An Assessment of Nutritional Status and Glycemic Control among Type 2 Diabetic Patients Attending Clinic in Wesley Guild Hospital, Ilesa, Osun State

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ABSTRACT

Objective: This study aimed to investigate the anthropometric profile and glycemic status of a population living with diabetes.

Methods: This cross-sectional study included 91 participants with diabetes. Anthropometric measurements, including body mass index (BMI) and waist-to-hip ratio, were assessed. Fasting blood glucose levels were evaluated to determine glycemic control.

Results: The study population exhibited a high prevalence of overweight (62.6%) and obesity (76.9% had an elevated waist-to-hip ratio). A substantial proportion (42.9%) of participants had fasting blood glucose levels above the recommended target range.

Conclusions: The findings of this study underscore the urgent need for comprehensive, multidisciplinary approaches to diabetes care that prioritize the management of modifiable cardiometabolic risk factors, such as overweight/obesity, central adiposity, and hyperglycemia. Integrating anthropometric and metabolic assessments can guide the development of personalized strategies to improve the overall health and well-being of this population living with diabetes.

Keywords: Diabetes, Obesity, Glycemic Control, Cardiometabolic Risk, Anthropometric Assessment

Plain English summary

Diabetes is a complex chronic condition that is often accompanied by comorbidities, such as obesity and suboptimal glycemic control, which can increase the risk of diabetes-related complications.

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INTRODUCTION

Diabetes mellitus, a chronic metabolic disorder, it is a global health concern affecting millions of individuals worldwide with an estimated 537 million adults living with the condition worldwide as of 2021(1).Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from the body's inability to effectively use insulin. Proper glycemic control is crucial for preventing or delaying the

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development of diabetes-related complications. Nutritional status, which encompasses factors such as dietary intake, nutritional status, and body composition, has been identified as a key determinant of glycemic control in individuals with T2DM (2). A systematic review and meta-analysis by Mwamba, Nzaji, Hoff, et al(3) found that a diet high in fruits, vegetables, whole grains, and lean proteins was associated with better glycemic control, as measured by lower haemoglobin A1c (HbA1c) levels. Similarly, a systematic review conducted by Bin-Rakhis, AlDuwayhis, Aleid, AlBarrak, and Aloraini(4) observed that a higher intake of plant-based foods and a lower intake of animal-based foods were linked to improved glycemic control and reduced risk of diabetes-related complications (5).

In Africa, studies have highlighted the challenges faced in managing T2DM due to various socioeconomic and cultural factors (6). Other cross-sectional studies in Africa(7)'(8) found that poor glycemic control was associated with lower educational attainment, irregular medication adherence, and limited access to healthcare services. Another study(9) reported that suboptimal nutritional status, characterized by underweight or overweight/obesity, was a significant predictor of poor glycemic control(10).Nigeria, the most populous country in Africa, has seen a rising prevalence of T2DM in recent years. A study by Adeloye et al. (6) a systematic review and meta-analysis of the prevalence of overweight and obesity in Nigeria found that a majority of T2DM patients had poor glycemic control, which was linked to factors such as low socioeconomic status, inadequate dietary knowledge, and limited access to healthcare resources. Additionally, several other studies conducted in Nigeria (11) has highlighted the need for culturally appropriate dietary interventions and multidisciplinary care approaches to improve glycemic control and nutritional status among Nigerian T2DM patients (1)

Glycemic control is important in managing various health conditions, including diabetes, metabolic syndrome, and cardiovascular disease. While glycated haemoglobin (HbA1c) is commonly used to assess long-term glycemic control, fasting blood glucose (FBG) can provide valuable insight into short-term blood glucose regulation. Additionally, as indicated by body mass index (BMI) and waist-hip ratio (WHR), nutritional status is closely linked to glycemic control and overall metabolic health. Fasting blood glucose is a widely used metric for assessing glycemic control. A cross-sectional study by YimamAhmed et al. (2021) (12) found that higher FBG levels were associated with an increased risk of cardiovascular disease, even in individuals without a diabetes diagnosis. Similarly, a longitudinal study by Sendekie et al. (2022) demonstrated that elevated FBG was a strong predictor of the development of type 2 diabetes, highlighting the importance of maintaining optimal blood glucose levels(13).

Body mass index (BMI) is a common metric used to assess nutritional status and classify individuals as underweight, normal weight, overweight, or obese. Research has consistently shown a strong link between obesity and impaired glycemic control. A systematic review and meta-analysis by Ali et al. (14) reported that obese individuals had a significantly higher risk of developing type 2 diabetes compared to those with a normal BMI. Conversely, a study by Adeloye et al. (6) found that individuals with a healthy BMI had better glycemic control and a lower risk of diabetes-related complications. Waist-hip ratio (WHR) is another important indicator of metabolic health and body fat distribution. A high WHR, indicating abdominal or central obesity, is associated with an increased risk of insulin resistance, impaired glucose tolerance, and type 2 diabetes(15). Essentially, literature has shown that individuals with a high WHR had significantly higher FBG levels and a greater likelihood of undiagnosed diabetes compared to those with a normal WHR (16). This current study aims to contribute to the growing body of evidence on the relationship between patient perceptions and diet in the context of diabetes care.

Objectives of the study

This study assessed the perceived dietary among diabetes patients attending clinics in Wesley Guide Hospital, an affiliate of Obafemi Awolowo University Teaching Hospitals Complex Ile-Ife, Osun State. The specific objectives are set to:

1. investigate the anthropometric indices of the study population
2. find out the anthropometric characteristics of the respondents

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3. ascertain the fasting blood sugar level of the study population

MATERIALS AND METHODS

Design and study population

This is a cross-sectional study conducted at the Wesley Guild Hospital, Ilesa, Osun State, Nigeria. The study population comprised of 91 Type 2 Diabetes patients attending clinics (General Outpatient Department) at the Wesley Guild Hospital, Ilesa.

Study Area and study location

Wesley Guild Hospital, a branch of Obafemi Awolowo University Teaching Hospitals Complex in Ile-Ife, Osun State is located in Ilesa, Osun State, and provides patients with wide ranges of healthcare services and solutions.

Sampling technique

A total of 91 patients with type 2 diabetes were recruited from the Wesley Guild Hospital, Ilesa, General Outpatient Department. Eligible participants were adults (aged 18 years and above) with a confirmed diagnosis of type 2 diabetes, who were willing to participate in the study and provide informed consent.

Instrument and data collection

Anthropometric measurements were done using a bathroom scale for weight measurement, a heightometer for height measurement and a tape rule for waist and hip measurement. Fasting blood glucose levels were evaluated to determine glycemic control using a glucometer. Data were collected from the respondents at the General Outpatient Department of the selected hospital for 6 weeks.

Data processing and analysis

Quantitative data were analyzed using descriptive statistics, including means, standard deviations, and frequencies, to summarize the study outcomes. The data analysis was conducted with the aid of Statistical Package for Social Science (SPSS)

RESULTS

As shown in Table 1, the majority of the participants were Christians (61.5%), followed by Muslims (33.0%), and a smaller proportion practiced traditional religion (5.5%). The study population was predominantly Yoruba (83.5%), with a smaller proportion of Igbo (15.4%) and Hausa (1.1%) participants. This ethnic composition is representative of the regional demographics, where the Yoruba people are the dominant ethnic group in Osun State. with regards to family size and living arrangement, all participants (100.0%) reported having a family size of more than 5 members and living with others, likely in extended family households, which is a common living arrangement in this region. The distribution of nationality and place of residence revealed that all participants (100.0%) were Nigerians. The majority (83.5%) resided in urban areas, while smaller proportions lived in suburban (6.6%) and rural (9.9%) locations. This distribution suggests that the study population was predominantly urban-based, which may have implications for access to healthcare services and resources.

Table 1: sociodemographic characteristics

Item	Response	Frequency	Percentage
Age in years	40 years and below	2	2.2
	41 - 59 years	48	52.7
	60 years and above	41	45.1

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Gender	Male	30	33.0
	Female	61	67.0
Marital status	Single	2	2.2
	Married	75	82.4
	Widowed	13	14.3
	Separated\ Divorced	1	1.1
Religion	Christianity	56	61.5
	Islam	30	33.0
	Traditional	5	5.5
Ethnicity	Yoruba	76	83.5
	Igbo	14	15.4
	Hausa	1	1.1
Family size	>5	91	100.0
Living arrangement	With others	91	100.0
Nationality	Nigerian	91	100.0
Place of residence	Urban	76	83.5
	Suburban	6	6.6
	Rural	9	9.9

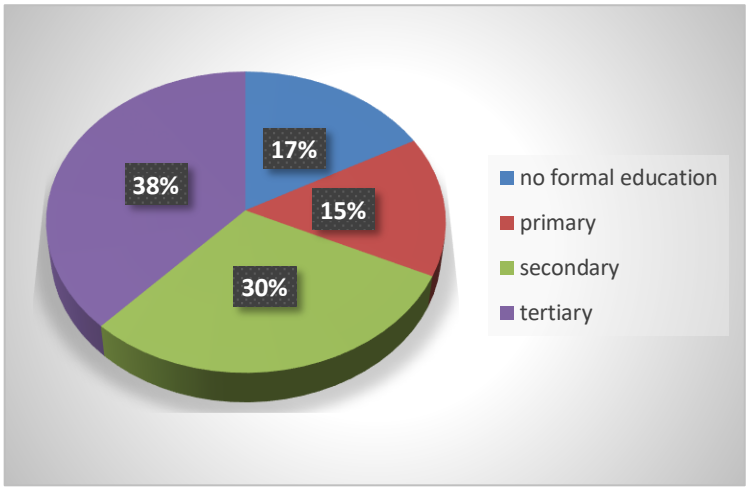

Figure1: Distribution of respondents by educational qualification

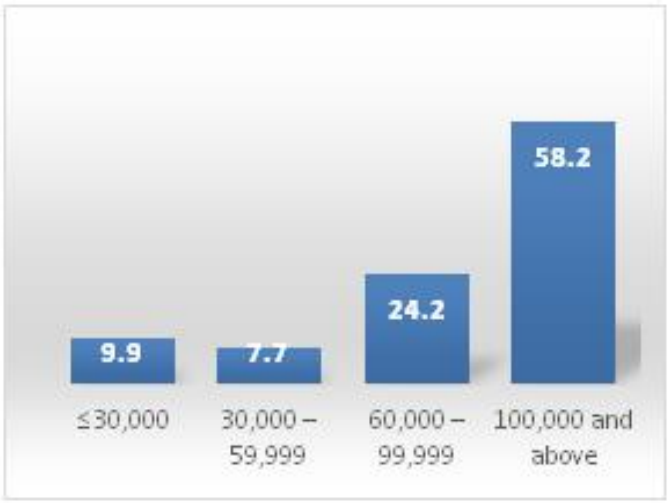

Figure 2: Distribution of respondents by income

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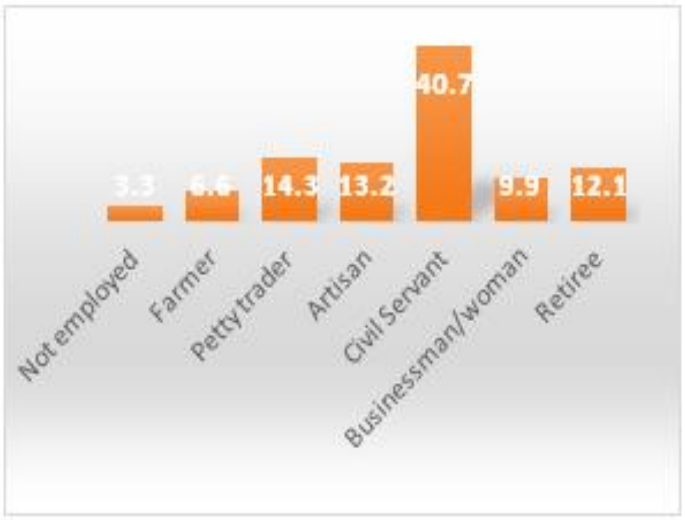

Figure 3: Distribution of respondents by spousal occupation

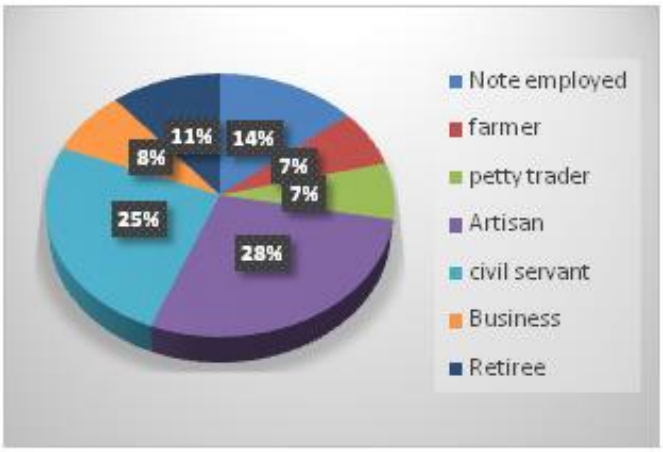

Figure 4: Distribution of respondents by occupation

Figures 1-4 revealed that the educational profile of the participants was diverse, with the highest proportion having tertiary-level education (38.5%), followed by secondary (29.7%), primary (15.4%), and no formal education (16.5%). This suggests a relatively educated study population, which may influence their awareness and understanding of diabetes management. The participants' occupations varied, with the largest groups being civil servants (25.3%), artisans (27.5%), and businesspeople (15.4%). A smaller proportion were farmers (3.3%), petty traders (6.6%), and retirees (14.3%). The majority being civil servants (40.7%), followed by artisans (13.2%), petty traders (14.3%), and businesspeople (9.9%). The study population had a relatively high average monthly income, with the majority (58.2%) earning 100,000 Nigerian Naira (NGN) or more per month. A smaller proportion earned between 60,000 – 99,999 NGN (24.2%), 30,000 – 59,999 NGN (7.7%), or 30,000 NGN or less (9.9%). This suggests that the participants had a relatively high socioeconomic status, which may influence their access to healthcare and ability to adhere to recommended dietary practices.

Table 2: Anthropometric Indices

Item	Response	Frequency	Percentage
BMI (kg/m2)	underweight (<18.5kg/m2)	4	4.4
	normal weight (18.5-24.99kg/m2)	29	31.9
	overweight (25-29.99kg/m2)	57	62.6
	obesity (30kg/m2 or higher)	1	1.1
Waist-ratio	safe: female (0.75-0.85), male (0.85-0.95)	21	23.1
	unsafe: female (> 0.85), male (> 0.95)	70	76.9

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Table 2 shows the Body Mass Index (BMI), the majority of participants were classified as overweight, with 62.6% having a BMI between 25-29.99 kg/m2. A smaller proportion were in the normal weight range of 18.5-24.99 kg/m2 (31.9%), and only a small minority were underweight (BMI < 18.5 kg/m2, 4.4%). The high prevalence of overweight among the study population is concerning, as excess body weight is a major risk factor for diabetes and its complications. As regards Waist-to-Hip Ratio (WHR), Regarding the waist-to-hip ratio, a significant proportion of participants (76.9%) had an "unsafe" WHR, meaning their ratio exceeded the recommended thresholds of 0.85 for females and 0.95 for males. Only 23.1% were within the "safe" WHR range. Elevated WHR is associated with increased abdominal adiposity, which is a strong predictor of cardiometabolic risks in individuals with diabetes.The combination of a high prevalence of overweight/obesity (as indicated by BMI) and a high proportion of participants with an unsafe waist-to-hip ratio suggests that the study population may be at increased risk of diabetes-related complications, such as cardiovascular disease, kidney disease, and neuropathy. These anthropometric findings underscore the importance of implementing comprehensive strategies for weight management, including dietary modifications and increased physical activity, as part of the overall diabetes care and prevention approach for this patient group.The high rates of overweight/obesity and unfavourable body fat distribution highlight the need for a programme that prioritizes healthy lifestyle changes to improve body composition and reduce central adiposity. Closely monitoring and addressing these modifiable risk factors can help mitigate the long-term health consequences associated with diabetes in this population.

Table 3: Anthropometriccharacteristics

Parameter	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Std. Error (Skewness)	Kurtosis	Std. Error (Kurtosis)
Weight (kg)	91	47.5	124	71.4505	15.82439	0.824	0.253	0.624	0.5
Height (m)	91	1.49	1.85	1.6159	0.08146	0.411	0.253	-0.578	0.5
BMI (kg/m^2)	91	17.68	46.67	27.4162	5.98256	0.809	0.253	0.741	0.5

Table 3 shows that the distribution of weight indicated that the mean weight of the participants was 71.45 kg, with a standard deviation of 15.82 kg. This indicates a fairly wide range of weights within the study group. The mean height was 1.62 m, with a standard deviation of 0.08 m. The relatively low standard deviation suggests the heights were fairly consistent across the participants. Also, the mean BMI was 27.42 kg/m2, with a standard deviation of 5.98 kg/m2. This mean BMI value falls into the overweight range, and the relatively high standard deviation indicates a wide distribution of BMI values within the population. The mean waist circumference was 85.04 cm, with a standard deviation of 16.55 cm. This suggests a substantial variability in abdominal adiposity among the participants. The mean hip circumference was 90.11 cm, with a standard deviation of 16.77 cm. Similar to the waist circumference, this metric exhibits a wide range across the study group. The mean waist-hip ratio was 0.95, with a standard deviation of 0.18. A ratio above 0.85 for women and 0.95 for men is considered unhealthy. The high mean value and wide standard deviation indicate that a large proportion of the participants likely had an unfavourable body fat distribution, putting them at increased cardiometabolic risk.In summary, the anthropometric data reveals a population with a high prevalence of overweight/obesity, central adiposity, and impaired glucose metabolism. These factors are closely linked to the development and progression of diabetes and its comorbidities. Implementing a comprehensive lifestyle programme targeting weight management, central fat distribution, and glucose control should be a priority for this patient group to mitigate their elevated cardiometabolic risks.

Table 4: Fasting Blood Sugar

Item	**Response**	**Frequency**	**Percentage**
Fasting Blood Sugar	target range (4-7mmol/l)	52	57.1
	above target range (>7mmol/l)	39	42.9
	Total	91	100.0

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Table 4 reveals the Fasting Blood Sugar Levels. The mean fasting blood glucose level was 7.08 mmol/L, with a standard deviation of 2.32 mmol/L. This mean value is above the normal fasting blood glucose range, suggesting the presence of hyperglycemia or impaired glucose regulation in the study population. It shows that 57.1% of participants had fasting blood sugar levels within the target range of 4-7 mmol/L.42.9% of participants had fasting blood sugar levels above the target range (>7 mmol/L).This breakdown of the fasting blood sugar data is concerning, as it indicates that a significant proportion (42.9%) of the study population had inadequate glycemic control, with blood glucose levels in the hyperglycemic range.Elevated fasting blood sugar levels, particularly those exceeding 7 mmol/L (126 mg/dL), are associated with an increased risk of diabetes-related complications, such as diabetic retinopathy, nephropathy, neuropathy, and cardiovascular disease. The high prevalence of participants with suboptimal glycemic control underscores the need for intensive diabetes management to help this patient group achieve and maintain recommended blood glucose targets. Strategies to improve glycemic control may include reinforcing patient education on the importance of consistent medication, self-monitoring of blood glucose, and dietary/lifestyle modifications. Optimizing medication regimens and dosing to better manage hyperglycemia. Providing access to diabetes self-management support, including nutrition counseling and physical activity programs. Closely monitoring blood glucose levels and adjusting treatment plans accordingly.

DISCUSSION

The present study provides valuable insights into the anthropometric profile and glycemic status of a population living with diabetes in the study area. Obesity and Abdominal Adiposity: from the findings, a concerning trend emerged, with a high prevalence of overweight (62.6%) and obesity among the study participants. Furthermore, a large proportion (76.9%) exhibited an unfavourable body fat distribution, as indicated by an elevated waist-to-hip ratio. These findings are consistent with recent reports highlighting the growing burden of obesity and central adiposity in populations with diabetes. Excessive body weight and abdominal fat deposition are major risk factors for insulin resistance, poor glycemic control, and an increased risk of diabetic complications. A systematic review and meta-analysis published in 2022 found that individuals with diabetes and obesity had a significantly higher risk of developing microvascular and macrovascular complications, including diabetic neuropathy, nephropathy, and cardiovascular disease, compared to those with diabetes and a healthy weight(17),(18). According to Ekpor et al., (2023) high prevalence of overweight and obesity was reported to be 35.6% and 25.6% respectively in African type 2 diabetes patients(19). It was also reported in a recent research that most type 2 diabetes patients are obese, and had percentage of body fat that is high or abnormal fat distribution. This is said to be related to the pathophysiology of diabetes mellitus(20)

Similarly, a 2021 study demonstrated that a higher waist-to-hip ratio was associated with a greater likelihood of developing diabetic retinopathy, an important cause of vision loss in people with diabetes(7). The results of the findings of this research on obesity and overweight could be adduced to the occupation and lifestyle of the respondents, as 40.7% were civil servants whose activity profile were likely sedentary in nature. This is in line with a study in Nigeria that reported that some civil servants sit down for 3-7 hours while working daily and this predisposed them to certain health challenges (21). Likewise 12.2% were retired, whose daily activities rate could have reduced thus increasing the possibility of weight gain. These findings underscore the critical need for targeted weight management and body fat distribution in this high-risk population.

A substantial proportion (42.9%) of the study participants had fasting blood glucose levels above the recommended target range. Persistent hyperglycemia is a well-established driver of microvascular and macrovascular complications in diabetes, including diabetic retinopathy, nephropathy, and cardiovascular disease(22). It was reported in 2020 that 60.4% of the respondents had good glycemic control status in a research study (23). On the contrast, another study reported that 73.75 % percent of the patients had poor glycemic control (24). A 2022 review article highlighted the importance of optimal glycemic control in reducing the risk of diabetes-related complications(25). The authors emphasized that maintaining fasting blood sugar levels within the recommended range can significantly decrease the incidence of microvascular complications, such as diabetic kidney disease and neuropathy(26). Additionally, a 2020 study found that individuals with diabetes and poor glycemic control had a higher risk of developing cardiovascular events, including myocardial infarction and stroke, compared to those with well-controlled blood glucose levels(27).

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The differences in these findings might be due to study population; this present study had its participants from tertiary hospital setting. These centres are known for managing acute and complicated cases for whom achieving good glycemic control might still be a huge challenge.

The concurrent evaluation of anthropometric parameters and glycemic status provided a comprehensive understanding of the cardiometabolic risk profile in this population with diabetes(28). The high prevalence of overweight/obesity, central adiposity, and suboptimal glycemic control highlights the importance of routinely assessing these interrelated factors as part of the clinical management of diabetes. A 2021 study emphasized the value of integrating anthropometric and metabolic assessments in the risk stratification of individuals with diabetes(29). The authors found that the combined evaluation of BMI, waist circumference, and HbA1c levels improved the prediction of cardiovascular disease and all-cause mortality compared to individual risk factors(29).

CONCLUSION

The findings of this study emphasize the critical importance of adopting a holistic, patient-centred approach to diabetes management that prioritizes the comprehensive assessment and targeted management of modifiable cardiometabolic risk factors. By integrating these strategies, healthcare providers can empower individuals with diabetes to achieve optimal health outcomes and reduce the burden of diabetes-related complications.

Declaration

Ethical approval and consent to participate

The study protocol was approved by the hospital's ethical clearance committee (protocol number **ERC/2022/09/05**). All participants provided written informed consent before enrollment. Confidentiality and anonymity of participants were maintained throughout the study.

Consent for Publication

Availability of data and materials

The data generated and analysed in this study are available from the corresponding author upon request

Competing interests

The authors declared no conflict of interest

Funding

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Authors contributions

Oluwadamilare Priscilla Oluwaseun designed the study, Oluwadamilare Priscilla Oluwaseun and Oluwadamilare Faith Oluwadarasimi did literature review and manuscript writing, Opele Jacob Kehinde performed data analysis, Oluwadamilare Priscilla Oluwadamilare wrote the initial draft, Dada Israel Olanrele, Alebiosu Ibidayo A and Ogbonna Obinna C reviewed the draft while the final draft was approved by Dada I.O, Alebiosu Ibidayo.A, Ogbonna Obinna.C, Opele Jacob Kehinde, Oluwadamilare Faith Oluwadamilare and Oluwadamilare Priscilla Oluwaseun.

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