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Pattern of Dyslipidaemia and Obesity among Diabetic Patients Attending a Specialist Care Facility in South-Eastern Nigeria: A Five-Year Review

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ABSTRACT

Background: Diabetes mellitus is frequently associated with dyslipidaemia and obesity, key metabolic abnormalities that heighten cardiovascular risk. Understanding their patterns among diabetic patients is critical for targeted interventions. This study therefore set out to determine the prevalence and pattern of dyslipidaemia and obesity among diabetic patients attending a specialist care facility in South-Eastern Nigeria over a 5-year period.
Methods: This retrospective cross-sectional study reviewed 215 medical records of diabetic patients who attended Specialist Care facility in Nnewi, South-Eastern Nigeria between April 2018 and March 2023. Data on lipid profile and body mass index (BMI) were extracted and analyzed using SPSS version 25. Descriptive and inferential statistics were applied, with $p \leq 0.05$ considered significant.
Results: Of the 215 patients (mean age = 58.9±13.7 years; 52.6% male), 69.8% had dyslipidaemia and 31.6% were obese. The most prevalent lipid abnormality was low HDL-C (87%), followed by high LDL-C (70.2%), high triglyceride (55.8%), and high total cholesterol (53%). Overweight (43.3%) was also common. No significant associations were found between age, gender, or marital status and the presence of dyslipidaemia or obesity ($p>0.05$).
Conclusion: A high burden of dyslipidaemia and obesity exists among diabetic patients in this setting, with low HDL-C being the most common lipid abnormality. Routine lipid monitoring and lifestyle-based interventions are recommended to reduce cardiovascular risk in diabetic populations.

Keywords: Diabetes mellitus, Dyslipidaemia, Obesity, Cardiovascular risk, Nigeria

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from impaired insulin secretion, insulin action, or both. The chronic elevation of blood glucose is associated with long-term damage, dysfunction, and failure of various organs, particularly the eyes, kidneys, nerves, heart, and blood vessels. [1,2] According to the International Diabetes Federation (IDF), approximately 463 million adults aged 20–79 years were living with diabetes in 2019, representing a global prevalence of 9.3%.[3] The burden of diabetes continues to rise, particularly in developing countries, due to urbanization, lifestyle changes, and increased obesity prevalence.[4-6]

Among the major metabolic abnormalities observed in diabetes, dyslipidaemia and obesity stand out as key contributors to cardiovascular morbidity and mortality.[7-9] Dyslipidaemia in diabetes is typically characterized by elevated plasma triglycerides, low high-density lipoprotein cholesterol (HDL-C), and an increased proportion of small dense low-density lipoprotein cholesterol (LDL-C) particles, a pattern often referred to as atherogenic diabetic dyslipidaemia.[10,11] These lipid abnormalities arise from insulin resistance, which increases free fatty acid flux and alters hepatic lipid metabolism.[12] Dyslipidaemia contributes significantly to the development of atherosclerosis, thereby increasing the risk of coronary artery disease, stroke, and peripheral vascular disease in diabetic patients.[13]

Obesity, defined as excessive accumulation of body fat that presents a risk to health, is another critical factor linked with diabetes and dyslipidaemia.[14] The World Health Organization (WHO) defines overweight as a body mass index (BMI) ≥25 kg/m² and obesity as BMI ≥30 kg/m².[15] Central (abdominal) obesity, measured using waist circumference or waist-to-hip ratio, is more strongly correlated with metabolic risk than general obesity.[16] Obesity induces insulin resistance and promotes a pro-inflammatory state, which worsens glycaemic control and lipid abnormalities.[17] Studies have shown that obese individuals, especially those with central obesity, have higher triglyceride levels, lower HDL-C, and increased LDL-C, thereby compounding cardiovascular risk.[18,19]

The coexistence of diabetes, dyslipidaemia, and obesity has been recognized as a major driver of cardiovascular disease worldwide.[20,21] In sub-Saharan Africa, the prevalence of diabetic dyslipidaemia has been reported to range between 65% and 90%.[22-24], while obesity among diabetic patients remains markedly high, influenced by dietary patterns, physical inactivity, and urbanization.[25,26] In Nigeria, studies have shown that reduced HDL-C and elevated triglycerides are the most prevalent lipid abnormalities among patients with type 2 diabetes; however, regional variations exist due to genetic, environmental, and lifestyle factors, underscoring the need for local data to inform effective intervention strategies.[27,28] There is limited evidence on the pattern of dyslipidaemia and obesity among diabetic patients in South-Eastern Nigeria, hence the need for this study. Understanding these patterns is crucial for early detection and management of cardiovascular risk among diabetic patients. Therefore, this study aims to determine the pattern of dyslipidaemia and obesity among diabetic patients attending a specialist care facility in South-Eastern Nigeria, with a view to providing data that could guide targeted interventions to reduce the burden of cardiovascular complications in this population.

MATERIALS AND METHODS

Study Area

This study was carried out in Ojiofor Specialist Hospital, a tertiary healthcare facility located at Nnewi Ichi, Nnewi North Local Government, Anambra State. It was established on 5th September, 2006 and operates on 24 24-hour basis. It is an Endocrinology Centre with specialists who specialize in the management of conditions

such as diabetes and its complications, thyroid disorders, endocrine diseases, and other chronic medical diseases. Nnewi is the second largest city in Anambra state with a land area of over 200 square miles (520km^2) and a population of 391,227 according to the Nigerian census of 2006 with an estimated population of 1,176,550 in 2022, with an estimated annual population growth of 5.66%.[29,30]

Study Design

A descriptive cross-sectional retrospective study design was used for this study.

Study Population

The population for this study comprised all diabetic patients aged greater than 18 years who presented to the facility between 1st of April, 2018, and 31st of March, 2023.

Inclusion Criteria

All adult diabetic patients who presented to the facility within the study period and whose medical records were available and complete for the study.

Exclusion Criteria

Pregnant women and paediatric patients with diabetic mellitus, those patients within the study period whose medical records were not available for study and analysis, and those with incomplete data for the research in their case files.

Sample Size Determination

A total population retrospective study of all the records of adult diabetic patients that presented to the facility within the study period and met the inclusion criteria were taken.

Research instrument.

A well-structured data collection tool (proforma) was designed and used to collect relevant data from the patient's case files.

Training of research assistants.

Two research assistants (Clinical Medical Students of Nnamdi Azikiwe University) were recruited and trained on how to extract required information from patients' case files using the proforma checklist that was given to them.

Data collection.

Permission was obtained from the Chief Medical Director and the head of the records department of the facility. Case files of the adult patients diagnosed with diabetes mellitus were identified, studied and the required information retrieved.

Data analysis.

The data obtained were arranged, inspected, cleaned, entered, coded and analysed using International Business Machines- Statistical Package for Social Sciences (IBM-SPSS) version 25. Categorical variables were summarized using percentages and proportions, while numerical variables were summarized using mean and standard deviation. The association between categorical variables was done using chi-square (or Fisher's exact test, where appropriate). The P-value of <0.05 with a confidence level of 95% was considered statistically significant.

RESULTS

Out of the 253 folders that were reviewed of all diabetic patients who presented to the facility between April, 2018 and March, 2023, 215 patients had complete records and were included in this study.

Table 1: Socio-demographic Characteristics

Variable	Frequency(n=215)	Percentage (%)
Age (Years)		
20-40	24	11.2
41-60	88	40.9
61-80	94	43.7
>80	9	4.2

Gender		
Male	113	52.6
Female	102	47.4
Marital status		
Single	7	3.3
Married	208	96.7

Table 1 summarizes the socio-demographic characteristics of the respondents. Their ages ranged from 22 to 92 years with a mean age of 58.89 ±13.74 years. Majority of the respondents (43.7%) were in the age range of 61-80 years and married (96.7%). Males constituted 52.6% while female made up 47.4%.

Table 2: Proportion of Dyslipidaemia and Obesity among Diabetic Patients

	Frequency(N=215)	Percentage (%)
Atherogenic Dyslipidemia		
Yes	150	69.8
No	65	30.2
Body Mass Index (kg/m^2)		
<30 (Not Obese)	147	68.4
≥30 (Obese)	68	31.6

Table 2 shows that 150(69.8%) out of 215 patients fulfilled the atherogenic criteria hence were dyslipidemic. 68 (31.6%) out of 215 patients fulfilled the World Health Organization criteria hence were obese.

Table 3: Pattern of Dyslipidaemia among Diabetic Patients

Parameters		Frequency(N=215)	Percentage (%)
Total cholesterol	Below 5.17	101	47
	Above 5.17	114	53
Triglyceride	Below 1.7	95	44.2
	Above 1.7	120	55.8
HDL-C	Below 1.03	187	87
	Above 1.03	28	13
LDL-C	Below 3.36	64	29.8
	Above 3.36	151	70.2

Table 3 shows that the most prevalent dyslipidemia was low HDL-C ($n = 187$, 87%), followed by high LDL-C ($n = 151$, 70.2%), high Triglyceride ($n = 120$, 55.8%) and high Total Cholesterol ($n = 114$, 53%).

Table 4: Pattern of Obesity among Diabetic Patients

Weight status	Body Mass Index(kg/m^2)	Frequency(N=215)	Percentage (%)
Underweight	<18.5	2	0.9
Normal Range	18.5 - 24.9	52	24.2
Overweight	25.0 - 29.9	93	43.3
Obese class I	30.0 - 34.9	54	25.1
Obese class II	35.0 - 39.9	5	2.3
Obese class III	>40	9	4.2

Table 4 showed that out of all the 215 diabetic patients studied, 52(24.2%) were in their ideal range, 93(43.3%) were overweight, 68 (31.6%) were obese according to WHO classification of obesity.

Table 5: Relationship between Socio-Demographic Factors and Pattern of Dyslipidaemia among Diabetic Patients.

			Frequency n (%)			
		Dyslipidemia	**Normo-lipidemia**	**Total**	**χ^2 test**	**p value**
Age	20-40	20(83.3)	4(16.67)	24(100.00)		
	41-60	54(61.36)	34(38.64)	88(100.00)	5.904	0.116
	61-80	69(73.40)	25(26.60)	94(100.00)		
	>80	7(77.78)	2(22.22)	9(100.00)		
Gender	Male	77(68.14)	36(31.86)	113(100.00)	0.299	0.585
	Female	73(71.57)	29(28.43)	102(100.00)		
Marital status	Married	144(69.23)	64(30.77)	208(100.00)	0.872	0.350
	Single	6(85.71)	1(14.29)	7(100.00)		

Table 5 shows the association between the respondents' dyslipidemic profile and socio-demographic characteristics at the bivariate level using chi-square test of statistical significance. There was no statistically significant association between age, gender, marital status, and pattern of dyslipidemia among the diabetic patients studied.

Table 6a: Relationship between Socio-demographic Factors and Pattern of Obesity (WHO Classification) among Diabetic Patients

		Obesity Pattern (WHO Classification)								
		<18.5	**18.5-24.5**	**25-29.9**	**30-34.5**	**35-39.5**	**>40**	**Total**	**χ^2**	**p value**
Age	20-40	0(0.00)	7(29.17)	8(33.33)	7(29.17)	1(4.17)	1(4.17)	24(100.00)		
	41-60	0(0.00)	20(22.73)	35(39.77)	22(25)	4(4.55)	7(7.95)	88(100.00)	16.176	0.370
	61-80	2(2.13)	24(25.53)	44(46.81)	23(24.47)	0(0.00)	1(1.06)	94(100.00)		
	>80	0(0.00)	1(11.11)	6(66.67)	2(22.22)	0(0.00)	0(0.00)	9(100.00)		
Gender	Female	1(0.98)	26(25.49)	41(40.20)	25(24.51)	2(1.96)	7(6.86)	102(100.00)	4.023	0.546
	Male	1(0.88)	26(23.01)	52(46.02)	29(25.66)	3(2.65)	2(1.77)	113(100.00)		
Marital Status	Married	2(0.96)	49(23.56)	91(43.75)	53(25.48)	4(1.92)	9(4.33)	208(100.00)	6.562	0.255
	Single	0(0.00)	3(42.86)	2(28.57)	1(14.29)	1(14.29)	0(0.00)	7(100.00)		

Table 6b: Relationship between Socio-Demographic Factors and Pattern of Obesity among Diabetic Patients.

		Pattern of Obesity				
		Not obese N (%)	**Obese N (%)**	**Total N (%)**	**χ^2**	**p value**
Age	20-40	15(62.5)	9(37.5)	24(100.00)		
	41-60	55(62.5)	33(37.5)	88(100.00)	16.176	0.370
	61-80	70(74.47)	24(25.53)	94(100.00)		
	>80	7(77.78)	2(22.22)	9(100.00)		
Gender	Male	79(69.91)	34(30.09)	113(100.00)	4.023	0.546
	Female	68(66.67)	34(33.33)	102(100.00)		
Marital status	Married	142(68.27)	66(31.73)	208(100.00)	6.562	0.255
	Single	5(71.43)	2(28.57)	7(100.00)		

Table 6a&6b shows the association between respondents' Body Mass Index and socio-demographic characteristics at the bivariate level using chi-square test of statistical significance. There were no statistically significant association between age, gender, marital status, and dyslipidemia.

DISCUSSION

This was a cross-sectional descriptive study carried out to determine the pattern of dyslipidaemia and obesity among diabetic patients attending a secondary healthcare facility and also to establish relationship (if any) with their socio-demographic characteristics.

Out of the 253 folders that were reviewed of all diabetic patients who presented to the facility between April 1st, 2018 and March 31st, 2023, 215 patients were confirmed diabetic patients with complete records pertaining to this study, and hence were used. The ages of the studied population ranged from 22 to 92 years with a mean age of 58.89±13.74 years. Majority of the respondents were in the age range of 61-80 years and married. Males constituted 52.6% while female made up 47.4%.

Greater proportion of the patients fulfilled the atherogenic criteria, hence were classified as dyslipidemic. This prevalence (69.8%) was similar to the findings in Zaria, North-Western Nigeria by Ohunene et al, where the prevalence was noted to be 69.3%.[27] However, the prevalence of dyslipidemia from this study was slightly higher than what was obtained by Sheth et al in a similar study among urban Western India, where the prevalence was 50.27%.[31]

The prevalence and pattern of dyslipidemia were determined to be low HDL-C ($n = 187$, 87%), followed by high LDL-C ($n = 151$, 70.2%), high Triglyceride ($n = 120$, 55.8%) and high Total cholesterol ($n = 114$, 53%). These were in tandem with the findings by a similar study by Ohunene et al in Zaria, North-Western Nigeria, and by Jisieike-Onuigbo et al in South-East Nigeria.[22, 27]

With regards to the obesity pattern, it was noted that about 52(24.2%) were in their ideal range (18.5-24.9kg/m^2), 93(43.3%) were overweight, and 68 (31.6%) were obese (≥30kg/m^2). The prevalence of obesity in this study was however slightly smaller than what was obtained in the study by Akter et al among Bangladeshi diabetic women of reproductive age, where they reported a prevalence of 48%.[26] There were more female (33.33%) than male (30.09%) obese patients among the studied population. This was in tandem to the study by Misra et al among the urban slum population in northern India, where they noted more prevalence of obesity in females than males.[25] This was also similar to the findings from the study by el-Hazmi & Warsy, in Saudi Arabia where it was found that obesity was more in female than in male.[32] Furthermore, different cultures may have varying norms and attitudes regarding body size and obesity, which can impact obesity prevalence.

There were no statistically significant associations between age, gender and marital status and dyslipidemia in this study. Similar findings were noted by Ohunene et al in their study in Zaria, Northwestern Nigeria, where they stated that there was no relationship between age, gender, and dyslipidemia.[27] However, this contradicts with the result from a similar study in Somali by Gökhan Alıcı and Ömer Genc, where they reported a significant relationship between age, gender, and dyslipidemia.[28]

There were also no statistically significant association between age, gender, marital status and obesity. These contrasted sharply with a study conducted by Jesmin Akter et al among Bangladeshi diabetic women of reproductive age, where they established a significant relationship between age and BMI.[26]

CONCLUSION

A notable proportion of individuals with diabetes experience co-occurring dyslipidemia and obesity, which can amplify the risk of cardiovascular complications and other health outcomes. Effectively managing dyslipidemia and obesity in diabetic patients is essential in reducing the burden of

associated health risks. A comprehensive approach to care, including regular medical assessment, a personalized treatment plan that may include lifestyle modifications, medications, and close monitoring, is crucial. By addressing these co-morbid conditions, healthcare providers can help diabetic patients improve their overall health, reduce complications, and enhance their quality of life. Additionally, public health efforts aimed at diabetes prevention and management should consider the role of dyslipidemia and obesity in the context of diabetic care and prevention.

RECOMMENDATION

The management of dyslipidemia and obesity in diabetic patients is crucial for reducing the risk of cardiovascular complications and improving overall health. We therefore offer the following recommendations:

1. Healthcare workers should encourage and educate diabetic patients on the need for regular medical check-ups, compliance to medications, lifestyle modifications such as healthy diets, smoking cessation, regular physical activity, and weight management.
2. Healthcare providers should develop personalized treatment plans that take into account the unique needs and circumstances of each diabetic patient.
3. The government and policy makers should launch public awareness campaigns to educate diabetic patients, their caregivers, and the general public about impact of dyslipidemia and obesity on diabetes.
4. There should be adoption of multidisciplinary approach to care, involving healthcare providers such as physicians, dieticians, physical therapists, and behavioural counsellors, to provide comprehensive support to diabetic patients.
5. More funding for research on diabetes, obesity and dyslipidemia should be allocated to better understand its prevalence, risk factors, and effective interventions.

Authors' Contributions

This work was carried out in collaboration among all the authors. All authors read and approved the final manuscript.

Declaration by Authors

Ethical Approval: Ethical approval for this study was obtained from the Ethics committee of Nnamdi Azikiwe University Teaching Hospital with ethical approval number NAUTH/CS/66/VOL.16/VER.3/265/2023/190. Permission and approval were sought and obtained from the management of the facility to access the patient's case files. Information obtained from case notes were used only for the purpose of the study and kept very confidential.

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Competing Interests

The authors declare that they have no competing interests.

Conflict of Interest: The authors declare no conflict of interest.

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