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Dyslipidemia among students of a tertiary institution in Ebonyi State: a cross sectional prevalence study

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A B S T R A C T

Introduction: Dyslipidaemia is a medical condition characterized by disorders in lipid metabolism leading to changes or abnormalities in the blood levels of lipids and lipoproteins. The type of food consumed and inactivity and/or reduced physical activities asides from medication and genetics has been widely linked to dyslipidemia. The aim of the study was to determine the prevalence of dyslipidemia among the students of Ebonyi State University, Abakaliki. **Research Methods**: The study was a cross-sectional prevalence study comprising of 200 participants who consented to the study. Fasting blood samples were collected for the estimation of total cholesterol (TChol), triglyceride (TG) and high-density lipoprotein (HDL) while low-density lipoprotein was calculated using Friedewald's equation. Anthropometric data were collected using meter rule, flexible tape and digital scale for calculation of body mass index (BMI) and waist/hip ratio (WHR). **Results:** The prevalence of dyslipidemia was 62%, dominated by HDL dyslipidemia (22%) and TCholdyslipidemia (21%) while other were TG dyslipidemia (11%) and LDL dyslipidemia (8%). The prevalence was higher among females than males. The differences in the levels of cholesterol within and between the different age groups were statistically not significant ($p > 0.05$). The levels of cholesterol were observed to increase with increasing BMI and WHR. **Conclusion**: The findings of this study necessitate the need for increased awareness of healthy feeding habits as well as reduction of BMI and WHR as strategies to prevent lipid-associated complications in old age.

Keywords:*Prevalence, Dyslipidemia, Body Mass Index, Waist-Hip Ratio, Ebonyi State*

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INTRODUCTION

Dyslipidemia could be defined as a medical condition where there is too high or low lipid in the blood[1]. Though a wide range of conditions is implicated in dyslipidemia, the most common are high levels of low-density lipoproteins, high levels of triglyceride, high levels of cholesterol and low level of high-density lipoproteins[2]. Based on causes, dyslipidemia may be categorized into two: (1) primary dyslipidemia which is genetically related, amongst which are familial combined hyperlipidemia, familial hypertriglyceridemia and polygenic hypercholesterolemia (2) secondary dyslipidemia which is associated with lifestyle and medical conditions that interfere with lipid level in the blood over time [3].

Among the most commonly consumed foods in Ebonyi State includes Abacha (African salad) and Okpa (Bambara bean pudding) due to their availability, low cost and nutritional value. These foods have been documented to possess incredible nutrients and loaded with lots of minerals and vitamins[4]. The health benefits associated with these foods include anti-glycemia, healthy bones due to the high content of calcium and phosphorus [5], cancer prevention, boost immune health, promote digestionand preventingglaucoma amongst others [5,6,7]. However, there is a dearth of information on their lipidemic effect.

Dyslipidemia among adolescents has not been fully studied. However, most studies assert that lipid abnormalities in adults are also seen in adolescents [8,9]. Infact, adolescents with dyslipidemia are more likely to develop diabetes mellitus and other related conditions when they become adults[8]. This is not surprising because metabolic abnormalities associated with adulthood such as diabetes mellitus, hypertension, coronary heart disease amongst others begin at adolescence due to increased explorative lifestyle and craving for energy-dense food, rich in fat [10].

We believe that evaluation of blood lipid levels in adolescents will not only determine the prevalence of dyslipidemia but will also open up the possibility of futuristic abnormalities associated with lipid metabolism. Therefore the basic objectives of the study was to evaluate the level of blood lipids including total cholesterol (TChol), high-density lipoproteins (HDL, triglyceride (TG) and low-density lipoproteins (LDL) among students of Ebonyi State University.

RESEARCH METHODS

Study population

The study population was made up of students of Ebonyi State University at different levels of study. The University has four campuses,all within the state capital with an estimated population of20,000 students and over 80% of the students areindigenes of Ebonyi State.

Study design

The study was a cross sectional prevalence study carried out among students of Ebonyi State University between May and October 2021. A total number of 200 students made up of 100 males and 100 females within the ages of 16 and 35 years who consented to the study were recruited. The recruited participants were apparently healthy with no physical signs of sickness. Those on medication known to alter cholesterol balance were excluded from the study. Laboratory analysis was carried out at Ebonyi State University Ultramodern Diagnostic and Research Laboratory within the school premises.

Collection of sample

The participants were instructed to fast overnight prior to the collection of blood samples the next day at 8 am for the analysis. Information on personal data and medical history were collected with the use of self-administered structured questionnaires.

Assessment of anthropometric data

Height and body weight were determined using a meter rule to the nearest 0.1cm and a digital scale to the nearest 0.1kg respectively. A flexible tape rule to the nearest 0.1cm was used to measure the waist circumference at the level of the superior iliac crest at the end of normal expiration and hip circumference. Body mass index (BMI) was calculated as weight in kilogram divided by the square of height in meter. Waist-hip-circumference (WHC) was calculated as waist circumference divided by hip circumference. Grouping of participants based on BMIwere underweight (<18.5), normal weight (18.5 – 24.9), overweight (25 – 29.9) and Obese (> 29.9) [11] and based on WHR, low (≤ 0.80), moderate (0.81-0.85) and high (≥ 0.86) for females and low (≤ 0.95), moderate (0.96 – 1.00) and high (≥ 1.00) for males [11].

Biochemical analysis

Total cholesterol (TChol), high-density lipoprotein (HDL) and triglyceride (TG) were determined by enzymatic colorimetric method (CHOD-PAP and GPO-PAP) using commercial test kits obtained from RANDOX Laboratories Ltd, Crumlin, Antrium, UK. Low-density lipoprotein was calculated by Friedewald's equation [12].

Dyslipidemia was defined according to National Cholesterol Education Programme guideline as TChol level of > 5.2 mmol/L, HDL level of < 1.4 mmol/L, TG level of > 1.7 mmol/L or LDL level of > 3.4mmol/L

Data analysis

Data were presented as mean ± SD after statistical analyses using the statistical package for social science (SPSS) version 22.0 (IBM Statistics 22, Chicago, IL, USA). Student t-test and one-way analysis of variance were used for comparison of the mean difference

Ethical consideration

Ethical approval for the conduct of this study was obtained from the Ethics and Research Committee of the Faculty of Health Sciences and Technology, Ebonyi State University. All ethical precepts regarding research on humans were duly followed

RESULTS

Prevalence of dyslipidemia among the study population

An overall prevalence of 62% was observed comprising of 21%, 11%, 22% and 8% ofTChol, TG, HDL and LDL respectively (Table 1). The table also shows the mean cholesterol level of all the participants and dyslipidemic participants.

Gender-related prevalence of dyslipidemia

As shown in Table 2, more males had an abnormal level ofTChol and TG than the female (22 vs 20 and 18 vs 4 respectively) while the females had more abnormal levels of HDL than the males (34 vs 10). Both genders had an equal abnormal level of LDL. The difference in the level of TChol, TG and HDL between the males and females were statistically not significant ($p = 0.096$, $p = 0.067$ and $p = 0.887$ respectively) while the difference in the level of LDL was statistically significant ($p = 0.022$).

Age related level of serum TChol, TG, HDL and LDL

In table 3,participants within the ages of 26-30 years had the highest TChol (4.81 ± 0.68) and HDL (1.87 ± 1.04) and those within the ages of 31-35 years had the highest level of TG (1.57 ± 0.93) and the highest level of LDL was observed among those in the age group 16-20 years (2.34 ± 0.24). The differences in the levels of all the cholesterols within and between the various age groups were statistically not significant (p = 0.199, p = 0.511, p = 0.877 and p = 0.894 for TChol, TG, HDL and LDL respectively).

BMI related levels of serum TChol, TG, HDL and LDL

In table 4, the obese had the highest level of TChol (5.01 ± 0.51) and LDL (2.82 ± 1.54) while those within normal BMI had the highest level of TG (1.22 ± 0.53) and the underweight had the highest level of HDL (3.03 ± 2.81). The difference in TChol, HDL and LDL within and between the various BMI groups were statistically significant (p = 0.017, p = 0.002, p = 0.002 respectively) while the difference in TG was statistically not significant (p = 0.617).

WHR related levels of serum TChol, TG, HDL and LDL

Females of high WHR had the highest level of TChol (4.58 ± 0.49) and LDL (2.52 ± 0.89), those with low WHR had the highest level of TG (1.18 ± 0.60) and those with high WHR had the lowest level of HDL (1.09 ± 0.56). While the difference in TChol between and within the various WHR groups was statistically significant (p = 0.021), those of TG, HDL and LDL were statistically not significant (p = 0.373, p = 0.535 and p = 0.547 respectively).

Within the male counterpart, those in high WHR had the highest level of TChol (4.75 ± 0.86), TG (1.33 ± 0.81) and LDL (2.61 ± 0.29) and the lowest HDL (1.40 ± 0.73). The difference in all the cholesterols within and between the various parameters were observed to be statistically not significant (p = 0.886, p = 0.871, p = 0.445 and p = 0.718 respectively).

Table1: Prevalence of dyslipidemia among the study population (n = 200)

Variables	**Mean for all participants**	**High Tchol, LDL, TG or low HDL**	
		Mean for dyslipidemia	**Prevalence (%)**
TChol	4.56 ± 0.80	5.53 ± 0.23	42 (21 %)
TG	1.17 ± 0.49	2.22 ± 0.51	22 (11%)
HDL	1.76 ± 1.31	0.79 ± 0.32	44 (22%)
LDL	2.17 ± 1.65	4.11 ± 0.39	16 (8%)
Total			124 (62%)

Table 2: Gender-related prevalence of dyslipidemia among the study population

Parameters (mmol/L)	**Male**	**Female**	**p-value**
TChol	22 (5.61 ± 0.26)	20 (5.45 ± 0.18)	0.096
TG	18(2.01 ± 0.24)	4 (3.14 ± 0.23)	0.067
HDL	10 (0.81 ± 0.16)	34 (0.78 ± 0.35)	0.889
LDL	8 (3.78 ± 0.15)	8 (4.44 ± 0.20)	0.022
	58	66	

Table 3: Age-related difference in the level of TChol, TG, HDL and LDL among the study population

Parameters (mmol/L)	**16 – 20 years (n = 22)**	**21 – 25 years (n = 116)**	**26 – 30 years (n = 56)**	**31-35 years (n = 6)**	**p-value**
TChol	4.60 ± 0.69	4.45 ± 0.86	4.81 ± 0.68	3.12 ± 0.70	0.199
TG	1.14 ± 0.63	1.18 ± 0.45	1.12 ± 0.47	1.57 ± 0.93	0.511
HDL	1.63 ± 0.90	1.76 ± 1.52	1.87 ± 1.04	1.28 ± 0.60	0.877
LDL	2.34 ± 0.24	2.07 ± 1.98	2.33 ± 1.24	2.01 ± 0.38	0.894

Table 3: BMI-related difference in the level of TChol, TG, HDL and LDL among the study population

Parameters (mmol/L)	**Underweight (n = 6)**	**Normal (n = 108)**	**Overweight (n = 60)**	**Obese (n = 26)**	**p-value**
TChol	4.03 ± 1.36	4.53 ± 0.62	4.81 ± 0.69	5.01 ± 0.51	0.017
TG	1.03 ± 0.31	1.22 ± 0.53	1.18 ± 0.49	1.03 ± 0.39	0.617
HDL	3.03 ± 2.81	1.51 ± 0.69	1.66 ± 0.91	1.66 ± 1.10	0.002
LDL	0.58 ± 3.67	2.34 ± 0.72	2.49 ± 1.12	2.82 ± 1.54	0.002

Table 3: WHR-related difference in the level of TChol, TG, HDL and LDL among the study population

Parameters (mmol/L)	**Low**	**Moderate**	**high**	**p-value**

	Female			
	(n = 62)	**(n = 28)**	**(n = 10)**	
TChol	3.68 ± 0.486	4.57 ± 0.73	4.58 ± 0.49	0.021
TG	1.18 ± 0.60	1.13 ± 0.16	0.84 ± 0.23	0.373
HDL	1.38 ± 0.70	1.44 ± 0.36	1.09 ± 0.56	0.535
LDL	2.10 ± 0.23	2.49 ± 0.63	2.52 ± 0.89	0.547
	Male			
	(n = 82)	**(n = 10)**	**(n = 8)**	
TChol	4.65 ± 0.93	4.47 ± 0.61	4.75 ± 0.86	0.886
TG	1.20 ± 0.47	1.25 ± 0.53	1.33 ± 0.81	0.871
HDL	2.29 ± 1.78	1.56 ± 1.02	1.40 ± 0.73	0.445
LDL	1.76 ± 2.33	2.21 ± 1.46	2.61 ± 0.29	0.718

DISCUSSION

The findings of this study showed an overall prevalence of 62% predominated by low HDL (22%) and high TChol (21%).Females were more prone to dyslipidemia than males with a significant difference in LDL ($p < 0.05$). The finding was similar tothe 64% prevalence reported by Gama *et al*. [13], 72% reported by Homma *et al*. [14].Crisieli*et al*.[15], also reported a prevalence of 61% determined by Brazilian Society of Cardiology (BSC) and 28% by NACP diagnostic criteria. The prevalence of dyslipidemia was lower in other studies [16,17]. The predomination of low HDL and high TChol forms of dyslipidemia as observed in the present study strengthen the findings of previous studies [18, 19 and 20].The high prevalence of dyslipidemia recorded in this study could be attributed to the increased sedentary lifestyle and preference of fast foods by the students due to tight academic schedules which may not afford them time to feed of varieties or engage in physical activities such as exercise.

In the present study, females were more prone to dyslipidemia than males. However, high TChol and high TG forms of dyslipidemia were higher among the males while low HDL dyslipidemia was more among the females. The findings of this study support the report of Perez et al. [21],but contradict the report of Bulut et al.[17].Although the study ofBulut et al. [17], was ontype 1 diabetic participants who were within the ages of 3 and 18 years. The higher prevalence of dyslipidemia among females could be due to the effect of estrogen which has been implicated in weight gain [17] as well as differences in dietary habits and reduced physical activities when compared with their male counterparts.

A not statistically significant difference ($p > 0.05$) was observed in the mean difference of the level of various cholesterol among the different age groups. This agrees with the report of Tamunopriye and Iroro[22]. But in the study of Hui-Qin et al. [23], dyslipidemia was observed to associate significantly with age.

Also in the findings of the present, the obese had the highest level of TChol and LDL when compared to participants in other BMI groups. The highest level of HDL was observed among the underweight. With respect to WHR, TChol and LDL were highest in participants of high WHR while females in moderate WHR and males in low WHR had the highest level of HDL. These findings support the established notion that BMI, as well as abdominal obesity reflected by WHR positively, correlate with dyslipidemia [24,23].

As a limitation, we were unable to verify the accuracy of the information provided by the participants in respect of the overnight fasting.

CONCLUSION

In this study, the overall prevalence of dyslipidemia among the students of Ebonyi State University was 62%, dominated by HDL dyslipidemia (22%) and TChol dyslipidemia (21%) while other were TG dyslipidemia (11%) and LDL dyslipidemia (8%). The prevalence was higher in the females than the males, though more males had TChol dyslipidemia and TG dyslipidemia than the females. No significant difference was observed in the level of the various cholesterol among the different age groups. The levels of cholesterol were observed to increase with increasing BMI and WHR. The findings of this study confirm the presence of dyslipidemia among the students and therefore necessitate the need for increased awareness of healthy feeding habits as well as reduction of BMI and WHR as strategies to prevent lipid-associated complications in old age.

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