhalation of quarry dust ranges from 4.7484747E-13 (for Cd) to 1.0888396E-10 mg/kg/day (for Zn). The daily average exposures were estimated for both non-carcinogenic and carcinogenic effects.

The mean values of inhalational carcinogenic EDI of heavy metal concentrations in the dust samples were found in the order of Ni> Pb> Cd. The mean values of the inhalational non-carcinogenic EDI of heavy metal concentrations in the dust samples were found in the order of Zn>Ni>Cu>Cd>Pb.

Table 2: Inhalational carcinogenic and non-carcinogenic estimated daily intake (EDI) of heavy metals from quarry dust

Variables	EDI of Inhalational route (mg/kg/day)			
	Cluster A	Cluster B	Cluster C	Cluster D
Carcinogenic				
Lead	1.9425578E-12	2.4174053E-12	2.4605732E-12	2.4174053E-12
Nickel	6.1989179E-11	3.3196155E-11	4.1268562E-11	8.2105444E-11
Copper	-	-	-	-
Zinc	-	-	-	-
Cadmium	1.1266835E-11	3.4534361E-12	4.7484747E-13	6.0435132E-13
Non-carcinogenic				
Lead	4.5326349E-12	5.6406124E-12	5.7413376E-12	5.6406124E-12
Nickel	1.4464141E-10	7.7457695E-11	9.6293311E-11	1.9157937E-10
Copper	7.2018533E-11	4.3009669E-11	3.1929895E-11	5.9629331E-11
Zinc	2.4647461E-10	1.6367848E-10	1.0888396E-10	3.2473811E-10
Cadmium	2.6289282E-11	8.0580177E-12	1.1079774E-12	1.4101531E-12

(HQ)) of heavy metals concentrations.

The heavy metal inhalational carcinogenic HQ in each of the cluster of the quarry sites is below 1, showing absence of carcinogenic risk from the heavy metal contaminants in the quarry dusts.

The heavy metal inhalational non-carcinogenic HQs in each of the cluster of the quarry sites is below 1, showing absence of non-carcinogenic risk from the heavy metal contaminants in the quarry dusts.

Table 3: Inhalational carcinogenic and non-carcinogenic estimated hazard quotient (HQ) of heavy metals from quarry dust

Variables	HQ of Inhalational route			
	Cluster A	Cluster B	Cluster C	Cluster D
Carcinogenic				
Lead	5.5501651E-10	6.9068722E-10	7.0302091E-10	6.9068722E-10
Nickel	2.47956716E-9	1.34478462E-9	1.65074248E-9	3.28421776E-9
Copper	-	-	-	-
Zinc	-	-	-	-
Cadmium	1.97663771E-7	6.05865982E-8	8.33065736E-9	1.06026547E-8
Non-carcinogenic				
Lead	1.2950385E-9	1.6116035E-9	1.6403822E-9	1.6116035E-9
Nickel	5.7856564E-9	3.0983078E-9	3.8517324E-9	7.6631748E-8
Copper	1.6004118E-9	9.5577042E-10	7.0955322E-10	1.3250962E-9
Zinc	7.0421317E-10	4.6765280E-10	3.1109702E-10	9.2782317E-10
Cadmium	4.6121547E-7	1.4136873E-7	1.9438200E-8	2.4739528E-8

HQ- Hazard Quotient

Estimated hazard index (for non-carcinogenic analysis) and Incremental Lifetime Cancer Risk of heavy Table 4 shows the inhalational non-carcinogenic hazard Index (HI) and incremental lifetime cancer risk (ILCR) of heavy metals from quarry dust. The inhalational HQ computed for each metal was summed and expressed as a Hazard Index (HI). The result however shows non-carcinogenic risk to health as each of the values of the HI is below 1.

The estimated inhalational ILCR for **carcinogenic analysis for all the cancer prone heavy metals (Lead, Nickel and Cadmium) in all the clusters were less than** 10^{-5} which is an indication that there was no cancer risk from the heavy metal contaminants in the quarry dusts.

Table 4: Inhalational Non-carcinogenic Hazard Index and Incremental Lifetime Cancer Risk of heavy metals from quarry dust

Variables	Cluster A	Cluster B	Cluster C	Cluster D
			Inhalational HI	
Non-Carcinogenic	4.70600789E-7	1.47502064E-7	2.59509648E-8	1.05235798E-7
Carcinogenic			**Inhalational ILCR**	
Lead	2.9138367E-11	3.6261079E-11	3.6908598E-11	3.6261079E-11
Nickel	5.6410152E-11	3.0208501E-11	3.7554391E-11	7.4715954E-11
Copper	-	-	-	-
Zinc	-	-	-	-
Cadmium	4.2813973E-12	1.3123057E-12	1.8044203E-13	2.2965350E-13

HI - Hazard Index, ILCR- incremental lifetime cancer risk

DISCUSSION

Quarrying exposes workers to increased quantities of suspended dust particles. The quarry site in Umuoghara, Ebonyi state hosts about 250 quarry workers daily creating a beehive of activity in the four clusters of the quarry site.[10] In this study, the risks of heavy metal contamination in the quarry dusts of Umuoghara quarry sites were assessed to determine the non-carcinogenic and carcinogenic health risks caused by inhalation. This is crucial as health risk assessment is one of the most widely used screening tools in the field of health promotion and is often the first step in multi-component health promotion program.[16,17]The result revealed that quarry dust contains heavy metals - Lead, Zinc, Cadmium, Nickel, similar to findings of an earlier study.[14]

A wide variation in mean values of heavy metals were seen in the four clusters of the quarry site where the maximum metal concentration was for Zn with a mean of 3.224mg/L and the minimum metal concentration was for Pb with a mean concentration of 0.045mg/L.The order of the heavy metals according to mean concentrations measured in the quarry dusts was Zn>Ni>Cu>Cd>Pb. Although there was higher concentration of Zinc in the dust samples followed by Nickel, Copper, Cadmium, and Lead, the comparative analysis of the mean values in the four clusters of the quarry site showed no significant difference ($P>0.05$) in the heavy metal concentrations.

The estimated hazard quotients (HQ) and hazard index (HI) were below 1 for all the metals in the samples. The result indicated that the highest values of carcinogenic and non-carcinogenic HQ values were 1.97663771E-7 and 4.6121547E-7, both for cadmium. The least carcinogenic and non-carcinogenic HQ values were 5.5501651E-10 and 3.1109702E-10 for lead and Zinc, respectively. The estimated Incremental Lifetime Cancer Risk (ILCR) for **carcinogenic analysis for all the cancer prone heavy metals in all the clusters was less than** 10^{-5}. The human health risk assessment in the dust samples of the four clusters of the quarry site shows obvious absence of carcinogenic and non-carcinogenic health risk through the inhalational route as each of the values of the HQ and HI were below 1.These findings are consistent with earlier studies.[14,15]

A hazard quotient less than or equal to 1indicates that adverse effects are not likely to occur, and thus can be considered to have negligible hazard. HQs greater than **1 may be said to be unsafe** but this is a mere hypothetical statement which depends on whether the exposure concentration (EDI) exceeds the reference concentration (RFD).[14] The hazard index is a

measure of the potential risk of adverse health effects from a mixture of chemical constituents in various quarry dust samples and non-carcinogenic impacts may be said to occur when HI?>?1.[15] Incremental lifetime cancer risk is used to identify probable cancer risks due to exposure to a specified dose of heavy metal. Cancer risks will be considered highly negligible when the estimated ILCR is $\leq 10^{-5}$; however, if the ILCR is greater than 10^{-5}, the risk assessment should either be repeated in a refined manner or risk management measures taken.[13]

The risk assessment in this study can be related to a study in Ogbere town, Ijebu-North Local Government Area of Ogun State which shows that the population of the biodiversity (flora and fauna) around the quarry community was greatly decreased by the negative impact of the quarry dust particles; aquatic and terrestrial animals are all at risk.[18,19]In Lagos, a report from a study pointed out that Lead from most classrooms dusts was above the reference limit which revealed significantly high concentration of Lead from classroom dusts.[20] Evaluation of some heavy metals in the dusts of three university motor parks in Western Nigeria (University of Ibadan, University of Ilorin, and Kwara State University) showed the presence of Mn, Zn, Pb, Ni, Cu and Cd in different concentrations.[21] The above expositions are indications that the dusts in our environments may not be free from heavy metal.

Despite the safety level of the heavy metals noted in this study, there is the need to understand that heavy metal dusts can adversely affect human health at toxic level which depends on the degree of the dosage, duration, and dust type.[22] The effects of heavy metal dusts had been established to cause necrosis, interstitial fibrosis, and degenerative changes in the lungs when they bypass the natural respiratory self-defence.[23]The respiratory system has protective barriers and other mechanisms of self-defence; while the bigger particles are captured by nasal mucosa, the remaining particles are discarded by mucociliary mechanisms in the respiratory tract and also by macrophages in the alveolar parenchyma.[23] Dusts of only 1-5 µm diameter can reach the lung parenchyma but dust particles smaller than 1 mm are discarded by expiration.[23]

LIMITATION OF THE STUDY

The study was only carried out in a rural quarry industry in Ebonyi State; this may limit the extent to which the study can be generalised.

CONCLUSION

This study has provided data on heavy metal content in the quarry dusts commonly seen in Umu-Oghara quarry site in Ebonyi state, Nigeria. The level of heavy metals in the studied dusts were used to estimate the risk posed by these heavy metal content in different clusters of the quarry site and has been established through the comparative assessment of the means of exposed concentration as well as the estimated hazard quotient, hazard index and incremental lifetime cancer risk that the quarry dust in Umu-Oghara quarry site currently pose no risk. However, universal precautions should be adhered since the risk is dose dependent.

CONFLICTS OF INTEREST

There are no conflicts of interest

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APPENDIX

REFERENCE DOSES (RFD) FOR HEAVY METAL CONCENTRATIONReference doses (RFD) (mg/kg/day) of heavy metals via ingestion, inhalation and dermal exposure routes used for the non-carcinogenic health risk assessment.

Table showing reference doses (rfd) for heavy metal concentration

Heavy metals	Pb	Cd	Cr	Ni	Cu	Fe	Zn
RFD Ingestion	3.5 E -3	1.0 E -3	1.5 E +0	2.0 E -2	4.0 E -2	7.0 E -1	3.0 E -1
RFD Dermal	5.3 E -4	1.0 E -3	3.0 E -3	2.0 E -2	4.0 E -2	7.0 E -1	3.0 E -1
RFD Inhalation	3.5 E -3	5.7 E -5	3.0 E -5	2.5 E -2	4.5 E -2	8.0 E -1	3.5 E -1

B. INCREMENTAL LIFE TIME CANCER RISK (ILCR) =EDI×CSF

Table showing cancer slope factors for heavy metals (mg/kg per day)-[1]

Lead	15.00
Nickel	0.91
Copper	--
Zinc	--
Cadmium	0.38

CHHRA, 2010

C. MEAN RANK

Table showing K-W mean rankings

	area	N	Mean Rank
Lead	Cluster A	3	5.00
	Cluster B	3	6.67
	Cluster C	3	6.33
	Cluster D	3	8.00
	Total	12	
Nickel	Cluster A	3	7.33
	Cluster B	3	3.67
	Cluster C	3	6.00
	Cluster D	3	9.00
	Total	12	
Copper	Cluster A	3	8.00
	Cluster B	3	8.67
	Cluster C	3	5.00
	Cluster D	3	4.33
	Total	12	
zinc	Cluster A	3	7.33
	Cluster B	3	7.00
	Cluster C	3	3.00
	Cluster D	3	8.67
	Total	12	
cadmium	Cluster A	3	10.33
	Cluster B	3	6.83
	Cluster C	3	5.00
	Cluster D	3	3.83
	Total	12	

CHARACTERISTICS OF ATTENDEES WITH ABNORMAL PAP SMEAR AT COLPOSCOPY IN A HOSPITAL IN JOS AND THE DIAGNOSTIC CORRELATION BETWEEN COLPOSCOPIC FINDINGS AND HISTOLOGIC DIAGNOSIS

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ABSTRACT

Background-
Premalignant lesions of the cervix are of global concern. Cervical cancer is the commonest female genital tract malignancy in Nigeria.

Aim-
This was to analyse the characteristics of women who presented for colposcopy with abnormal Pap smear result and to determine the diagnostic correlation or agreement between colposcopy and histopathology.

Methodology
- The medical records of 111women with abnormal Pap smear who presented for colposcopy at the cervical cancer screening Unit of Jos University Teaching Hospital (JUTH), Jos between January 2014 to December 2016 were retrieved. The socio-demographic and clinical characteristics, cytology, colposcopy and histology diagnosis were extracted from the records and analysed usingEPI INFO 3.5.4 CDC Atlanta, USA.

Results- The medical record of 111 women were retrieved. The average age of the women in this study was 46.5years with a modal age range of 41-50 years. Majority of the women had formal education with 58% having up to tertiary education. Most (54.0%) of the women were civil servants, 4.6% traders, 33.3% and 8.1% were unemployed and retired respectively. The risk factors for abnormal cytology studied during the study period include early coitarche (54.1%), multiple sexual partners (25.2%), use of oral contraceptive pills (29.9%). High Grade Squamous Intraepithelial Lesion (HSIL) accounted for 71.2% of abnormal cytology results. Women with Low Grade Squamous Intraepithelial Lesion on two consecutive occasions (LSILX2) accounted for 20.7%, ASCUS(Atypical Squamous Cell of Undetermine significance), ASC-H(Atypical Squamous Cell – High grade lesion) constituted the remaining 8.1%. High Grade Cervical Intraepithelial Lesion (HGCIN) was the colposcopy diagnosis in 36.0% of women, normal was in 27% and

LGCIN was in 15.3% of the women reviewed. In this study 27.4% of the women had histopathologic diagnosis of cervicitis, 21.2% had CINIII, 20.2% had CIN II and 4.0% had invasive cancer. The overall correlation between colposcopy and histology diagnosis was 50.5%. Colposcopy diagnosis was underestimated in 33.3% of cases and overestimated in 16.2% of cases after histology.

Conclusion-
The average age of the women with abnormal Pap smear who presented for colposcopy was 46.5 years and were mostly women with formal education and employed. Early coitarche and multiple sexual partners were the risk factors for premalignant lesion of the cervix present in these women. The most common indication for colposcopy was HSIL and the most common colposcopy impression was HGCIN. Most of the cervical biopsies sent for histology turned out to be cervicitis. The rate of underestimation was higher especially for HGCIN. Only half of the colposcopic diagnosis correlated with histology. We suggest that biopsies should be performed when colposcopy is abnormal. Continuous retraining of colposcopist and regular auditing of colposcopy services will improve its performance in cervical screening.

KEY WORDS-
Correlation, Abnormal Pap Smear, Colposcopy, Histology, Over diagnosis, under diagnosis

BACKGROUND

According to the World Health Organization cervical cancer is a leading cause of death among women.[1] It was stated that in 2020 about 604 000 cases were diagnosed and about 342,000 died from the disease and most of these deaths are in low income countries.[1]It is the commonest female genital tract malignancy in Nigeria.[2,3]Reports from Ibadan Cancer Registry showed that cervical cancer is the most common cancer among women after breast cancer in Nigeria.[4] According to the GLOBOCAN report of 2012 it accounted for 11.5% of all mortalities from cancer.[5]Despite the associated morbidity and mortality associated with cervical cancer, Nigeria sadly has no cervical screening policy or a population based screening programme. Most of the screenings done are opportunistic and sparsely distributed.

Cervical cancer is preceded by a long pre-invasive stage.[7]Efforts at preventing it have centred on identifying and treating pre-invasive lesions of the cervix.[8]Available screening methods include visual inspection which can be aided with acetic acid or Lugol's iodine or unaided.Pap smear(cytology) and Human Papilloma Virus (HPV) DNA testing are other screening modalities.[2,8] The introduction of cytological screening and subsequent colposcopy for identification of premalignant lesions has led to a significant reduction of the incidence.[9]

Colposcopy is a non-invasive procedure that examines the illuminated magnified view of the female lower genital tract. It determines the location, size and extent of cervical lesions. Because cervical cytology is less sensitive and associated with a high false negative rate, the value of colposcopy has been recognized, mainly in the reevaluation of patients with abnormal cervical smears. There is also poor compliance of patients with abnormal Pap smear for follow up.[7] It has been stated that apart from cervical smears, colposcopy should be offered as diagnostic method in all the patients with unhealthy cervix.[8] Colposcopy allows identification, localization and delineation of premalignant lesions of the cervix and directs biopsy.[11]

A varied correlation between colposcopy and histology has been reported.[12]A good agreement/correlation between colposcopy and histology has been demonstrated and this translates to improved detection of premalignant and malignant cervical lesions during colposcopy.[13]Overestimated colposcopy diagnosis has been stated to lead to unnecessary cervical biopsy.[12] Expertise of the operator, interpretation and sampling errors have been recognized as common causes of disagreement between colposcopy and histology.[12,14]
Pap smear has remained an important tool in the screening of cervical cancer.[8]

The aims of this study were to determine the clinical characteristics of women with abnormal

Pap smear who presented for colposcopy, colposcopy and histology diagnosis, and to determine the correlation oragreement between histology and colposcopy diagnosis.

METHODOLOGY

This was a retrospective study of women with abnormal Pap smear who presented for colposcopy at the Cervical Cancer Screening Unit (CCU), Department of Obstetrics and Gynaecology of Jos University Teaching Hospital, Jos, Plateau State, North Central Nigeria. This was over a three-year period (January 2014- December 2016).

A proforma was used to extract information from the colposcopy register in the centre, case records of the women and histopathology register. The information extracted included the clinical characteristics of the patients, cytology diagnosis, colposcopy diagnosis and histologic diagnosis of cervical biopsies.

The colposcopies were performed by any of the Gynaecologists trained in colposcopy. The colposcopies were all performed adhering to the routine pattern using 5% acetic acid and iodine. The colposcopic diagnosis of cervical neoplasia depended on the recognition of four main features: intensity of acetowhitening, margin and surface contour of the acetowhite areas, vascular features (punctuations and mosaics), and colour changes after iodine application.[15]The colposcopic impression was considered Low Grade CIN (LGCIN) were the acetowhite epithelium is snow white, flat surface with irregular feathered demarcation; vessels are fine, irregularly shaped and of uniform calibre. High grade CIN (HGCIN) lesions are those with dull and oyster white acetowhite epithelium with irregular contour and sharp straightline demarcation; the vessels are coarse, dilated with increased inter capillary distance, they may be comma, corkscrew or spaghetti shaped. Biopsies were obtained from the worst of all abnormal areas under colposcopic guidance. Biopsy specimens were immediately fixed in formalin and sent to the histopathology department for processing and reporting. The colposcopy was adjudged satisfactory when the whole (Transformation Zone) TZ was visualized. Where the examination is unsatisfactory, it was repeated at a later date or endocervical curettage is performed and the sample is sent for histology. Where colposcopy was normal or unsatisfactory biopsies were not taken for histology. Interventions were offered based on results of evaluation. Histology was considered the gold standard in this study.

Data were analysed retrospectively using EPI INFO 3.5.4 CDC Atlanta, USA. Quantitative variables were analysed by mean and standard deviation and qualitative variables by percentage and frequency. Histology and colposcopy impressions that were inflammatory and polyps were grouped as benign. LGCIN corresponded with (Cervical Intraepithelial Neoplasia) CINI and HGCIN corresponded with CINII/CINIII/Carcino mainsitu (Ca insitu). Correlation was defined as the proportion of colposcopic diagnosis that was in exact agreement or concordance with histologic diagnosis. Over diagnosisis when histologic diagnosis is higher and worse than colposcopic diagnosis while under diagnosis is when histology diagnosis is milder or less severe than that by colposcopy.

RESULTS

During the period reviewed, a total of 155 women had colposcopy due to abnormal Pap smear result. A total of 111 case folders were retrieved and analysed. This gave a retrieval rate of 71.6%.The average age of the women studied was 46.5±9.6 with a modal (45.9%) age range of 41-50 years. Most of the women in this study had a parity of <5(60%) and had tertiary level of education. See Table 1.

Table 2 shows the other risk factors for abnormal Pap smear present in the study population. Early coitarche featured prominently (54.1%) as a risk factor for abnormal Pap smear. Others include use of oral contraceptive pill (29.9%) and multiple sexual partners (25.2%).

From Figure 1, 71.2% of women with abnormal Pap smears who presented for colposcopy within the study period had HSIL. This was closely followed by women who had LSIL on two consecutive occasions which accounted for 20.7%.

Of the 111 women with abnormal Pap smear who had colposcopy, HGCIN was the most common diagnosis (48.6%). Low grade CIN accounted for 19.8% of colposcopic diagnosis. Other colposcopic diagnosis is shown in Table 3 below.

Table 4 shows the histologic diagnosis of the cervical biopsies. The histology report of 27.4%

of the women who had colposcopic guided biopsies revealed cervicitis. This was followed by CIN III which accounted for 21.2% of the histology diagnosis. Cervical biopsies were normal in 10.1% of all the samples sent for histology.

Table5 shows the correlation between colposcopic and histologic diagnosis. Of the 20 patients with benign lesions at colposcopy whose samples were sent for histology, 13 cases correlated with colposcopy while 2 cases were over-diagnosed as CIN II/CIN III/Ca insitu. There was diagnostic correlation on histology in 30 out of the 54 cases of HGCIN diagnosed on colposcopy. Three, 6 and 14 cases of HGCIN were wrongly diagnosed and underestimated as normal, CIN1 and benign on histology respectively. All the cases of invasive cancer diagnosed on colposcopy were confirmed as malignancies on histology. The overall correlation between colposcopy and histology was 50.5%. Of the 99 histology reports 33.3% and 16.2% of cases were underestimated and overestimated, respectively.

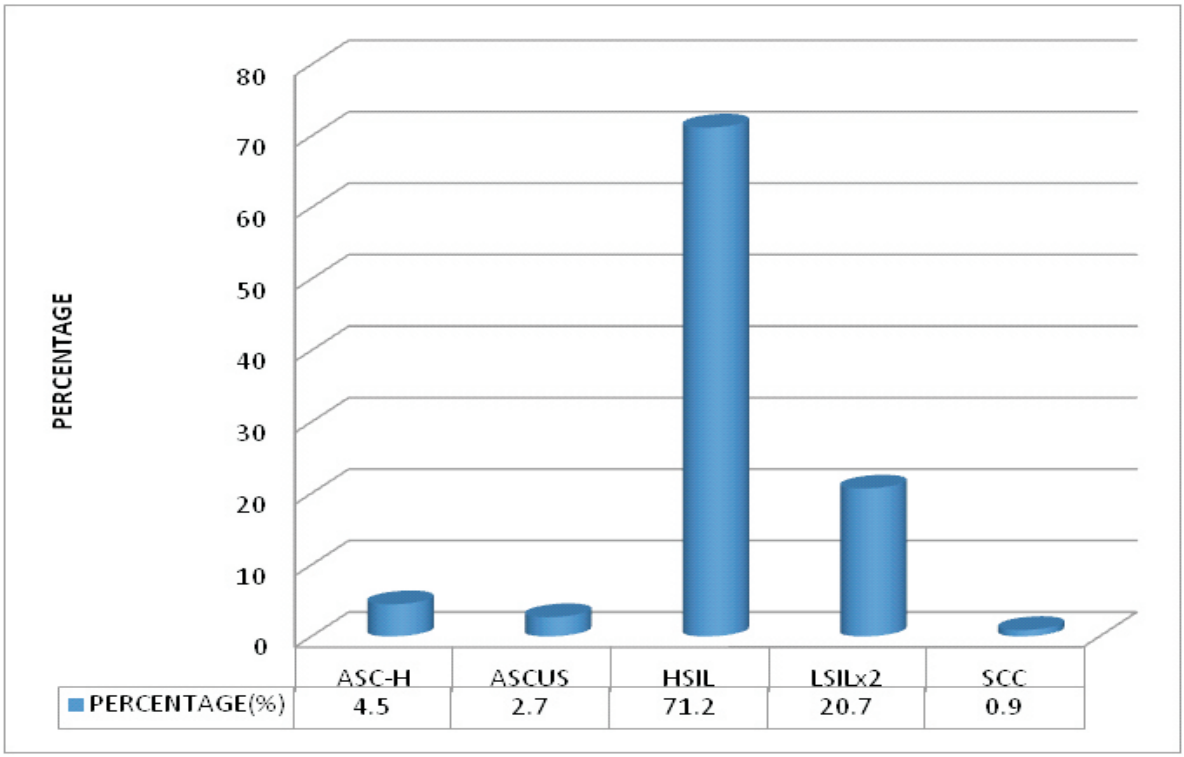
Table 1: Demographics of study population

VARIABLE	FREQUENCY	PERCENTAGE (%)
AgeGroup(Years)		
20-30	3	3.6
31-40	26	23.4
41-50	51	45.9
51-60	21	18.1
61-70	10	9.0
Mean age:46.5±9.6		
Parity		
<5	67	60
≥ 5	44	40
EducationalStatus		
Non	22	19.8
Primary	11	9.9
Secondary	20	18.0
Tertiary	58	52.3
MaritalStatus		
Married	103	92.8
Single	8	7.2
Occupation		
Trading	5	4.6
Civil Servant	60	54.0
Unemployed	37	33.3
Retired	9	8.1

Table 2: Other risk factors for abnormal Pap smear

VARIABLE	FREQUENCY	PERCENTAGE (%)
Alcohol		
Yes	22	19.9
No	89	80.2
Tobacco use		
Yes	1	0.9
No	110	99.1
HIV Infection		
Yes	10	9.0
No	101	89.2
Sexual Partners		
1	83	74.8
>1	28	25.2
Coitarche		
≤19 year	60	54.1
≥20 year	51	45.9
Oral contraceptives		
Yes	31	29.9
No	80	72.1

Figure 1- Abnormal Pap smear result at presentation



ASCUS= Atypical Squamous Cell of Undetermine significance; ASC-H= Atypical Squamous Cell – High grade lesion can't be excluded; LSILX2= Low Grade Squamous Intraepithelial Lesion on 2 occasions; HSIL= High Grade Squamous Intraepithelial Lesion; SCC= Squamous Cell Carcinoma

Table 3- Colposcopy diagnosis

COLPOSCOPY DIAGNOSIS	FREQUENCY	PERCENTAGE[%]
Normal	11	9.9
Low grade CIN	22	19.8
High grade CIN	54	48.6
Invasive Cancer	3	2.7
Inflammation	10	9.0
Cervical Polyp	6	5.4
Leucoplakia	4	3.6
Unsatisfactory	1	0.9
TOTAL	111	100

CIN=Cervical Intraepithelial Neoplasia

Table 4- Histology Diagnosis

HISTOLOGICDIAGNOSIS	FREQUENCY	PERCENTAGE[%]
Normal	10	10.1
Cervicitis	27	27.4
CIN I	10	10.1
CIN II	20	20.2
CIN III	21	21.2
Carcinoma insitu	4	4.0
Squamous Metaplasia	1	1.0
Invasive Ca	4	4.0
Cervical Polyp	2	2.0
TOTAL	99	100

CIN=Cervical Intraepithelial Neoplasia; Ca= Cancer

Table 5- Agreement between colposcopy and Histologic diagnosis

Colposcopy Diagnosis	Histological Diagnosis					Total
	Normal	Benign	CINI	CINII/CIN III/Ca insitu	Invasive	
Benign	5(5.0)	13(13.1)	-	2(2)	-	20
LGCIN	3(3.0)	2(2.0)	4(4.0)	13(13.1)	-	22
HGCIN	3(3.0)	14(14.1)	6(6.1)	30(30.3)	1(1.0)	54
Invasive	-	-	-	-	3(3.0)	3
Total	11	29	10	45	4	99

CIN=Cervical Intraepithelial Neoplasia; Ca insitu=Carcinoma insitu;LGCIN=Low Grade Cervical Intraepithelial Neoplasia; HGCIN= High Grade Cervical Intraepithelial Neoplasia

DISCUSSION

The average age of the women who presented for colposcopy during the study period was 46.5 years, the modal age range was 41-50 years. This finding is similar to findings reported from related studies.[16,17,18,19] The age of 46 has been reported as the age for the second peak of prevalence in some countries.[20,21] In southern Nigeria, the prevalence of oncogenic HPV peaks at15-29 years and 60-69 years.[22,23] However, the average age of women who presented for colposcopy in Kano, Nigeria was 36 years which corresponded with the age of first peak of incidence of cervical cancer in Nigeria.[10] Only 19.8% of the women in this study did not have formal education. Majority of the women had up to tertiary education. In a study to determine the acceptance of colposcopy, majority (41.7%) of the women who accepted colposcopy had tertiary education compared to those who rejected it.[17] High level of education and social class has been shown to positively influence utilization of cervical cancer screening services.[24] A meta-analysis revealed that the odds of having cervical screening is 96% higher in women with the highest level of education that in those with a lower level of education.[25] It is apparent from this that to eliminate the inequalities in cervical screening policy makers should put policies in place to promote education of women to the highest level.[25] Also only 25.2% of the women in this study did not have a source of livelihood. Chigbu et al in their study reported that more employed women accepted colposcopy than the unemployed though not statistically significant.[17] Empowered women have stronger self-efficiency and believe that cervical screening makes them more in control of their bodies.[26] Low socio-economic status may increase sexual promiscuity and puts a strain on moral values.[27]

Other prominent risk factors for cervical dysplasia in this study include early coitarche (54.1%), oral contraceptive pill utilization (29.9%), and multiple sexual partners (25.2%). In a study in Makurdi Nigeria, 62.5% of women with abnormal Pap smear attained coitarche at or earlier than 19 years of age.[28] Human Papilloma Virus infection, the primary aetiologic agent of cervical cancer increases with early coitarche.[8,28] The transformation zone of the cervix is particularly susceptible to HPV infection.[29] Also there is no secondary immune response to HPV during this early sexual debut.[29] On the other hand majority of the women with abnormal pap smear in this study did not use OCPs. The association of the use of OCP with cervical cancer has been the subject of many epidemiological studies.[28] Fariba et al in their study did not find any association between the use of OCPs and cervical cancer.[30]

During the period reviewed, HSIL accounted for 71.2% of abnormal cytology result at presentation for colposcopy. This was followed by women who had 2 consecutive LSIL (20.70%). However in a similar study in Kano, LSIL was the commonest cytology result at presentation for colposcopy.[113] Benus et al in Turkey reported ASCUS as the commonest (6.7%) abnormal smear results at colposcopy.[31] The higher incidence of HSIL than LSIL in this study may be due to the fact a woman will have to have 2 consecutive LSIL result before referral for colposcopy while a single cytology result of HSIL is an indications for colposcopy in our centre.

In this study HGCIN was the most common (38.7%) colposcopy diagnosis, this was followed by normal colposcopy and LGCIN. In a similar study in Kano, Nigeria normal cervix and LGCIN were however the most common colposcopy diagnosis.[13] Cervicitis was the most common histologic diagnosis in this study. This histologic finding is similar to the finding in a prospective randomised study on limits of colposcopy and histology.[32] This was followed by CINIII and CINII which accounted for 21.2% and 20.2% of histologic diagnosis respectively.[32] This is different from a study on the experience with colposcopy at a Tertiary hospital in KanoNigeria where the most common histology diagnosis was CINI. The difference in the colposcopy and histology diagnosis in this study and the studies mentioned above may be attributable to the difference in types of abnormal Pap smear sent for colposcopy. While in the centres where the above studies were done women with a single LSIL are sent for colposcopy, in our centre women are sent for colposcopy if they have 2 consecutive LSIL.

The diagnostic accuracy (agreement) of colposcopy with histology in this study was 50.5%. This was better than that of other studies which reported 32-37%.[33,34] Higher diagnostic correlations of 51.9%, 87.5%, and 92.0% have however been reported.[13,35,36] These studies however included patients that had no epithelial cell abnormalities.

Colposcopy wrongly diagnosed 49.5% of premalignant lesions of the cervix. Out of this number, 16.2% cases were over diagnosed and 33.3% of cases were underdiagnosed. From this study, colposcopy was better at diagnosing HGCIN and invasive cancers as over half of HGCIN diagnosed at colposcopy was confirmed at histology and all invasive cancers diagnosed at colposcopy was confirmed with histology. Only 4 of the 22 cases of LGCIN were correctly diagnosed in this study with 13 cases being over-diagnosed as high grade lesion on histology. It has been stated that colposcopy more often overestimate severity of lesions.[32] Overestimated colposcopy diagnosis leads to unnecessary cervical biopsy, however, the benefits of early treatment overcomes the risk of the biopsy process.[13]Sampling errors and interpretation have been stated as common causes of disagreement. The threshold between normal and CINI is narrow and that has been stated as a source of disagreement.[12] Also experience plays a major role in a colposcopist ability to grade abnormal cervical lesions, therefore a long time experience in a colposcopy unit is invaluable in ensuring high accuracy of colposcopy.[32]

CONCLUSION

Our data suggests that the average age of the women with abnormal Pap smear who presented for colposcopy was 46.5 years and were mostly women with formal education up to tertiary level and employed. Early coitarche and having multiple sexual partners were the prominent risk factors for premalignant lesion of the cervix. The most common indication for colposcopy was HSIL and the most common colposcopy impression was HGCIN. Most of the cervical biopsies sent for histology turned out to be cervicitis. The rate of underestimation was higher especially for HGCIN. The agreement between colposcopy and histology diagnosis in this study was average therefore biopsies should be performed during colposcopy.

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THE EFFECTIVENESS OF DOLUTEGRAVIR AMONG HIV POSITIVE ADOLESCENTS ATTENDING ART CLINIC AT BENUE STATE UNIVERSITY TEACHING HOSPITAL, MAKURDI, BENUE STATE,NIGERIA

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ABSTRACT

Background
Globally, HIV is the second leading cause of death among adolescents. These adolescents (10-19 years) make up 8% of people living with HIV (PLWH) in Nigeria with an HIV prevalence rate of 1.4%. They have poorer adherence, retention and rate of viral suppression than HIV-infected adults. To curb these issues, Dolutegravir (DTG) which is the third HIV integrase inhibitor (INI) has been initiated for them and for most clients.

Objective: In other to measure the effectiveness of DTG, this study compared the treatment outcomes between other antiretroviral therapy (ART) combination and DTG-based regimenamong HIV positive adolescents attending ART Clinic in Benue State University Teaching Hospital (BSUTH) Makurdi, Benue state, Nigeria.

Methods: A comparative descriptive study was employed to review 27 HIV positive adolescents on DTG regimen over a four-year period from the clients date of commencement of antiretroviral drugs (ARVs) to December 2021in BSUTH ART Clinic. All the adolescents (27) who were regular at their clinic appointment within that period were included in the study. Those who were identified from records who had commenced ART prior to the study period and had been changed from previous ART combination to a DTG-based regimen were analyzed. Outcome measures of interest were:

(1) Virological response(virological suppression when target is not detected, viral laod<50 which is low level viremia and viral load >50) (HIV-1 RNA viral load before and after commencement of DTG based ARTregimen)

(2) Intolerability (discontinuation)
(3) Weight difference>1kg (at 0 and 6months of commencement of previous ART regimen without DTG and DTG-based ART regimen)

Results:
The mean age of respondents was approximately 14 years. Through period under review, virologic suppression rate was 82% (on-treatment analysis) for DTG-based regimen and 11% for other ART-based regimen. There were no discontinuations of DTG as it was well tolerated by the clients. By 6 months after commencement of DTG-based regimen, the median change in weight for the study population was 9.1 kg on DTG regimen as compared to 3.5kg while on other ART-based regimen.

Conclusion:
In our cohort of adolescent male and female clients, DTG showed good virologic efficacy and was generally well tolerated.

Recommendation:
More deliberate measures such as enhanced adherence counselling should be put in place to attain the 95-95-95 target among adolescent patients. Whether DTG results in undesirable weight gain or rather statistically significant results, remains a debate. Hence the use of DTG regimen for HIV-positive adolescents is strongly supported.

Keywords:
Adolescents, Antiretroviral, Dolutegravir, Makurdi, Therapy.

Introduction

Worldwide, about 2.1 million adolescents aged 10-19 years are living with HIV of which 160,000 are Nigerians.[1] National data also suggests that 40% of all reported new cases of HIV occur in young persons aged 15 to 24 which is the highest when compared to other age groups.[2] However, the high-risk sexual behavior exhibited by adolescents results in their engagement in unprotected sex with multiple partners, transactional sex, being easily coerced into sex, and peer pressure.[3] Though analysis shows that the adolescent males engage in risky behaviour than the females,[3] early sexual debut, marriage, and childbirth also makes female adolescents vulnerable to HIV infection.[3,4] High levels of stigma, gender inequality, punitive laws against repressed vulnerable groups, and poverty are identified structural factors that contribute and increase these vulnerabilities.[3] Compared to adult populations living with HIV, adolescents living with HIV (ALHIV) have a higher likelihood of suboptimal adherence, viral load progression, lost to follow-up, morbidity and mortality partly due to the aforementioned issues.[5] Additionally, toxicity, treatment failure, and resistance to existing HIV treatment regimens have become a challenge in resource-limited settings.

Whereas supporting evidence synthesis suggested favourable efficacy, tolerability and safety of dolutegravir (DTG) relative to EFV.[6] As a result, DTG which is the third HIV integrase inhibitor (INI) has been initiated for most clients[7] and in Nigeria, DTG fixed dose-based combination therapy was approved as the preferred first line ART in 2018.

However, a new side effect has been observed in recent years, associated with DTG in particular, namely an unexpected excess in weight gain during the course of treatment.[8] The mechanism underlying weight gain and its' effect on the metabolic and cardiovascular outcomes is still unclear at this time.[9] Therefore, this study aimed to assess the virological effect and the side effects such as weight gain of DTG-based antiretroviral therapy among HIV positive adolescents attending ART clinic at Benue state university teaching hospital, Makurdi, Benue State,Nigeria .

Materials and methods

Study Design

This was a descriptive comparative study done

byreviewing client recordwhich was carried out starting from each clients' ART commencement on Efavirenz or Nevirapine based combination mostly from birth to 2018 when they were all changed to DTG and their progress up to December 2021.

Setting

The ART Clinic of Benue State University Teaching Hospital (BSUTH) was used for the study. It is one of the clinics set up through funds obtained from the United States Presidential Emergency Plan for AIDS Relief (PEPFAR now APIN) program in Nigeria. Benue State University Teaching Hospital is a 300-bed State Government-owned Tertiary Healthcare Facility in Benue State, Nigeria. The ART clinic days are Tuesdays, Fridays every week (for adults and pediatric clients) and third Saturday of every month for adolescents with an average of 20 adolescents seen at each clinic. The clinic has a program for disclosure and all the adolescents used in this study have already been disclosed to.

Participants

The study population was male and female adolescents aged 10 to 21 years (age range stipulated by the APIN program) on ARTtill date. The file records of all the adolescents who had been changed from other regimen to DTG-based regimen and were regular (did not miss attendance within the period of the study) at their hospital appointments and had good adherence were included in the study however those with incomplete file records were excluded.

Sample sizedetermination

Sample size was determined by using all the adolescents that attended the clinic because they were few in number (30) therefore, they were all included in the study. However, those with incomplete records were excluded from the study (3 respondents).

Data Sources/Management

The tools used were clients file records and aproforma based on the study objectives. The proforma captured clients' socio-demographic characteristics, weight at their ART commencement and 6months after (for both ART-based regimen and DTG-based regimen).Significant weight gain or loss termed as weight gain >1kg or <1kg respectively, viral load records (virological suppression whentarget is not detected, viral laod<50 which is low level viremia and viral load >50)while on other ART regimen and one year after the change to DTG and any noted complaints of side effects or discontinuation of the DTG-based regimen compared with other ART combination regimen. Data was analyzed using SPSS version 21.0. Categorical data are presented as frequencies and percentages. Statistical significance was set at P-value of 0.05.

Ethical clearance

Thiswas obtained from Benue State University Teaching Hospital (BSUTH) Health Research Ethics Committee (HREC)

Results

Table 1 showing socio-demographic characteristics, drug regimen and WHO staging of the respondents

Variables	Frequency(N)	Percentage (%)
Age(years)		
Mean 14 years		
≤14years	19	70
15-17	5	19
18-21	3	11
Sex		
Male	12	44
Female	15	56
Previous Regimen		
AZT-3TC-NVP	17	63
AZT-3TC-EFV	2	7
TDF-3TC-EFV	3	11
ABC-3TC-LPV/r	5	19
Current Regimen		
TDF-3TC-DTG	19	70
ABC-3TC-DTG	8	30
Side Effects of DTG based ART regimen		93
Weight gain	25	7
Weight loss	2	
Side of other ART regimen without DTG		74 7
Weight gain	20	19
Weight loss	2	
No weight change	5	
WHO Staging		
Stage I	19	70
Stage II	2	7
Stage III	5	19
Stage IV	1	4

Abbreviations: 3TC, Lamivudine; ABC, Abacavir; TDF, Tenofovir disoproxil fumarate; NVP, Nevirapine;EVZ, Efavirenz;LPV/r, Lopinavir/ritonavir;

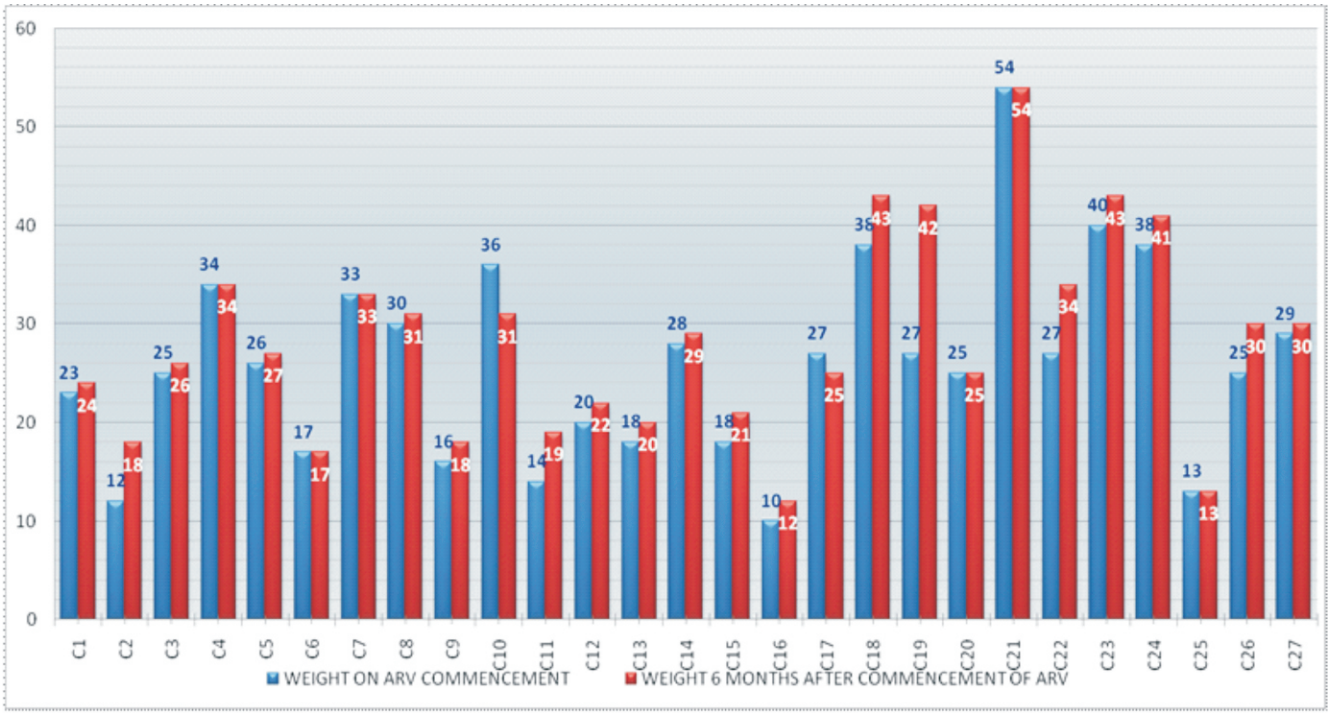
From Table 1 above, 70% of the respondents were 14years and below, 56% were females. All the respondents (100%) were changed from their previous ART regimen to DTG-based regimen, 93% of the respondents gained weight after the change to DTG regimen, no other side effects were observed among the respondents and 70% of the respondents presented at WHO stage I.

Table 2 showing the viral load results of the respondents following ART regimen change

Viral load categories Copies/ml	Viral load before change to DTG regimen N (%)	Viral load after change to DTG regimen N (%)	Fischer's (P-value)
TND	3 (11)	22 (82)	0.0001
<50	14 (52)	2 (7)	
≥50	10 (37)	3 (11)	
Total	**27(100)**	**27(100)**	

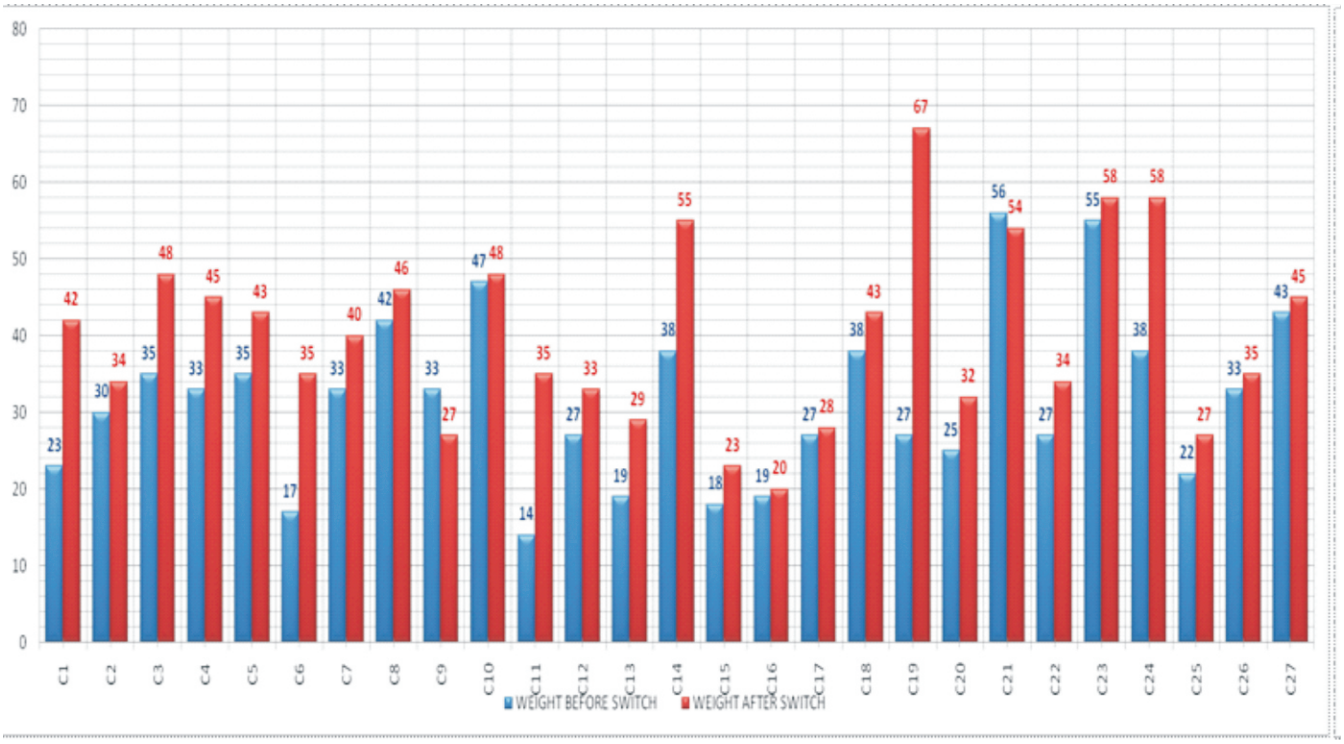
*TND=Target not detected which is virological suppression, Viral laod<50=Low level viremia; Viral load 50=Unsuppressed

Table 2 above shows that there is a statistically significant difference between the viral load before and after commencement of DTG-based regimen commencement (p- 0.0001) with 82% of the respondents are virally suppressed.



*Significant weight gain termed as weight gain >1kg

Figure 1. Chart showing the weight of respondents on commencement of ART without DTG and 6 months after, 74% of respondents gained weight whereas, 19% of them experienced no weight change and 7% had weight loss after commencent of ART. Average weight gain was 3.5kg.



***Significant weight gain termed as weight gain >1kg**

Figure2.Chart showing the weight of respondents before and after their change to DTG regimen and 93% of respondents gained weight 6 months after commencent of DTG regimen while 7% lost weight. Average weight gain was 9.1kg.

Discussion

Our study revealed that more female adolescents than males (Table 1) were positive and active on regular clinic visits and ART at BSUTH which is in keeping with a report from the Global information and education on HIV and AIDS which showed that Young people (10 to 24 years) and adolescents (10 to 19 years), especially young women and young key populations, continue to be disproportionately affected by HIV.[10]Most of the adolescents in this study population were 14 years and below. This agrees with a study carried out in 2018, where 120,000 adolescents and 140,000 children in Nigeria had HIV/1,000 uninfected population, the HIV incidence rate among children aged up to 14 years was 79%.Nigeria recorded in 2018 the highest rate of children infected with HIV through their mothers worldwide.[11]

A comparative study conducted in University of Port Harcourt Teaching Hospital among children on the effect of DTG-based regimen, revealed a statistically significant effect on suppressing viral load over a 6 months' period (X2 =53.77, p= 0.0001)[12]which is similar with the findings of our study (p = 0.001).The same study reported that 91.5% of respondents achieved a viral suppression at the end of 6 monthsalso consistent with the findings of our study which showed that 82% of respondents had viral load suppression (TND).

Whereas the IMPAACT study showed that 70% of adolescents (12 to <?18 years old) treated with DTG achieve a complete viral suppression[13] which was below our findings. Despite these achievement with DTG, the 95-95-95 target has not been attained probably due to poor adherence and risky sexual behavioral tendencies among adolescents.

Among our respondents while on NVP and EFV-based combination for over 5years, only 11% had achieved complete viral suppression (TND) with 52% at the level of low level viraemia (LLV).But when they were changed to DTG, the TND was achieved in 82% of the respondents. This is in line with a report from WHO indicated that viral load suppression was found to be faster among

those on DTG-based regimens compared to EFV-based regimens.[14] It stated that 81% of patients who started with a DTG-based regimen presented a suppressed viral load after 3 months of treatment, compared to 61% for those on an EFV-based regimen.[14]

The weight gain observed in our study showed that on commencement of other ART regimen, 74% of the respondents gained weight which was 3.5kg on the average as compared to when changed to DTG-based regimen, 93% of them gained weight with an average of 9.1 kg at 6 months. This maybe attributed to the attendant viral suppression, less chances of opportunistic infections and better living on changing to DTG. A similar finding was observed in a study where a total of 495 patients were included: 136 switched from EVF/TDF/FTC to an INSTI-containing regimen and 34 switched to a PI-containing regimen. Patients switched to an INSTI-containing regimen gained an average of 2.9 kg at 18 months compared to 0.9 kg among those continued on EFV/TDF/FTC (p=0.003),[15]

With regards to the side effects resulting in discontinuation of DTG regimen, none was reported among our clients compared to the other ARV based regimen with complaints of unpleasant taste of the drugs and frequency of the dosage. This is similar to the findings in a study carried out among HIV-infected pediatric patients who experienced no adverse events were reported and most patients demonstrated a good adherence to treatment.[16] DTG was also statistically superior to EFV, EVG/c, ATV/r, LPV/r, and NVP with regards to rates of discontinuation due to adverse events (AEs) in another research.[6]

Conclusion

In conclusion, the findings from this study indicates that adolescents will benefit from DTG-based regimen achieving a complete control of HIV infection with no side effects. The major advantages of DTG-based regimen are the prompt viral suppression, possibility to reduce the pill burden to two pills once a day, the increasing treatment adherence and the low or absent risk of additional drug resistance mutations. Whether DTG results in undesirable weight gain or rather statistically significant results, remains a debate and should be researched further.

Limitations

Weight gain may be sign of improvement therefore further studies need to be conducted tocompare specifically the weight gain using Body Mass Index on commencement of ART with Efavirenz and ART regimen with DTG among other health facilities.

Conflict of interest statement

The authors declare that they have no competing interests.

Acknowledgement

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AN ASSESSMENT OF SEXUAL BEHAVIOUR AND ITS HEALTH OUTCOMES AMONG FEMALE STUDENTS OF A TERTIARY INSTITUTION ON THE PLATEAU, NORTH CENTRAL NIGERIA

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ABSTRACT

Background: Extant data suggest that negative consequences associated with sexual risk-taking are common in tertiary institutions worldwide and Nigeria is no exception.
Objective: To assess the sexual practices and health outcomes of risky sexual behaviour among the female students of a tertiary institution in north central Nigeria.

Methodology: This was a cross sectional study involving 400 female students of a tertiary institution on the Plateau. The subjects were selected from all the departments using a two-stage sampling technique. A pretested semi-structuredself-administered questionnaire was used to obtain relevant information from the subject. Analysis was done using IBM-SPSS 22.0. Statistical significance was set at $P \leq 0.05$.

Results: Sixty-four percent of the respondents had their first sexual experience at age 19-23 years. About 48% had multiple partners within the last six months of the research while respondent's sexual partners were mostly male (98.8%). A large proportion (91.5%) of respondents practiced vaginal sex, with 6.2% practicing oral sex and 2.3% having anal sex. Only 23.1% used condom always and 38.7% of study participants did not negotiate for safer sex.The health outcomes included: unwanted pregnancies among 28.7% of them, while abortion, STI (sexually transmitted infection) and HIV (Human Immunodeficiency virus) were found in 28.7%, 28.2% and 16.7% of the respondents respectively.

Conclusion: Majority of the undergraduates in this study indulged in high-risk sexual behaviour with resultant adverse health outcomes of unplanned pregnancies, abortions and STIs.

Key words: *Sexual behaviour, Female students, Health outcome, Tertiary Institution*

INTRODUCTION

There are consistent reports that majority of adolescents throughout the world are sexually active by the age of 19 years.[1] Reported mean age of onset of sexual activity for boys was 14.4 years and girls 15.9 years with majority of them by the end of adolescence.[1]This therefore exposes young unmarried people to sexually transmitted infections (STIs) including HIV/AIDS (Human Immunodeficiency virus/Acquired

Immunodeficiency syndrome) and Human Papillomavirus (HPV), unintended pregnancies and unsafe abortions. They are also predisposed to increased risk of ectopic pregnancies, secondary infertility and genital tract malignancies in the future. Therefore, the sequelae of high-risk sexual behaviour remain a significant public health problem, especially among females aged 15-29 years.[2]

In Nigeria, many young people are sexually active and engage in high-risk sexual behaviour, such as early sexual debut, unprotected sex, multiple sexual partnerships, and anal sex, in the face of poor knowledge about STIs.[3,4,5] As a consequence, there is a high reported rate of STIs of about 10% among young people between 15 and 24 years of age.[6] Of the 300,000 new HIV infections occurring annually in Nigeria, young people contribute 60% which was as a result of high-risk sexual behaviour.[7] Most young people often lack the skills and confidence necessary to negotiate for safer sex, while some erroneously perceive themselves not at risk of STIs, which are some of the vulnerability factors to HIV infection.[8, 9]Therefore young people continuing to remain at the centre of the global HIV epidemic in the face of other challenges that make them more vulnerable.[10,11]

The reported high rates of unwanted pregnancies and unsafe abortions in developing countries among adolescents and young-adults is an important cause of maternal mortality in the region, as such a critical public health problem.[12,13]This study assessed the sexual practices and the health outcomes of high-risk sexual behaviour among the female students of Plateau State Polytechnic.

METHODOLOGY

Study Area

This study was conducted at Plateau State Polytechnic, Jos Campus. The school was established in 1978 and it has a total of eight departments. The population of female students is 1700.

Study Population

The study population comprised of female students of the Plateau State Polytechnic, Jos Campus

Study Design

This was a cross sectional study.

Sample Size Determination

Sample size was calculated using Cochran formula [$n= z^2pq/d^2$]

Where n = appropriate sample size

z= normal standard deviation at alpha level of 0.05= 1.96

p= the proportion of students having sex without condom in a similar study (57.0%).[14]

q= estimate of variance (0.31)

d= acceptable margin of error set at 0.05. $n = z^2pq/d^2$

$n = [(1.96)^2 \times 0.57 \times 0.43] / (0.05)^2$

n = 377

An estimated 5% (19) was added to make up for incomplete responses or non-response. Total study participants were 400

Sampling Technique

The study participants were selected from all the departments using a two-stage sampling technique. All 8 departments were included since all of them have female students. **Stage one**: Selection of classes; each department has students in different levels of academic pursuit: HND- Higher National Diploma (first and second year) and OND-Ordinary National diploma (also first and second year). Using Simple random sampling by balloting, one of the classes was selected in each of the academic levels (HND/OND). **Stage two**: Selection of female students; a list of all the female students in all the classes selected was generated, (516). Proportion to size technique was used to determine the number of female students to be selected from each of the classes by dividing the number of eligible female students (A) in each class by the cumulative total of all the students in all the selected classes (B = 516) multiplied by the sample size (n) for the study, {i.e. number per class (c) = (A/B) x n}. 'A' for the various departments is as follows; Public Administrations department-89, Accounting department-66, Legal and General Studies department-69, Marketing department-73, Office Technology department-63, Banking and Finance department-54, Mass Communications department-41, Business Administration and Management department-61.

Following which the serialized list of the eligible

students in each of the classes selected (3 OND-1, 4 OND-2, 3 HND-1 and 3 HND-2 classes) was taken as the sampling frame from which random sampling technique using table of random numbers was used to select the participants for the study.

Date Collection

A pretested semi-structured self-administered questionnaire was used to obtain information from the study subjects. This questionnaire was developed by the researcher based on the objectives of the study after extensive literature search (Cronbach's alpha reliability, $\alpha = 0.839$) and was pretested on students of University of Jos among 10% of the estimated sample size. The research team comprised the researcher and research assistants. Two data collectors were recruited and trained by a Public Health consultant on how to administer the questionnaires and address any concerns from the respondents. The questionnaires were shared in a hall to the selected students spaced apart and supervised to fill the information independently while maintaining confidentiality. All shared questionnaires were retrieved immediately by the trained data collectors.

Information that was obtained include; socio-demographic characteristics, sexual conduct and practices, and health outcomes. Information was also sought on use of alcohol and other substances.

DATA ANALYSIS

Analysis was done using IBM-SPSS version 22.0. The level of statistical significance was set at $P \leq 0.05$. Simple descriptive statistics was used to present socio-demographic profile, sexual behaviour and health outcomes of the respondents in frequencies and percentages. Bivariate analysis was analysed for the overall sexual behaviour (risky/non-risky) and health outcomes. Number of sexual partners, condom use and safe sex negotiation were used to assess sexual behaviour while negative or unfavourable response to any such as multiple sexual partners, non-consistent use of condoms and non- negotiation of sex at all times was adjudged as risky sexual behaviour. Overall only if all three components were non-risky was it categorised as non-risky. Safe sex negotiation refers to a partner's ability to not only communicate the intention to either use condom or abstain to a partner, but also the other partner's reaction to such a proposal.[9,15]

Ethical Considerations

Ethical clearance for this study was obtained from the Research and Ethics Committee of Jos University Teaching Hospital (JUTH). Written informed consent was obtained from all students who met the criteria for inclusion in the study. Written permission was obtained from the school authority before commencement of the study.

RESULTS

Table One shows that most of the study participants were in the OND programme (52.6%), 30 years or below (43.3%), non-indigenous tribes on the Plateau (62.1%) and Christians (91.3%).Table Two shows that most of the respondents had their first sexual experience at age 19-23 years (64.1%), had sex with only one partner within the last six months (52.3%), sexual partners were mostly male (98.8%) and practiced vaginal sex (91.5%). Oral sex and anal sex accounted for 6.2% and2.3%, respectively. Less than half (41.8%) of the respondents used condom occasionally, while about 42.1% of the study participants sometimes negotiate for safer sex. Table Three shows that 47.7%, 76.9%, and 80.8% of the study participants had risky sexual behaviour with respect to number of sexual partners, condom use and safe sex negotiation respectively. The combined analysis of sexual behaviour showed that 99% of respondent's sexual behaviour was risky. Table Four shows that the prevalence of pregnancy amongst study participants was 28.7% while that of abortion, STI and HIV were 28.7%, 28.2%, and 16.7%, respectively. Table 5 shows that amongst those with non-risky sexual behaviour in all the three outcomes, none had anyof the outcomes studied. This finding was however not statistically significant. For the risky sexual behaviour group, there were double the number of those without the health outcomes than those with the health outcome. This also proved not to be statistically significant. The participants engaged in sex for various reasons in the six months prior to this study with sex for expression of love, for pleasure, to obtain favour, for monetary gain and to please someone accounting for 91 (23.3%), 89 (22.8%),

74 (19.0%), 71 (18.2%), and 65 (16.7%), respectively. These reasons were also expressed in various combinations as some respondents had more than one reason for engaging in sexual intercourse.

TABLE 1: SOCIODEMOGRAPHICS OF THE RESPONDENTS

SOCIODEMOGRAPHICS	(n) TOTALS=390	PERCENTAGE
DEPARTMENT		
Public Administrations	67	17.2
Mass Communications	50	12.8
Accounting	52	13.3
Legal and General Studies	55	14.1
Marketing	48	12.3
Office Technology Management	41	10.5
Banking and Finance	31	7.9
Business Administration and Management	46	11.8
TYPE OF PROGRAMME		
OND*	205	52.6
HND*	185	47.4
AGE(YEARS)		
≤ 20	135	34.6
21 – 29	169	43.3
30 – 39	71	18.2
40 – 49	15	3.8
ETHNICITY		
Plateau indigenous Tribes	148	37.9
Non-indigenous Tribes	242	62.1
RELIGION		
Christianity	356	91.3
Islam	34	8.7

TABLE 2: SEXUAL BEHAVIOUR OF THE RESPONDENTS

SEXUAL BEHAVIOUR	(n) TOTALS= 390	PERCENTAGE (%)
AGE AT FIRST INTERCOURSE		
≤ 18	83	21.3
19 – 23	250	64.1
24 – 28	57	14.6
NUMBER OF SEXUAL PARTNERS IN PAST SIX MONTHS		
1	204	52.3
2	90	23.1
3	54	13.8
4	42	10.8
SEX OF SEXUAL PARTNER		
Male	366	93.8
Female	22	5.6
Both	2	0.5
TYPE OF SEXUAL INTERCOURSE PRACTICED		
Vaginal sex	349	89.49
Oral sex	22	5.64
Anal sex	8	2.05
Vaginal and oral sex	8	2.05
Vaginal and anal sex	2	0.51
Vaginal, oral, and anal sex	1	0.26
CONDOM USE DURING SEXUAL INTERCOURSE		
Do not use	137	35.1
Use occasionally	163	41.8
Use always	90	23.1
SAFER SEX NEGOTIATION WITH PARTNER(S)		
At all times	75	19.2
Sometimes	164	42.1
At no time	151	38.7

TABLE 3: SEXUAL BEHAVIOUR CATEGORISED: RISKY/NON-RISKY

SEXUAL BEHAVIOUR COMPONENT	FREQUENCY (n) TOTALS= 390	PERCENTAGE (%)
NUMBER OF SEXUAL PARTNERS		
Non-Risky behaviour	204	52.3
Risky behaviour	186	47.7
CONDOM USE		
Non-Risky behaviour	90	23.1
Risky behaviour	300	76.9
SAFER SEX NEGOTIATION		
Non-Riskv behaviour	75	19.2
Risky behaviour	315	80.8
OVERALL SEXUAL BEHAVIOUR		
Non-Risky behaviour	4	1.0
Risky behaviour	386	99.0

TABLE 4: HEALTH OUTCOMES OF RESPONDENTS

HEALTH OUTCOMES	**FREQUENCY (n) TOTALS = 390**	**PERCENTAGE (%)**
PREGNANCY (LAST SIX MONTHS)	112	28.7
ABORTION (LAST SIX MONTHS)	112	28.7
STI* (LAST SIX MONTHS)	110	28.2
POSITIVE HIV* STATUS	65	16.7

*Self-reported status based on the last test before the onset of this study

TABLE 5: RELATIONSHIPS BETWEEN SEXUAL BEHAVIOUR AND HEALTH OUTCOMES

CHARACTERISTIC	UNWANTED PREGNANCY		χ^2	p-value
	YES	**NO**		
OVERALL SEXUAL BEHAVIOUR				
Non-Risky	0	4	1.624*	0.203
Risky	112	274		

CHARACTERISTIC	**TERMINATION OF PREGNANCY**		χ^2	**p-value**
	YES	**NO**		
OVERALL SEXUAL BEHAVIOUR				
Non-Risky	0	4	1.624*	0.203
Risky	112	274		

CHARACTERISTIC	**STI**		χ^2	**p-value**
	YES	**NO**		
OVERALL SEXUAL BEHAVIOUR				
Non-risky	0	4	1.584*	0.208
Risky	110	276		

DISCUSSION

Of the 400 students that participated in this study, 390 (97.5%) reported to have had at least one sexual intercourse at the time of this study. This high level of sexual activity reported among this group of adolescent is similar to those reported in other higher institutions across Nigeria and other parts of the world.[1,2,10] A significant proportion had their sexual debut before the age 18 years which is bothersome considering the immediate and future health consequences of such practices.[1,16,17]Although early onset of sexual activity reported in this study is lower than the earlier reported prevalence in related studies across Nigeria and neighbouring countries, the health risk could be enormous when individualised.[17] The lower prevalence may be attributable to level of awareness, liberality and influence of money which may be higher in southern Nigeria when compared to the North.[18] North-central Nigeria is predominantly a civil service and agrarian region where such exposure may be delayed.[19]

Nearly half of the respondents had multiple sexual partners which is similar to reports from other studies across Nigeria.[20]This unhealthy lifestyle may not be unconnected to the fact that adolescents and young person often engage in sexual experimentation and are oftentimes ignorant of the associated negative consequences. Evidence to this could be deduced from the findings that as high as 89 (22.8%) and 90 (23.1%) of the studied respondents indulged in sexual activity for "pleasure and to express love respectively", a situation which is even more worrisome. This practice if not stemmed down through sex education and other reproductive health services portend future danger.

Respondents engaged in a variety of sexual acts to satisfy their sexual drive ranging from vaginal intercourse, oral to anal and combinations of different acts. This is in line with the report of Marshall in 2010 that people engage in a variety of sexual acts, ranging from activities done alone (masturbation) to acts with another person (sexual intercourse, non-penetrativesex,oralsex, anal sex etc.) in varying patterns of frequency, for variety of reasons.[21]This study has also exposed some trend

that most local studies did not address. That is the practice of anal sex and the oral sex which contributed to 5.2% and 6.2%, respectfully. This study also revealed high prevalence of unwanted pregnancies, subsequent pregnancy terminations and sexually transmitted infections (STIs) among respondents in the last six months of this study. The lower prevalence reported in this study when compared to earlier ones may be due to the higher rate of condom use compared to the previous studies.[17] However, this rate cannot be neglected as the complication of STI if not properly treated which is the case most times as the respondent may not visit qualified personnel who may have given them the right treatment. This rate is also higher than what was reported in the developed country where there was high level of condom use.[22] Early age at coitarche is associated with the risk of developing cancer of the cervix in the future and this was reported in 21.3% of the respondents. This study also revealed that sex for pleasure is the commonest reason for which female students of the Polytechnic have sex, followed by money. Majority of the respondents are youths which means that it is not surprising that the reasons for having sex are for pleasure and expression of love. It is also not surprising that money is the third reason because the economic hardship may have forced some of the students to have sex in order to raise money for their upkeep in school. Sexual behaviour is a sensitive topic. Information obtained from the respondents were self-reported and may not reflect their exact sexual behaviour in all cases.[23]The HIV status of the respondents was also self-reported. Those who said they were HIV negative reported based on their last actual tests.

CONCLUSION AND RECOMMENDATIONS

Majority of the undergraduates in this study indulge in unprotected intercourse and often with multiple partners and most did not negotiate for safer sex. This constitutes high risk sexual behaviour. This high risk sexual behaviour was also reflected in their health outcome such as high level of unwanted pregnancy with its attendant termination of pregnancies as well as sexually transmitted infections. There was also high rate of HIV infections among the respondents. Safe sex sexualilty education is recommended for students in tertiary educational institutions to minimize this ugly trend. Youth friendly reproductive health services should also be provided in higher institutions where students can easily access care without fear of discrimination.

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CONFLICT OF INTEREST: We declared that, we do not have conflict of interest.

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PATTERN OF EYE DISEASES AMONG PATIENTS PRESENTING TO A UNIVERSITY HEALTH SERVICE

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Abstract

Background: To determine the pattern of eye diseases among patients attending the Eye Clinic of the University of Jos Health Centre.

Methods: A retrospective study of all patients presenting to the eye clinic of the University of Jos Health Services between March, 2019 to March, 2020 was done. Consecutive patients who visited the Eye clinic were first seen by a nurse who collected biodata and tested the visual acuity. Distance visual acuity was tested at a distance of 6m in day light using Snellen's chart for literate and E chart for illiterate patients and near visual acuity was tested at a distance of 33cm. Those with distance visual acuity of worse than 6/6 had refraction done by the Optometrist and the best corrected visual acuity recorded. Detailed ocular examination was performed by the Ophthalmologist using pen torch and direct ophthalmoscope. Data was analyzed using SPSS version 20.

Results: A total of 531 patients were seen during the study period comprising of 241 (45.4%) males and 290 (54.6%) females with a male to female ratio of 1:1.2. The mean age of the study participants was 32years (SD ±15). About 10.5% of the study participants had normal ocular examination findings, while 89.5% had at least one eye problem. The commonest ocular morbidities were allergic conjunctivitis (29%), refractive error (22.8%), presbyopia (16.6%), infective conjunctivitis (4.9%), cataract (3.8%), and glaucoma (15%).

Conclusion: Eye diseases constitute one of the presentations of patients attending the University Health Services. Therefore, the need for man power and infrastructural development cannot be over emphasized as good vision would improve the quality of services rendered by staff and academic performance of the students.

Key words:
Pattern, eye diseases, University of Jos

Introduction

Ocular diseases negatively impact on every aspect of the life of an individual and the pattern of such eye diseases varies in developing as well as the developed world depending on the age, sex, race and climatic conditions.[1] Common causes of blinding eye diseases globally include uncorrected refractive errors (43%), cataract (33%), glaucoma (2%), while age related macular degeneration (ARMD), diabetic retinopathy, trachoma and corneal opacities, each account for about 1%[2]. Majority of these ocular conditions can lead to blindness that can either be potentially preventable or curable when detected early[2]. The University of Jos Health Services provides health care to the university community (students, staff and their families) as well as the host community. The clinic is located within the University campus. The Eye clinic, which was established in 2019 is managed by a visiting Ophthalmologist who provides consultation twice a week while a visiting Optometrist provides refraction once a week.

We are unaware of a study on the pattern of eye diseases among the university community. This study aims to determine the pattern of eye diseases among patients presenting to the University of Jos Eye clinic with a view to make recommendations to the hospital management on improvements in the clinic infrastructure and human resource. To the best of our knowledge, no study has been conducted on the pattern of eye diseases among the university community in Jos. The information from this study will therefore help in planning preventive, curative and rehabilitative eye care services for the common eye disorders seen at the Jos University Health Services.

Methodology

This is a retrospective study of all patients seen at the Eye Clinic of the University Health Services, Jos, Plateau state Nigeria between March 2019 and March 2020. Patients were first seen in the General Outpatient Department before being referred to the Eye Clinic on account of an eye problem. However, few patients presented directly to the Eye Clinic. All patients were seen by the same Ophthalmologist. For each patient, biodata was obtained and the distance as well as near visual acuity was recorded using the Snellen or illiterate E chart and near chart (except when this was not possible such as in infants and pre-school children) by a nurse. The anterior and posterior segments was examined with a torch and a Heine direct Ophthalmoscope by the Ophthalmologist. Dilated fundoscopy was also done, if indicated. Refraction was also done by the Optometrist for those with visual acuity of 6/9 and less and/or those with near vision of worse than N5. Patients with treatable eye diseases were treated and those that required further eye evaluation and management were referred to Jos University Teaching Hospital. Patients who required spectacles were given from the glass stock in the Eye Clinic. The following details of the patients were recorded in a register opened for the Eye Clinic: the name of the patients seen, the hospital number, age, sex and diagnosis. The patients were classified as staff, family members of staff, students and outsiders.

Data was entered into Microsoft Excel sheet and analyzed using Statistical Package for Social Sciences version 22.

Ethical approval was obtained from the Health Research and Ethical Committee of University of Jos (Reference number: UJ/UHS/EC2018Vol.I/014).

Definition of terms

1. Presenting visual acuity (PVA)- The visual acuity of the patient on assessment (this include unaided VA for participants not using spectacles and VA with spectacles for individuals who have corrective spectacles on while being assessed).
2. Refractive error-defined as presenting visual acuity of less than 6/12 in the better eye.
3. Blindness-presenting visual acuity of less than 3/60 in the better eye.
4. Allergic conjunctivitis-diagnosed by the presence of itching, lacrimation, conjunctival hyperemia and papillae.
5. Refractive error- defined as presenting visual acuity of6/9 and worse which improves with pin hole.
6. Infective conjunctivitis-diagnosed by the presence of redness, discharge, burning, eye lid oedema and conjunctival hyperemia.

7. Cataract- defined as the opacification of the lens fibres.
8. Glaucoma- diagnosed by a vertical cup-disc ratio of 0.8 or greater or a cup disc asymmetry of 0.2 or greater.
9. Pingueculum- defined as a yellowish-white growth on the nasal or temporal bulbar conjunctiva adjacent to the limbus.
10. Pterygium-defined as a triangular fibrovascular growth of conjunctiva on to the cornea.
11. Chalazion-defined as a painless nodule within the tarsal plate.
12. Stye-defined as the presence of a painful swelling at the lid margin.
13. Trachoma-defined clinically as the presence central corneal scarring in the presence of at least one of the following signs of trachoma: trichiasis/entropion, conjunctival scarring, pannus or Herbert's pits.
14. Surgical complication- refers to an eye that was blind or visually impaired that had undergone cataract surgery in the absence of other causes of blindness/visual impairment.
15. Age Related Macular Degeneration- defined clinically by the presence of drusens at the macula, retinal pigment epithelial changes (hyper or hypopigmentation), geographic atrophy and/or choroidal neovascularization.
16. Diabetic Retinopathy- defined by the presence of the following in the retina; microaneurysm, hemorrhages (dot and blot and/or splinter), hard exudates, cotton wool spots, venous changes, arterial changes, and/or neovascularization.
17. Orbital cellulitis- defined as unilateral pain associated with visual impairment, hyperemic periorbital and lid oedema as well as the presence of proptosis.
18. Preseptal cellulitis-defined as unilateral pain associated with hyperemic periorbital and lid oedema in the presence of normal visual acuity and absent of proptosis.
19. Presbyopia- A person is said to have presbyopia if he is unable to read the N8 optotype with distance correction in place if needed, or they are able to read at least one more line with the addition of a plus lens.
20. Ptosis- is defined as drooping of the eye lid from various causes.

RESULTS

A total of 531(9.3%) patients with eye complaints were seen out of a total of 5700 patients that visited the health facility during the study period. There were 241 (45.4%) males and 290 (54.6%) females giving a male to female ratio of 1:1.2 with an age range of 1- 70years. The mean age of the study participant was 32years (SD ±15). The predominant age group was 21-30years as seen in Table 1. Majority of the patients were students and included both undergraduate and postgraduate students. This was followed by staff and staff relatives that comprises staff family members and dependents as seen in Table 1.

Table1: Occupational distribution of study participants

Occupation	Frequency(n)	Percent (%)
Student	320	60.3
Staff	116	21.8
Staff Relatives	76	14.3
Outsider	19	3.6
Total	**531**	**100.0**

Of the patients that were seen during the study period, 56 (10.5%) were found to have normal ocular examination findings, while 475 (89.5%) patients were found to have at least one eye disease as seen in Table 2. More females 263 (55.4%) than males 212 (44.6%) were found to have eye diseases. The commonest eye disorder found was allergic conjunctivitis 154 (29.0%). This was followed by refractive error 121 (22.8%). Table 3 shows the distribution of major eye diseases in the different age category.

Table 2: Pattern of Eye Diseases among study participants

Diagnosis	Frequency(n)	Percent(%)
Normal	56	10.5
AC	154	29.0
RE	121	22.8
Presbyopia	88	16.6
IC	26	4.9
Cataract	20	3.8
Glaucoma	15	2.8
Trauma	11	2.0
Pterygium, Pingueculum	8	1.5
Stye	6	1.1
Chalazion	5	0.9
Corneal disorders	3	0.5
DR	2	0.4
Macula Hole	2	0.4
Post cataract surg comp	2	0.4
Conj Disorders (Conj naevus, SCC)	2	0.4
Optic nerve disorder	2	0.4
Dry Eye	1	0.2
ARMD	1	0.2
Orbital cellulitis	1	0.2
Preseptal cellulitis	1	0.2
Ptosis	1	0.2
SCH	1	0.2
Superficial Dermoid	1	0.2
Amblyopia	1	0.2
Total	**531**	**100**

‡‡: AC: Allergic Conjunctivitis, RE: Refractive Error, IC: Infective Conjunctivitis, DR: Diabetic Retinopathy, Post Cataract Surg Comp: Post Cataract surgical Complication, Conj: Conjunctiva, SCC: Squamous Cell Carcinoma, ARMD: Age-Related Macula Degeneration, SCH: Sub Conjunctival Haemorrhage

Table 3: Age distribution of major eye diseases

Age Category	AC	RE	Presbyopia	IC	Cataract	Glaucoma
0-10	7	5	0	3	0	0
11-20	38	37	0	8	2	4
21-30	90	35	0	9	2	2
31-40	9	11	11	4	0	2
41-50	7	11	44	0	0	1
51-60	3	15	27	1	10	3
61-70	0	7	6	1	6	3
Total	**154**	**121**	**88**	**26**	**20**	**15**

‡‡: AC: Allergic Conjunctivitis, RE: Refractive Error, IC: Infective Conjunctivitis

Table 4 shows the effect of respondents' characteristic on the prevalence of allergic conjunctivitis

Table 4: Effect of respondents' characteristic on prevalence of Allergic conjunctivitis

Allergic Conjunctivitis	Odds ratio	Std. err.	p-value
Age	0.9635	0.0042	0.0001
Sex	1.4986	0.3104	0.0510

Log Likelihood= -263.170 Prob > chi2=0.0001 Number of Obs=474

The common eye disorders among students were allergic conjunctivitis (37.8%), refractive error (21.9%) and presbyopia (7.2%). Myopia was the commonest refractive error followed by astigmatism and anisometropia.

Presbyopia was found to be the commonest eye disorder among staff accounting for more than one third of the eye conditions, followed by refractive error (23.2%), cataract (8.6%), glaucoma (5.2%) and allergic conjunctivitis (5.2%) (Table 5).

TABLE 5: PATTERN OF EYE DISEASES AMONG STUDENT

	Frequency(n)	Percentage (%)
Normal	44	13.8
AC	121	37.8
Refractive Error	70	21.9
Presbyopia	23	7.2
IC	11	3.4
Trauma	10	3.2
Glaucoma	8	2.5
Cataract	5	1.6
Chalazion	4	1.3
Stye	4	1.3
Pingueculum	3	0.9
Pterygium	3	0.9
Post Cataract Surgical Comp	2	0.6
Corneal Opacity	2	0.6
Conj Disorder (Conjnaevus, OSSN)	2	0.6
Optic nerve disease	1	0.3
Ptosis	1	0.3
Macula Hole	1	0.3
Dry eye	1	0.3
Corneal Ulcer	1	0.3
Preseptal cellulitis	1	0.3
Orbital cellulitis	1	0.3
Amblyopia	1	0.3
Total	**320**	**100**

‡‡; AC: Allergic Conjunctivitis, IC: Infective Conjunctivitis, Post Cataract Surg Comp: Post Cataract surgical Complication, Conj: Conjunctiva, OSSN: Ocular Surface Squamous Neoplasia

The distribution of ocular trauma among study participants based on gender and occupation is shown in Table 6

Table 6: Distribution of ocular trauma among study Participants

Age Group	Gender		Occupation		
(years)	Male	Female	Staff	Relatives	Student
0-10	**0**	**0**	**0**		**0**
11-20	1	1	0		2
21-30	2	4	0		6
31-40	0	1	0		1
41-50	1	1	1		1
51-60	0	0	0		0
61-70	0	0	0		0
Total	**4**	**7**	**1**		**10**

Table 7 Shows the Distribution of the Various Eye Conditions Among Staff.

Table 7: Pattern of Eye diseases among staff

	Frequency(n)	Percentage (%)
Normal	9	7.7
Presbyopia	47	40.5
RE	27	23.2
Cataract	10	8.6
Glaucoma	6	5.2
AC	6	5.2
IC	5	4.3
DR	2	1.7
ARMD	1	0.9
Macula Hole	1	0.9
SCH	1	0.9
Pterygium	1	0.9
Total	**116**	**100**

‡‡: AC: Allergic Conjunctivitis, RE: Refractive Error, IC: Infective Conjunctivitis, DR: Diabetic Retinopathy, ARMD: Age-Related Macula Degeneration, SCH: Sub Conjunctiva Hemorrhage

Discussion

The female preponderance in this study is similar to previous hospital based studies.[3,4] This could be because the women in this community have better health seeking behaviour. Our result is contrary to another finding which revealed that more males were seen in medical clinic in developing countries.[1] We also found in this study that more students were seen in the University Eye Clinic. This could be because of the larger population of students as compared to the staff and their families in the institution, as well as the close proximity of the hostels to the University clinic making it easily accessible to the students. It was

found in this study that increase in age increases the tendency of eye disease. More females were also found to have eye conditions than males which could be due to higher population of females in the study(odd ratio 4.3553 at p-value of 0.00001).

Allergic conjunctivitis was found to be the commonest eye condition among the study populationas seen in Table 2. This is similar to findings of other studies.[3,5] This could be because of the windy and dusty weather in the Northern part of Nigeria. Allergic conjunctivitis is found to be commoner in those less than 30years of agewhich could probably be due to the fact that over 87.6% of respondents sampled for this study falls within youthful age bracket (1-30 years) meaning majority of the patients attending the Eye Clinic are in this age bracket and thus justifies the reason for the findings. The relationship between allergic conjunctivitis and age was positive and significant at p-value of 0.00001 (1%) implying that as age increases there is more chances of being affected by the disease among participants in the first three decades as seen in Table 3 and also age as a variable is very important factor that influences allergic conjunctivitis. This differ from previous studies that revealed preponderance of allergic conjunctivitis in those 16 years and less.[6-8] Similar to age, sex also has a positive relationship to allergic conjunctivitis and it was not significant implying variation in sex between female to male increases chances of being affected with conjunctivitis, the variable was however not significant in determining prevalence of the disease. This is similar to findings of several other studies.[3,6,9-10]

Refractive error was found in about a quarter of the study population, with majority of those affected being students. Myopia was found to be the commonest type of refractive error. The high prevalence of uncorrected refractive error among students could have an impact on the visual and educational performance of these students. Similar studies found refractive error to be the second common ocular eye disease.[1,3,5,11] Presbyopia was found in less than 1/3rd of the patients, more than half of whom were staff and this could have an effect on the routine office work. Infective conjunctivitis was the fourth leading ocular condition in this study which is similar to findings of Adenuga et al.[3] Cataract and glaucoma which are ocular conditions associated with advancing age accounted for 3.8% and 2.8% respectively of eye conditions seen in this study. Eighty percent of those with cataract were 50years and above and comprised staff and staff relatives whereas the remaining 20% were students between ages of 20-25years. On the contrary, more than half of those with glaucoma were students less than 40years of age. This may be related to the known early onset of glaucoma in persons of African descent.[12] The prevalence of cataract and glaucoma in this study is similar to that found by Adenuga et al[3] working in a military Hospital in Jos which has similar demographics with our setting. However, the prevalence was lower than that found from previous studies by Monsudi et al[13]and Adeoye et al[4] working in Northwest Nigeria and South west, Nigeria, respectively. These higher prevalences could be because majority of the participants in these studies were 50 years and above and such conditions are commoner with advancing age.

Ocular trauma was found among 11 participants, 90% of whom were students with female preponderance. This could be because the population of females generally in the study outweighs that of males. In addition, it could also be due to quarrels from relationship among students. This is contrast to other studies around the world that revealed higher prevalence among males.[14-16]

Conclusion

In conclusion, eye disease constitutes one of the presentations of patients attending the University clinic with allergic conjunctivitis, refractive error, presbyopia, infective conjunctivitis, cataract and glaucoma being the most common eye conditions encountered. There is therefore need to further develop the Eye Clinic with respect infrastructure and man power.

Conflict of Interest

We declare that we have no financial or personal relationship which may have inappropriately influenced us in writing this paper.

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COLONOSCOPY PRACTICE IN JOS UNIVERSITY TEACHING HOSPITAL, JOS, NIGERIA.

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ABSTRACT:

Background:
Colonoscopy is a safe and effective procedure that enables visualization and inspection of the large bowel from the distal rectum to the caecum. It is a widely used screening modality for reducing colorectal carcinoma incidence and mortality. Colonoscopy remains the gold standard for the detection of colorectal cancer (CRC) and polyps. Polyps can be removed during colonoscopy, thereby reducing the risk of colon cancer. Colonoscopy can also be utilize to evaluate the colon in patients with large-bowel pathology, iron deficiency anaemia, abnormal results on radiographic studies of the colon, positive results on CRC screening tests, etc.

Our study was aimed at describing the common indications and the common colonoscopy findings in Jos University Teaching Hospital (JUTH) and to compare some indications such as lower gastrointestinal (GI) bleeding and the colonoscopy diagnosis.

Method:
It was a retrospective descriptive study that reviewed reports of colonoscopy in JUTH between January 2021 and April 2022. Patients who were referred to the endoscopy unit for colonoscopy were received and counselled by the endoscopy nurse. Bowel preparation was done in split-dose fashion, using either low-volume polyethylene glycol (PEG) or 1 liter of 20% mannitol. Written and informed consent and vital signs were done on the morning of the procedure, by the endoscopy nurse. Pethidine and Midazolam were used for pain control and mild sedation. Colonoscopy was done by the Consultant Gastroenterologist using Olympus CF-140 colonoscope. Reports of the procedure findings were documented by the Gastroenterologist who had performed the procedure. The data from the report books were entered into an excel sheet and a descriptive statistical analysis performed.

Results:
One hundred and twenty-five patients who had colonoscopy at our centre between January 2021 and April 2022, with fully documented reports, (when the service was uninterrupted) were enrolled.Males were 74(59.2%) while females were 51(40.8%).The mean age of the population was 51.55 years (males = 51.43; females = 51.72; p-value = 0.1021), age range was 16 – 85 years, and median age was 53years.Most patients had bowel preparation using 20% mannitol (78%). The duration of colonoscopy ranges between 24 to 67minutes (mean = 44minutes), while the caecal intubation rate (excluding patients with large rectal

tumors) was 83.2% (99 out of 119). The commonest indication for colonoscopy was lower gastrointestinal bleeding (37.6%), followed by colorectal cancer screening (22.4%), and chronic diarrhea (15.2%). The leading colonoscopic finding was normal finding (41.6%), followed by haemorrhoids (28.8%) and colorectal tumor (10.4%). Majority of the patients with lower GI bleeding had rectal haemorrhoids (46.8%). Colonic tumor and diverticulosis were seen in 17% each. Majority of the patients with chronic diarrhoea (52.6%) had a normal colonoscopy finding.

Conclusion:
Our study provided some basic and relevant information about colonoscopy practice in JUTH, North-Central Nigeria.

INTRODUCTION:

Colonoscopy is a safe and effective procedure that enables visualization and inspection of the large bowel from the distal rectum to the caecum.[1] The technology for colonoscopy has evolved to provide a very clear image of the mucosa through a video camera attached to the end of the scope. Colonoscopy is a widely used screening modality for reducing colorectal cancer (CRC) incidence and mortality. Other screening modalities used for colorectal cancer include: Faecal occult blood test (FOBT), Faecal immunochemical tests (FIT or IFOBT),Faecal DNA test, Flexible sigmoidoscopy and radiographic screening procedures.Colonoscopy remains the gold standard for the detection of colorectal cancer and polyps.[5] Colonoscopy can also be utilized to evaluate the colon in patients with other large-bowel pathologies, iron deficiency anaemia, abnormal results on radiographic studies of the colon, positive results on colorectal cancer (CRC) screening tests, post-polypectomy and post-cancer resection surveillance.

There is therefore a need to ensure thoroughness and completeness during the procedure. The effectiveness of the procedure depends on many variables related to the quality of the examination which varies among endoscopists in different centres. Many indices have been validated as indicators of quality of colonoscopy from both the patient and endoscopist perspective to optimise performance, these include; caecal intubation rate (CIR), adenoma detection rate (ADR), withdrawal time, quality of colonoscopy reporting, bowel preparation quality.[-] According to the American Society for Gastrointestinal Endoscopy (ASGE)guideline, the minimum CIR is 90% for all colonoscopy procedures while the minimum recommended ADR is 25 for men and 15 for women above 50 years. This is relevant in the occurrence of interval colorectal cancer (CRC), a marker of poor-quality colonoscopy. Most interval CRCs occurs because adenoma or a CRC was missed during a colonoscopy. A high-quality bowel preparation is an important factor in quality colonoscopyas it is crucial in the detection of polyps. Suboptimal bowel preparation may lead to failed detection of flat or subtle polyps. The impact of an inadequate preparation may be particularly pronounced in the proximal colon, reducing detection of both adenomas and sessile serrated lesions. The most widely used rating scales are the modified Aronchick score, a single score reflecting the overall quality of the bowel preparation (excellent, good, fair, poor, or inadequate), and the Boston Bowel Preparation Scale (BBPS), which grades bowel preparation from 0 (unprepared colon) to 3 (entire segment of colon well seen) for each colon segment (right, transverse, and left colon). The BBPS is preferred because it is applied after cleaning and has been thoroughly validated. Adequate preparation is defined as an overall BBPS score of ≥ 6, with each segment score ≥ 2, this score should be achieved in $\geq$ 90% of screening and surveillance endoscopies. The European Society for Gastrointestinal Endoscopy (ESGE) recommends a low fibre diet a day preceding the procedure.[2] Polyethylene glycol (PEG) (or other acceptable alternatives)should be prescribed for the patient as a split dose bowel preparation regime for elective cases while for patient undergoing afternoon colonoscopy, a same-

day bowel preparation is an acceptable alternative.
The duration of a colonoscopy depends on the characteristics of both the patient and the endoscopist. Studies have found a duration of 20-60 minutes for most colonoscopies. A colonoscopy has two components, the caecum intubation and the withdrawal. "Difficult colonoscopy" is a term used to describe cases that require longer than usual to achieve caecum intubation.[8] Difficulty in achieving caecum intubation is predicted by the level of training of the endoscopist, quality of bowel preparation, intra-abdominal adhesions secondary to previous surgeries, and presence of angulations among the large bowel loops. The American Society of Gastrointestinal Endoscopy (ASGE) recommends a minimum withdrawal time of 6 minutes in screening colonoscopy with negative findings to assure the quality of procedure.
The common indications for colonoscopy are lower GI bleeding, screening and surveillance of colorectal polyps and cancers, inflammatory bowel diseases, acute and chronic diarrhoea, and therapeutic indications such as excision and ablation of lesions, treatment of lower GI bleeding, colonic decompression, dilation of colonic stenosis and foreign body removal.[5,6]

Some common contraindications for colonoscopy include: a patient who is not willing to give informed consent, and uncooperative patients. Colonoscopy is also contraindicated for known or suspected colonic perforation and medical conditions associated with a high risk of perforation such as severe toxic megacolon and fulminant colitis.
Our study was aimed at describing the common indications and the common colonoscopy findings in JUTH and to compare some indications such as lower gastrointestinal bleeding and the colonoscopy diagnosis.

METHODS:

It was a retrospective descriptive study that reviewed reports of colonoscopy in JUTH between January 2021 and April 2022, when the service was interrupted.
Jos University Teaching Hospital (JUTH) is a 520-bed tertiary health centre located in North-Central Nigeria, with a well-established Gastroenterology/Hepatology unit. The endoscopy unit in JUTH has four Gastroenterologists, four well-trained endoscopy nurses, two towers, four gastroscopes and two colonoscopes. In addition to diagnosis, it also offers therapeutic endoscopic procedures such as variceal band ligation, adrenaline injection therapy, thermocoagulation, foreign body removal and polypectomy.

Patients who were referred to the endoscopy unit for colonoscopy were received and counselled by the endoscopy nurse. The nurse counselled them about the procedure, obtained relevant history and also administer the bowel preparation. Bowel preparationwas done in split-dose fashion, using either low-volume polyethylene glycol (PEG) or 1 liter of 20% mannitol. Patients were also asked to take low residue diet a day before the procedure.

Written and informed consent and vital signs were done on the morning of the procedure, by the endoscopy nurse. Pethidine and Midazolam were used for pain control and mild sedation. Colonoscopy was done by the consultant Gastroenterologist using Olympus CF-140 colonoscope. Reports of the procedure findings were written by the Gastroenterologist who had performed the procedure, and usually contain patients' bio-data, the indication, vital signs, type of anesthesia, average duration of procedure, colonoscopy findings and the recommendations.
The data from the report books including bio-data, indications, anaesthesia type, type of bowel preparation, duration of colonoscopy and findings at colonoscopy, were entered into an excel sheet and a descriptive statistics was performed.

RESULTS

One hundred and thirty-three patients had colonoscopy at our centre between January 2021 and April 2022, when the service was uninterrupted. One hundred and twenty-five had fully documented reports which was analyzed with results as follows: Males were 74(59.2%) while females were 51(40.8%), the mean age of the population was 51.55 years, (males = 51.43; females = 51.72; p-value = 0.1021), age range was 16 – 85 years, median age was 53years. Most patients had bowel preparation using 20% mannitol (78%). The duration of colonoscopy ranges between 24 to 67minutes (mean = 44minutes),

while the caecal intubation rate (excluding 6 patients with large rectal tumors) was 83.2% (99 out of 119).

The commonest indication for colonoscopy was lower gastrointestinal bleeding (37.6%), followed by colorectal cancer screening (22.4%), and chronic diarrhea (15.2%). The leading colonoscopic finding was normal finding (41.6%), followed by haemorrhoids (28.8%) and colorectal tumor (10.4%). See Table 1. Overall, 58.4% of the study subjects had pathologies on colonoscopy. (see Fig 1).

Figure 1. Diagnostic yield of colonoscopy.

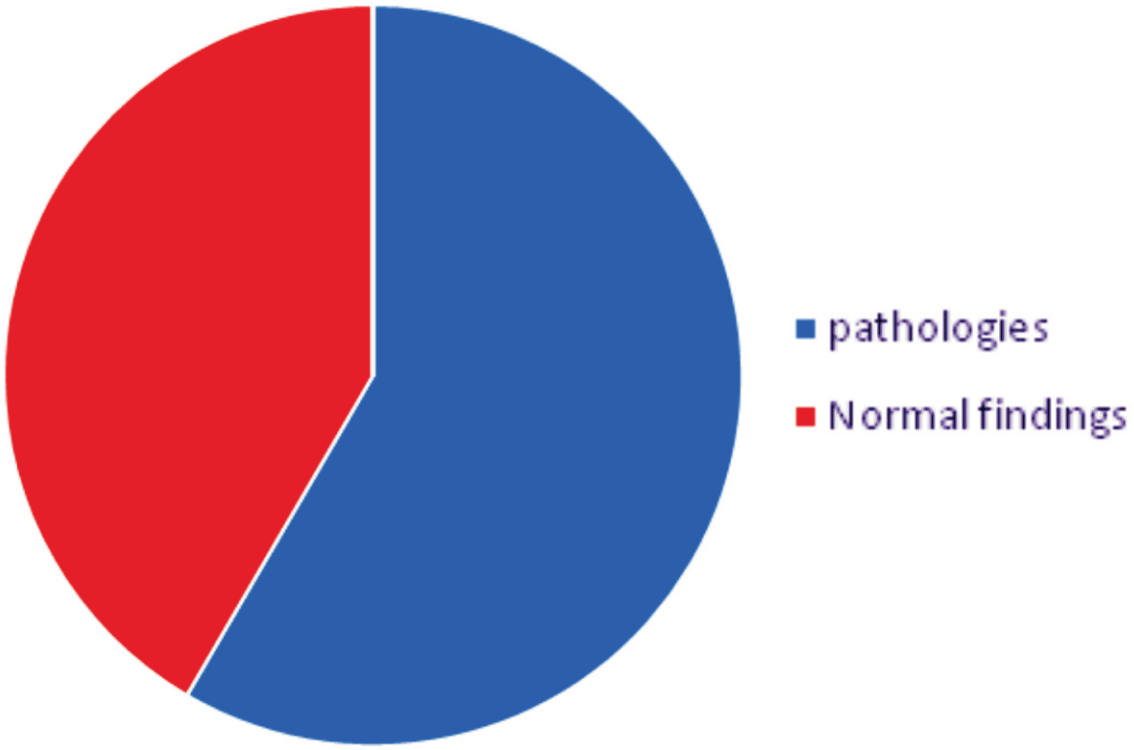

Table 1. Summary of findings.

PARAMETER	FREQUENCY	PERCENTAGE
Gender		
male	74	59.2
female	51	40.8
Age		
≤35	23	18.4
36-45	19	15.2
46-55	26	20.8
56-65	31	24.8
>65	26	20.8
Total	**125**	**100**
Indication		
Lower GI bleeding	47	37.6
Chronic diarrhea	19	15.2
Screening	28	22.4
Lower abdominal pain	10	8
Chronic constipation	4	3.2
Weight loss	3	2.4
Alternating bowel habit	2	1.6
*Others**	12	9.6
Total	**125**	**100**
Colonoscopy diagnosis		
Normal	52	41.6
Haemorrhoids	36	28.8
Diverticulosis	8	6.4
Rectal tumor	8	6.4
IBD-UC	7	5.6
polyps	7	5.6
Colonic tumour	5	4.0
Others[#]	2	1.6
Total	**125**	**100**

*Faecal incontinence, anal pain, anal protrusion, anaemia, external haemorrhoids
#Pseudomembranous colitis, anal fissure.

Majority of the patients with lower GI bleeding had rectal haemorrhoids (46.8%). Colonic tumour and diverticulosis were seen in 17% each. Majority of the patients with chronic diarrhoea (52.6%) had a normal colonoscopy finding. See Table 2.

Table 2. Some indications with colonoscopy findings.

INDICATIONS/FINDINGS	*FREQUENCY*	*PERCENTAGE*
Lower GI bleeding		
Haemorrhoids	22	46.8
Colo-rectal tumour	8	17.0
Diverticulosis	8	17.0
IBD-UC	4	8.5
Normal	4	8.5
Polyps	1	2.1
Total	**47**	**100**
Chronic diarrhea		
Normal	10	52.6
IBD-UC	3	15.7
Malignant tumour	2	10.5
Pseudomembranous colitis	1	5.2
Others	3	15.7
Total	**19**	**100**
Screening colonoscopy		
Normal	16	57.1
Haemorrhoids	8	28.6
Polyps	3	10.7
Diverticulosis	1	3.5
Total	**28**	**100**

DISCUSSION:

From our study, the commonest indication for colonoscopy was lower gastrointestinal bleeding followed by colorectal cancer screening and chronic diarrhea. The leading colonoscopic finding was normal finding, followed by haemorrhoids and colorectal tumours.

Studies have shown that mannitol is not inferior to other acceptable bowel preparations (sodium picosulphate), both in terms of safety and quality.[11] The adjusted caecal intubation rate in our study was slightly below the acceptable global standard of 90%, recommended by international endoscopy societies such as ASGE and ESGE.[5] Although, the overall quality of colonoscopy depends among other parameters, on bowel preparation, quality of bowel preparations were not reported consistently using standard criteria, hence we were not able to define and describe this in our study.

The diagnostic yield from our study was 58.4%. This is lower than what was previously reported in our centre and other parts of the country,[12,13] and this may be due to evolving indications in our environment. For example, colorectal cancer screening, as an indication for colonoscopy was much higher in our study than some previous studies.[12,13] Generally, diagnostic yield varies depending on the indication for colonoscopy.[14] Rectal bleeding, polyp follow-up and iron deficiency anaemia appear to have the highest diagnostic yields while cancer surveillance, abdominal pain and abnormal bowel habit have lower diagnostic yield.[15]

The commonest indication from studies in Nigeria (Lagos and Ilorin),[6,13] were lower gastrointestinal bleeding (24.2% and 39.8%). This is the same with the finding in our study, however, may differ from findings in other parts of the world. For example, in a systematic study done in U.S. of 459,503 colonoscopies reviewed, 242,756 (52.8%) were screening colonoscopies.[16] The lower screening rate in our environmentis explained by limitations in resources including colonoscopy capacity, and the organization of structure of healthcare delivery.[17] Colonoscopy for screening purpose was done in 22.4% of our study subjects. The rates of screening for colorectal cancer were much lower in older studies in Nigeria.[6,12,13]For example, in a previous prospective study in our centre, about 10 years ago (2010-2012), there was no patient that had colonoscopy for colorectal cancer screening purpose.[18]This may suggest increased awareness about screening colonoscopy in our environment, however, will require further study to ascertain.

Most study subjects had normal colonoscopy finding, which is in keeping with other studies.[6,12,13] The commonest pathology in our study was rectal haemorrhoids (28.8%), similar to previous studies in our centre[12] and in Lagos.[6] The commonest finding in patients with lower GI bleeding in our study was haemorrhoids. Although diverticular bleeding is the leading cause of lower gastrointestinal bleeding globally,[19] most studies in Africa reported rectal hemorrhoids as the leading cause.[20] It was also found to be a leading cause of lower GI bleeding in a study among African-Americans and Hispanics.[21]

CONCLUSION:

Our study like most studies in Nigeria showed that lower gastrointestinal bleeding is the leading indication for colonoscopy in JUTH. It also suggests that screening colonoscopy rate for colorectal cancer may be on the increase in our environment, this however, requires further study to ascertain.

CONFLICT OF INTEREST:

There is no conflict of interest.

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ISOLATIONS AND CHARACTERISATION OF SOME GUT MICROBIOMES IN HIV POSITIVE INDIVIDUALS IN JOS, NIGERIA

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ABSTRACT

Background +Aim: The human gut microbiota has an important implication in the maintenance of human health and disease pathogenesis. Recent research has shown that gut microbial imbalance, or dysbiosis, may lead to microbial gut translocation and chronic inflammation in HIV-infected individuals, further enhancing HIV progression, and potentially towards the development of AIDS. The isolation and characterisation of some gut microbiomes in HIV positive individuals in Jos Nigeria as well as the comparison of the blood parameters would improve patient management since gut microbiota in HIV individuals can havean over-representation of proinflammatory Proteobacteria, associated with mucosal and systemic immune activation.

Methodology : This research investigated the gut microbiomeusing faecalsamples and compare the **haematological, blood chemical, immunological and virological parameters** of 5 naive HIV-infected patients, 10 treated HIV-infected patients (less than 10years on ART and more than 10 years on ART) and 5 samples from healthy individual which served as the controls.

Result: Results showed that faecal samples from both HIV negative controls and HIV-infected individuals had dominant taxa from the phyla Firmicutes, Bacteroidetes and Proteobacteria. There was relative abundance of Firmicutes (**42.2%**), Bacteroidetes (**57.7%).** The analysis shows a significant decrease in the Bacteroidetes (coliforms) count while a significant riseof the abundance of Firmicutes (clostridia) with HIV progression. The faecal microbiota of individuals on ART for more than ten years exhibited significantly higher relative abundances of Clostridium cluster compared to HIV negative individuals. The total bacteria count had the highest abundance (**27.7%**), followed by Bacteroides counts (**24.4%**), Clostridia counts (**19.8%**), coliforms counts (**18.2%**) while the lowest was Lactic Acid Bacteria counts (**9.9%**). Bacteroides counts was high among HIV patients on drugsfor more than ten years. The Bacteroidetes (coliforms) counts was highest in HIV-negative controls while the Firmicutes (clostridia) count was highest among HIV patient who were on drugs for more than ten years. The magnitude of divergence from HIV-negative microbiota samples does not correlate with CD4+ T cell count or plasma HIV-1 RNA viral load (all Spearman correlation p-values > 0.73). There was significant increase in the haemoglobin, packed cell volume and platelets count with HIV progression due to the dysbiosis in the gut and likely bacteria translocation that invade the gut with a significant increase of monocytes with HIV progression.

Conclusion: This study is important for public health because it provided new insights into intestinal microbiome symbiosis related to HIV-1 infection. Immune status and ART were the key factors interactively affecting the gut microbiome. It suggests that microbiome composition influences the progression of HIV infection.

Keyword: Gastrointestinal Microbiome, HIV Infections, Viral Load, CD4 Lymphocyte Count, Nigeria

INTRODUCTION

The mechanism that HIV overactivates the immune system is still unclear to researchers. The leaky gut theory may be associated with this immune overactivation. This theory implies that bacteria/bacterial products such as lipopolysaccharides (LPS), translocate out of the gastrointestinal tract (GIT), due to an increased permeability of the GIT and overall decreased mucosal barrier integrity (e.g., tight junctions decline), and into the blood, causing a systemic chronic immune activation.[1] Chronic immune activation is detrimental to individuals infected with HIV. Increased T cell turnover creates an imbalance in the immune homeostasis and results in T-cell half-life decrease, T cell clonal exhaustion, and possibly depletion of memory T cell pools; additionally, chronic immune activation leads to constant T cell generation, and subsequently driving viral replication.[2,3]

A study conducted in China evaluated uninfected and chronically HIV-infected human stool samples for alpha (diversity within samples) and beta diversity (diversity between samples) and discovered an increase in the phyla Firmicutes and Proteobacteria in chronic HIV-infected patients, in comparison to non-HIV infected controls.[4-6] In the same study, an increase of Bacteroides and Arabacteroides were also observed in chronically infected patients. There have been conflicting results on the changes of the microbiome regarding HIV infection. Several studies,[1,5,7] showed an increase of Prevotella and a loss of Bacteroides in HIV infected individuals; whereas, other studies have shown the opposite effects,[7,8]or no difference in these two genera.[1,7,9]

HIV disrupts the overall immune system by destroying CD4+ T cells and allowing for opportunistic infections to occur, eventually leading to the development of AIDS. However, it is not fully understood what makes an individual susceptible to developing AIDS or the exact sequence of pathogenesis from HIV towards the development of AIDS. This study helps to further develop an understanding of the isolation and characterisation of microbial composition and microbial products influencing the pathogenesis of progressive HIV infection. Recent research has shown that during HIV infection, gut microbiota modifications have recently been associated with inflammation and microbial translocation in HIV-infected individuals, further enhancing HIV progression, potentially towards the development of AIDS.[10]It is based on the facts above that this study investigated the usefulness of gut microbiome since many microbes in the community are as yet unidentified in our present study population.

This study will help further develop an understanding of the gut bacterial changes and their characterisation profile in HIV-positive individuals in Jos and how microbial composition and products influence the pathogenesis of progressive HIV infection.

This study aims to determine the microbiome community in HIV patients accessing treatment alongside the effect of ART on the microbiome community and to compare the haematological, blood chemistry, immunological and virological parameters of HIV patients with gut microbiome and normal individuals within Jos Metropolis.

MATERIALS AND METHODS

Study location: The study was carried out at APIN JUTH, Jos Nigeria.

Ethical clearance: Ethical approval was gotten from the Jos University Teaching Hospital Research and Ethics Committee.

Study population: The study was carried out on HIV positive patients who are adults above 18years attending APIN JUTH, Jos Nigeria. Exclusion criteria included antibiotic treatment within the previous three months, not having TB and body mass index <18.5 or ≥ 25 kg/m^2.

Preparation of volunteers: The HIV positive patients were encouraged to provide aliquot of stool samples for analysis while blood samples were collected for Haematology, Blood Chemistry and Plasma Viral load.

Sample size/Collection of samples

A total of twenty (20) stool and blood samples each were collected. Fifteen (15) samples were collected from HIV positive patients while five (5) samples

from healthy individuals which served as the controls. Stool samples were collected from all patients and analyzed for gut bacterial microbiome community and their blood samples assessed for Haematological indices, Blood Chemistry, CD4 and Plasma Viral load.

General asepsis: All methods of sample collection were carried out under aseptic conditions. Workbenches were made aseptic by cleaning with sterilizing reagents, flaming the environment via a lit gas burner.

Stool samples: All of the faecal samples were properly handled and collected in disposable plastic sterile dung cups. All samples arrived the laboratory within 24h and were immediately frozen at -20°C and stored until analyzed.

Faecal characteristics: Faecal characteristics such as colour, texture, presence of blood and worms were observed in the faeces of HIV/AIDS patients.The faecal samples were collected from fifteen (15) patients who have HIV infection and five (5) healthy individuals and stored in -80°Cfreezer.

Blood samples: Blood samples were collected from HIV/AIDS patients attending Jos University Teaching Hospital for Haematological indices, Blood Chemistry, CD4, and Plasma Viral load.

Collection of blood: Blood samples were collected with care and adequate safety precautions to ensure test results are reliable, contamination of the samples was avoided and infection from blood transmissible pathogens was prevented. Protective gloves were worn when collecting and handling blood samples. Needles, and syringes were sterile, and dry, and blood collecting materials were discarded safely to avoid injury from needles.

Analysis of blood sample for Blood chemistry: Venous blood was drawn into plaintubes and was analyze using COBAS C311 autoanalyzer. Samples were allowed to clot and the serum separated and slotted into analyzer. Results were copied from the display on an LCD screen and/or in printed copy.

Analysis of blood sample for CD4: Venous blood was drawn into EDTA-filled tubes and was analyzed using Cyflow counter autoanalyzer. **Devices have inbuilt test processes with** compartment for reagents and wash solutions. Samples were slotted into analyzer or aspirated, Results was copied from the displayon an LCD screen and/or in printed copy.

STATISTICALANALYSIS

Numerical data were obtained from the experiment and these data were analyzed using MS--Excel and the data presented as means and standard deviations. The significant difference between means were analyzed using ANOVA and Regression analysis with a significance level of $p<0.05$.

Table 1: Demographic characteristics of the study population of HIV patients receiving Antiretroviral Drugs (ART) in Jos University Teaching Hospital based on Age

Characteristics		Age Group (frequency)				Total (%)
		16 – 35	36 – 45	46 – 55	56 – 65	(N=20)
Sex:	Male	0	5	4	3	12 (60)
	Female	1	3	4	0	8 (40)
Marital Status:	Single	0	3	0	0	3 (15)
	Married	1	4	7	3	15 (75)
	Divorced	0	2	0	0	2 (10)
Occupation	C/Servant	0	6	6	2	14 (70)
	Business	1	2	1	0	4 (20)
	Driver	0	0	0	1	1 (5)
	Farmer	0	0	1	0	1 (5)
Educational Level	Primary	0	0	1	0	1 (5)
	Secondary	1	2	1	1	5 (25)
	Tertiary	0	7	5	2	14 (70)

Figure 1: Demographic characteristics of the study population of HIV patients receiving Antiretroviral Drugs (ART) in Jos University Teaching Hospital based on Age

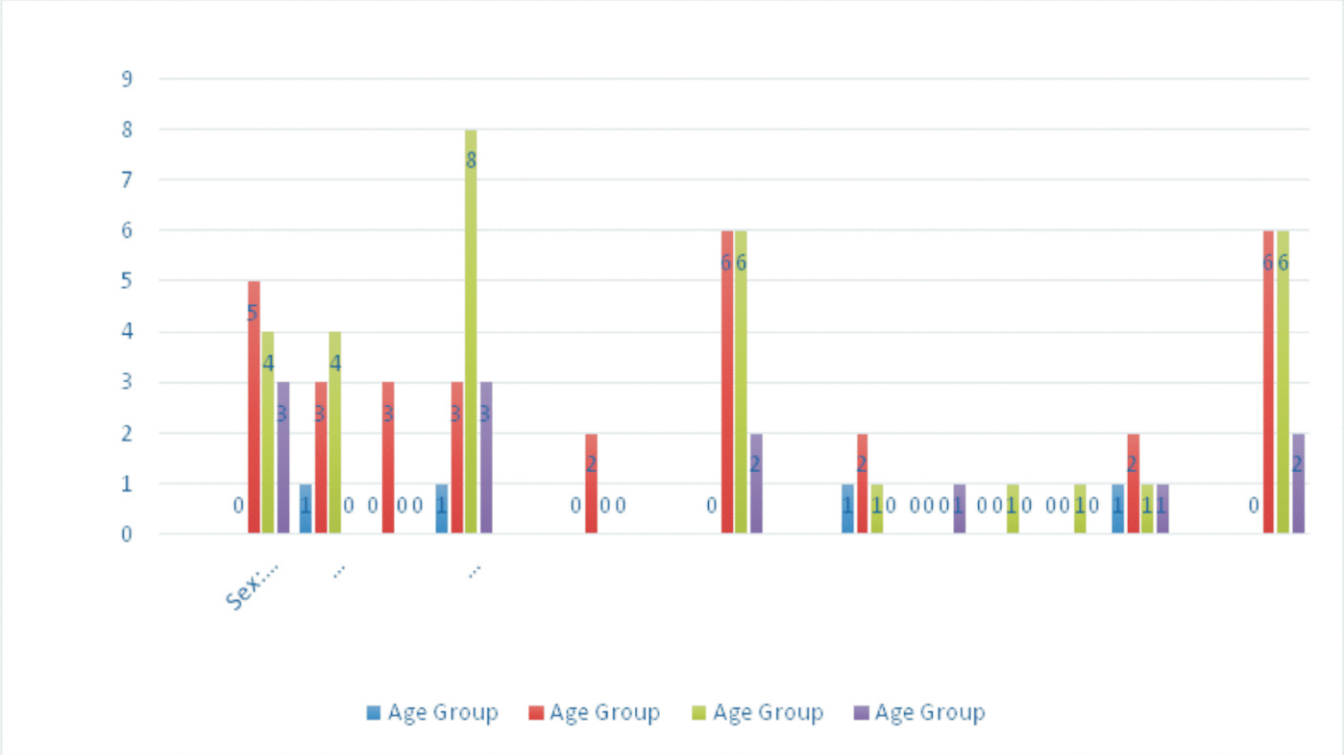
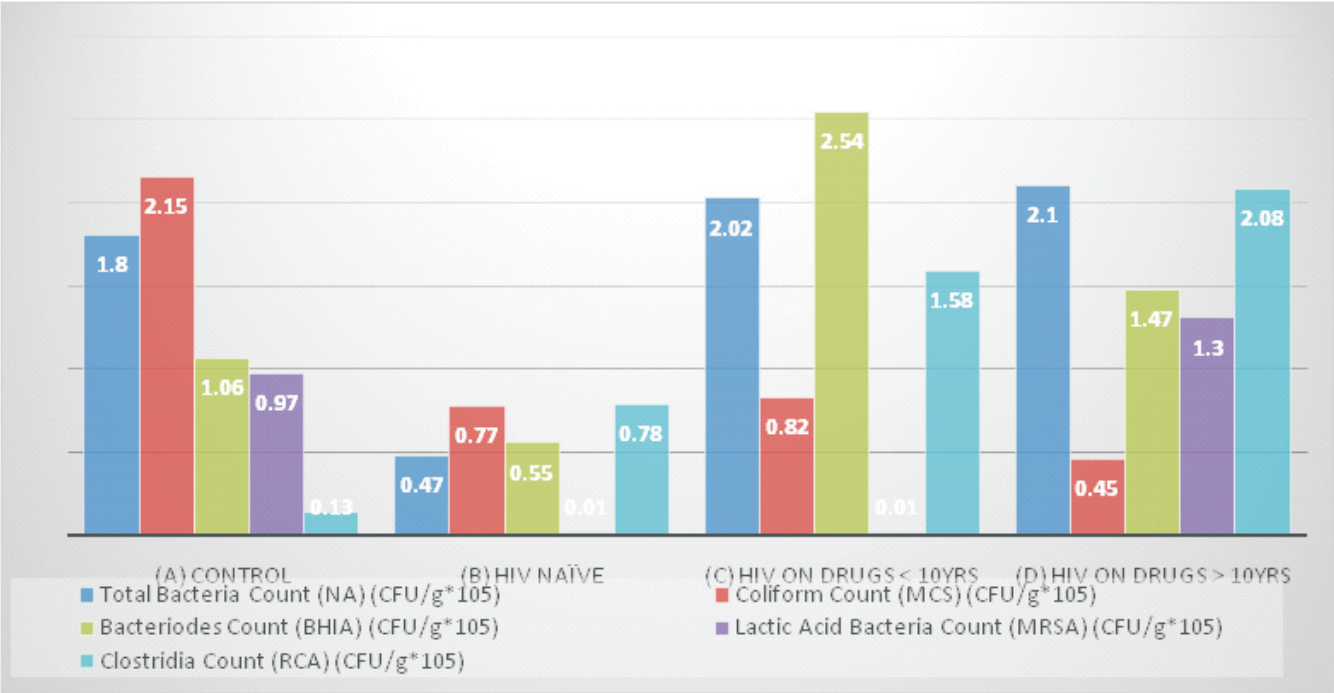


Figure 2: Relative Normal Abundance (Bacterial Load) of Gut Microbiota of HIV patients receiving Antiretroviral Drugs (ART) in Jos University Teaching Hospital.



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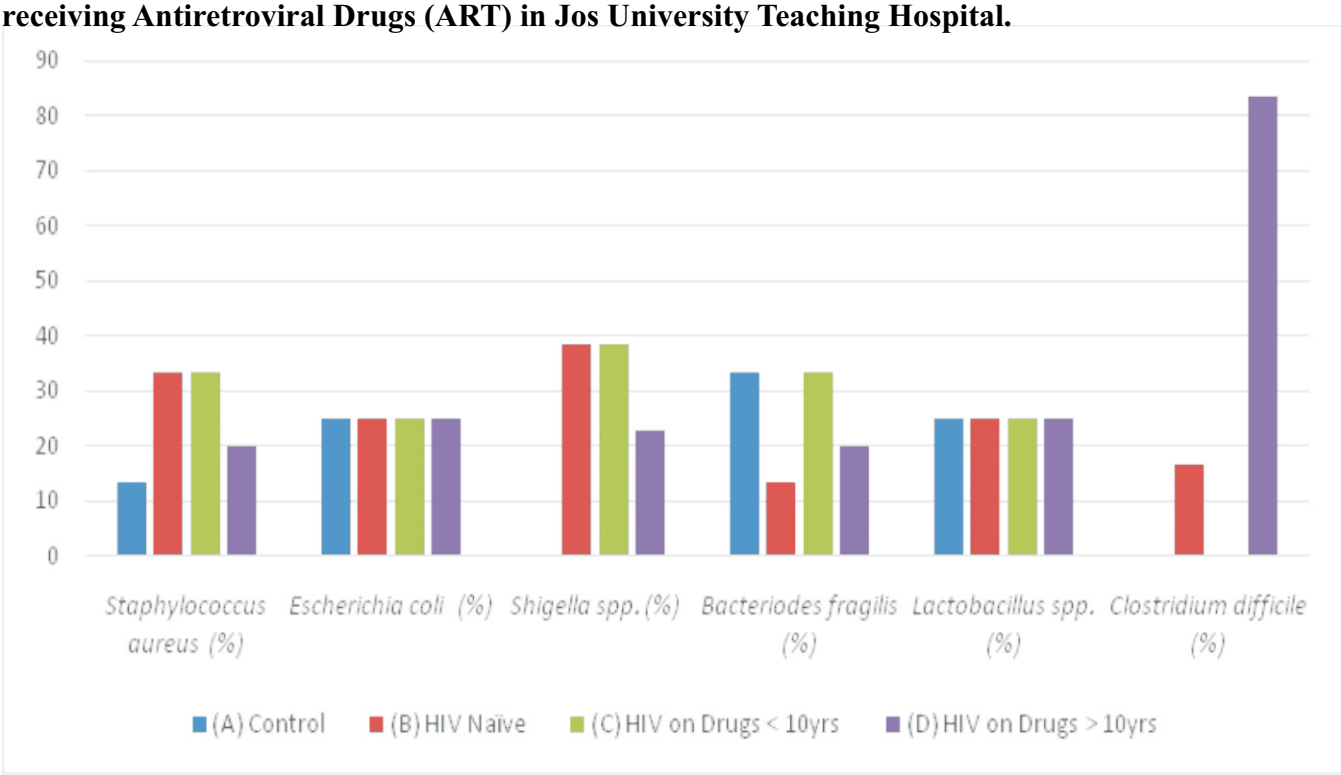

Figure 3: Frequency of occurrence of bacterial isolate from stool sample of some HIV patients receiving Antiretroviral Drugs (ART)

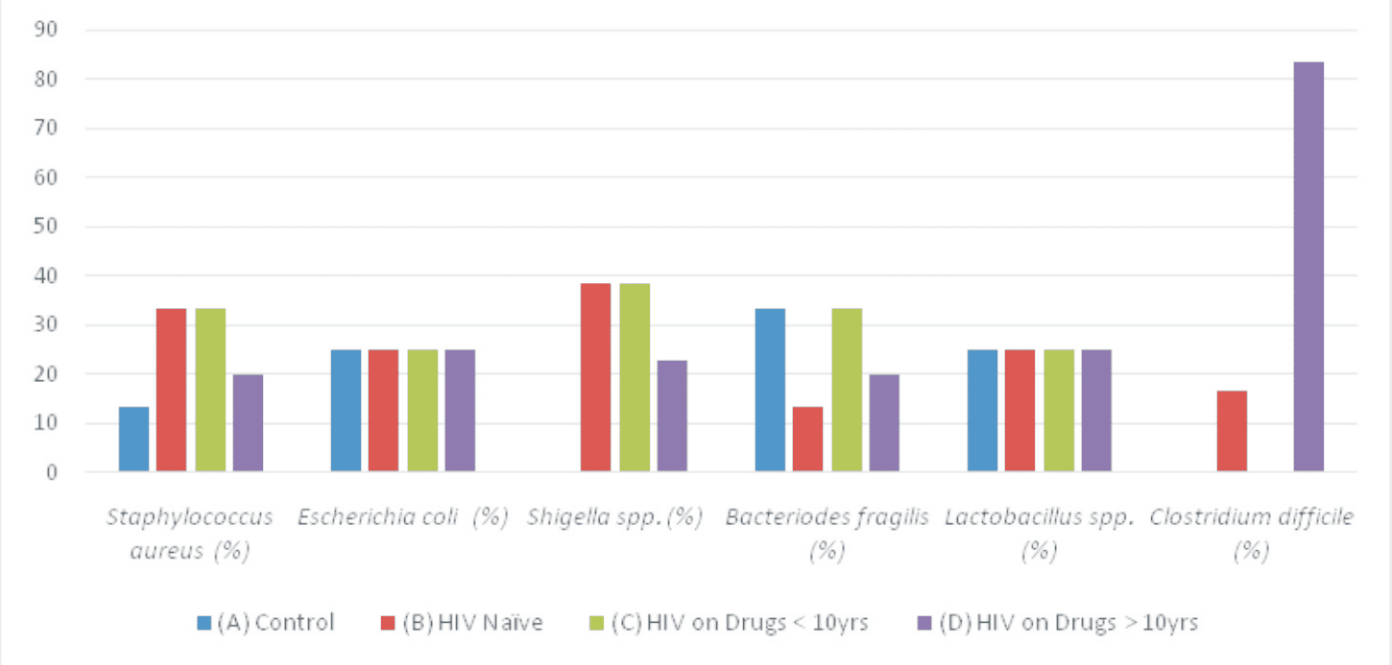

Figure 4:Haematological parameters of some HIV patients receiving Antiretroviral Drugs (ART) Biochemical, immunological and Virological parameters of some HIV patients with respect to parameter tested.

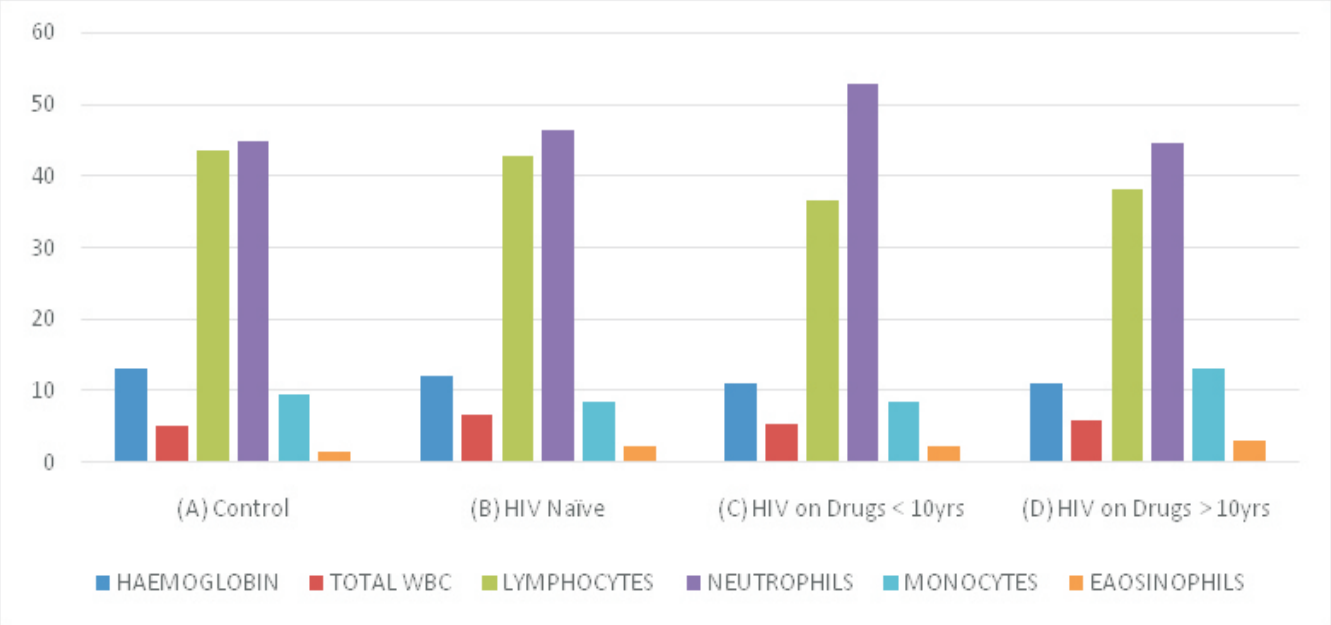

Figure 5:Biochemical, immunological and virological parameters of some HIV patients with respect to parameter tested

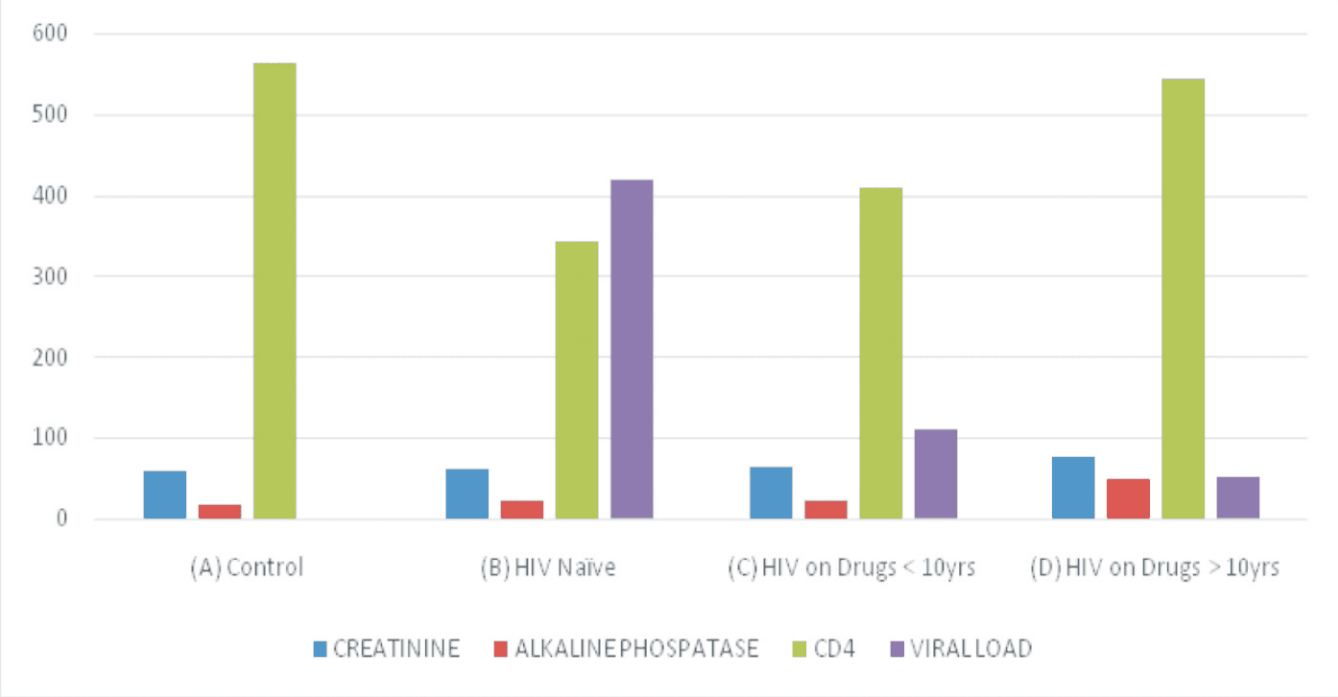

Table 2: Statistical analysis of the bacteria counts using ANOVA

Group of patients	Number	Total Bacteria Count (NA) (CFU/g*10^5)	Coliform Count (MCS) (CFU/g*10^5)	Bacteriodes Count (BHIA) (CFU/g*10^5)	Lactic Acid Bacteria Count (MRSA) (CFU/g*10^5)	Clostridia Count (RCA) (CFU/g*10^5)
(B) HIV Naïve	5	0.244	0.163	0.841	0.252	0.154
(C) HIV on Drugs < 10yrs	5	0.810	0.087	0.610	0.249	0.422
(D) HIV on Drugs > 10yrs	5	0.479	0.029 [a]	0.660	0.689	0.023 [a]

[a]mean difference is significant at the $p<0.05$.

Table 3: Statistical analysis of the Biochemical, Immunological and Virological Parameters counts using ANOVA

GROUP OF PAT IENTS	CREATININE	ALKALINE PHOSPATASE	CD4	VIRAL LOAD
(B) HIV Naïve	0.689	0.550	0.429	0.044*
(C) HIV on Drugs < 10yrs	0.373	0.644	0.062	0.570
(D) HIV on Drugs > 10yrs	0.026*	0.012*	0.011*	0.012*

*mean difference is significant at the $p<0.05$.

Table 4: Statistical analysis of the Haematological Parameters counts using ANOVA

GROUP	HB	TWC	LYMPH	NEU	MONO	EOSIN	BASO	PLAT
(B) HIV Naïve	0.209	0.101	0.879	0.213	0.569	0.379	0.379	0.249
(C) HIV on Drugs < 10yrs	**0.029***	0.798	0.193	0.975	0.496	0.379	0.379	0.208
(D) HIV on Drugs > 10yrs	**0.044***	0.525	0.293	0.799	**0.033***	**0.028***	0.379	0.113

*Mean difference is significant at the $p<0.05$.HB=haemoglogbin; TWC=total white blood cell; LYMPH= lymphocyes; NEU=neutrophil; MONO=monocytes; EOSIN=eosinophil; BASO=basophil; PLAT=platelet.

DISCUSSION:

In this study, we focused on the differences in microbial composition among healthy non-HIV infected controls and those who had HIV, as well as any microbial compositional changes between AIDS development time points with respect to age and year of ART management.

We compared the faecal bacterial microbiome, hematological, biochemical, immunological and viral load parameters among age-matched and period of individuals been on ART. We found that both healthy controls and HIV-infected were colonized by 3 main phyla: Bacteroidetes, Firmicutes and Proteobacteria. This confirmed previous gut phyla characterisations in HIV infection.[5,11,12] Within these main phyla we saw the greatest microbial abundance among the gram-negative genera Prevotella, Bacteroides, and Ruminococcus in both our healthy controls and HIV patients.The Bacteroidetes number (57.7%) while the Firmicutes number (42.2%).The faecal microbiota of individuals on ART for more than ten years exhibited significantly higher relative abundances of Clostridium cluster compared to HIV negative (Fig. 2,3, Table 2). HIV negative individuals had increased Bacteroidaceae

(Bacteroides), (Fig. 2,3, Table 2).

In HIV negative controls, we saw a high total bacterial count but reduced bacteria count in naïve HIV patients with very little changes in patients who had been on drugs. The total bacteria count had the highest (27.7%), Bacteroides counts (24.4%), Clostridia counts (19.8%), coliforms counts (18.2%) while the Lactic Acid Bacteria counts (9.9%). Bacteroides counts was high with HIV patient on drug more than ten years. The Bacteroidetes (coliforms) counts was highest in HIV negative control while the Firmicutes (clostridia) count was highest in HIV patient who are on drugs for more than ten years. The analysis shows a significant decrease in the Bacteroidetes (coliforms) count with HIV progression while a significant rise with Firmicutes (clostridia) with HIV progression. Mouse experiments have supported that a Bacteroides-poor microbiota in the context of a Western diet may have negative health effects.[13]

We enrolled 15 HIV-infected patients naïve and treated with HAART to identify any microbial differences among HIV-negative patients, HAART-treated individuals and healthy controls. The results showed that microbial diversity was increased after HAART; these effects were most apparent as increased levels of Bacteroides, and Faecalibacterium (Fig. 2 and 3). Since HIV-positive individuals suffer from increased incidence of diarrhoea in the absence of obvious enteric pathogens and increased intestinal inflammation.[4,5,11,14] We had expected an expansion of bacteria that increase with other chronic intestinal inflammatory diseases.

The faecal microbiota of HIV-1-infected patients was not completely restored after therapy, no chronically infected individual sampled on ART exhibited a strong shift towards the HIV-negative individuals (Fig.2,3), indicating that short-term ART was insufficient to restore the microbiota. However, the microbiota of individuals treated on ART above ten years for whom we did collect stool and blood samples showed a closer resemblance to HIV-negative individuals than on HIV patients less than ten years of infection (Fig.2, 3). HIV infected individuals on ART less than ten years had significantly higher bacterial count compared to the naïve subjects, the negative subjects and ART patients more than ten years were not significantly different from each other (Table 2).

It is important to note that although the HIV negative individuals presented microbial composition, the bacterial count and blood parameters were extremely low compared to the positive control. It is believed that the concentration is too low to influence the data. Overall, our descriptive study revealed that HIV negative individuals' microbiome showed an increase in the genera Bacteroides, and Ruminococcus compared to HIV naïve and those on drugs.

Consistent with an important role for adaptive immunity in modulating interactions between intestinal bacteria and blood parameters. The analysis of the blood samples also revealed a lot of investigations. There was significant increase in the haemoglobin, packed cell volume and platelets count with HIV progression. Due to the dysbiosis in the gut and likely bacteria translocation that invade the gut, there was also a significant increase of monocytes with HIV progression. To investigate whether disease severity impacted gut microbiota in HIV infection, we determined whether microbiota diversity correlated with peripheral CD4+ T cell count or plasma HIV-1 RNA viral load in 15 individuals with naïve and those who were on ART. As an estimate of divergence from healthy, we calculated the correlation between each HIV microbiota sample and HIV negative control samples. The magnitude of divergence from HIV-negative microbiota samples does not correlated with CD4+ T cell count or plasma HIV-1 RNA viral load (all Spearman correlation p-values > 0.73).

Several studies have suggested that HIV infection results in increased gut permeability and translocation of microbial products into circulation.[15]

The e? ect of HIV infection on the innate arm of the immune system is not well-understood. Acute HIV infection is associated with a dramatic increase in in? ammatory (non-classical CD16+) monocytes.[16,17] This population has been shown to remain elevated throughout the ? rst year of HAART treatment.[5,16,18]Monocytes are susceptible to HIV infection and can serve as a reservoir for latent HIV.[16,17] The reduction in circulating

monocyte numbers could potentially be due to low levels of viral reactivation.[5,16,18]

Recently it was shown that innate lymphoid cells regulate CD4+ T cell responses to intestinal bacteria.[5] CD4+ T cell-microbe interactions are perhaps best understood for Bacteroides fragilis, which is in a genus that consistently and dramatically decreases with HIV infection. Because HIV targets central players of innate and adaptive immunity including CD4+ T cells, monocytes, and macrophages,[10,19]changes in gut microbiota with infection supports that the immune system plays an important role in shaping composition. The CD4+ count was noticed to have increased with HIV progression alongside the markers for the liver (ALT) and kidney (Creatinine) while the viral load decreases. Given these interactions between Bacteroides species and CD4+ T cells, it is of interest that Bacteroides decrease in HIV-positive individuals when CD4+ T cell populations are compromised, suggesting that CD4+ T cell interactions may be essential for persistence of Bacteroides in the gut. Even within the overall compromised T-cell populations of HIV positive subjects, we show that proliferative responses to Bacteroides species are preferentially depleted compared to other species tested.

Microbiota changes with HIV-infection can have several underlying causes including 1) a compromised ability of the innate and/or adaptive immune system to control commensal bacteria, 2) the indirect selection of inflammation-tolerant versus sensitive bacteria resulting from a chronic inflammatory state or 3) a loss of interaction with CD4+ T cells that produce regulatory responses that promote tolerance of beneficial microbes. Although the immunologic driving factors of microbiota changes in HIV-infection are likely to be complex, we began to explore drivers of compositional differences by examining CD4+ T cell and viral load proliferative response to bacteria highly related microbiomes that differed with HIV infection status.

A persistence of an HIV-associated microbiota in some individuals on long-term ART is also consistent with the observation that ART treatment generally does not completely restore CD4+ T cells in blood cell.[5,19] Discordance between CD4+ T cell counts in and the periphery may explain why we did not observe a correlation between peripheral CD4+ T cell count and the degree of divergence in faecal microbiota composition from HIV-negative.

The failure of ART to consistently restore the gut microbiota to a state resembling HIV negative individual is consistent with persistence of gastrointestinal diseases with ART. HIV positive subjects on successful ART remain at greater risk of multiple inflammatory diseases, including atherosclerosis.[18,20,21] The changes we saw in our study are not broadly definitive primarily due to the relatively small sample size. There are still many questions that need to be addressed and further studied. Are the changes we see in the HIV patients due to the changes of integrity in the gut? Are these changes driving HIV progression or dissemination? Or is HIV infection driving these changes?

Limitation of Study:

The sample size is not large enough because of the procedures involve and cost implications since it is a grey area of research.The molecular profiling of the micro-biota among HIV patient would also help in the management of HIV patients.

Conclusions

Understanding gut microbiota alterations associated with HIV-infection and factors that drive these alterations may help explain gut-linked diseases prevalent with HIV. Collectively, the results of our study showed that both healthy controls and HIV-infected were colonized by 3 main phyla: Bacteroidetes, Firmicutes and Proteobacteria. These ?ndings implicated the interactive roles of immunode?ciency and ART for affecting gut microbiota in HIV-1-infected individuals, providing new insights into intestinal microbiome symbiosis related to HIV-1 infection. Immune status and ART were the key factors interactively affecting the gut microbiome in HIV-1-infected individuals with the most of the blood cell marker correlating with the counts of gut microbiota. Future studies will look at molecular profiling of the microbiota among HIV patient would also help in the management of HIV patients.

Competing interests

The authors of this work declare no competing interest.

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