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The Prevalence of Dyslipidemia in the Niger Delta Region of Southern Nigeria

Daka, I.R.[1*]; Amaewhule, M.N.[2]; Wekhe C.[3]

[1]Department of Pharmacology, Rivers State University, Port Harcourt, Nigeria.
[2]Department of Internal Medicine, Rivers State University, Port Harcourt, Nigeria.
[3]Department of Radiology, Rivers State University, Port Harcourt, Nigeria

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***Corresponding Author**
Daka, I.R.
E-mail: *iyaeneomidaka@gmail.com*

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ABSTRACT

Background: Dyslipidaemia is a general term used to describe high levels of LDL-C, TGs or low levels of HDL. They are major to atherosclerosis and its related conditions such as coronary heart disease, ischemic cerebrovascular disease and peripheral vascular disease. Data are scanty on the prevalence and pattern of dyslipidemia in Nigeria. However, some studies on the subject are now becoming available. . The objective of this study is to assess the prevalence of dyslipidemia in a sub-urban community in Niger Delta region of Southern Nigeria
Method: A cross-sectional study carried out among 107 participants (80 females and 27 males) aged between 23 and 80 years. They were first administered a structured questionnaire to obtain their socio-demographic data and lifestyle characteristics after which anthropometric assessment was performed. Thereafter, their blood pressure was taken and blood samples collected for blood sugar and lipid analysis.
Results: The prevalence of the various components of metabolic syndrome was also accessed and 18 (16.8%) had reduced high density lipoprotein cholesterol, 6 (5.6%) had raised triglyceride.It was found that 70 (65.4%) of the respondents had high blood pressure, 54 (50.5%) had raised blood sugar, 48(44.9%) had abdominal obesity, 31(29.0%) had central obesity. Dyslipidemia was highly prevalent in this geopolitical zone of Nigeria with the consistent pattern being low HDL-Cholesterol and high LDL-C.
Conclusion: Dyslipidemia is highly prevalent in Southern Nigeria and health education to increase awareness of the need for and to actually screen for dyslipidemia will facilitate early detection and treatment.

INTRODUCTION

Hyperlipidemia is a condition that incorporates various genetic and acquired disorders that describe elevated lipid levels within the human body. Hyperlipidemia is extremely common, especially in the Western hemisphere, but also throughout the world. Alternatively, a more objective definition describes hyperlipidemia as low-density lipoprotein (LDL), total cholesterol, triglyceride levels, or lipoprotein levels greater than the 90th percentile in comparison to the general population, or an HDL level less than the 10th percentile when compared to the general population. Lipids typically include cholesterol levels, lipoproteins, chylomicrons, VLDL, LDL, apolipoproteins, and HDL.

Dyslipidemia is a state that arises as a result of abnormalities in the plasma lipids. These abnormalities could be quantitative, qualitative or both. Quantitatively, dyslipidemia is due to elevated plasma total cholesterol (TC), elevated low-density lipoprotein cholesterol (LDL-C), elevated triglycerides (TG) and reduced high-density lipoprotein cholesterol (HDL-C) levels, occurring singly or in combinations. Qualitatively, dyslipidemia implies changes in composition of LDL-C which includes small dense LDL-C, increased TG content or increased electronegativity of LDL-C.

A linear relationship probably exists between lipid levels and cardiovascular risk. Dyslipidemia contributes to the development of atherosclerosis. The atherogenic dyslipidaemic profile is characterized by elevated TG, low HDL-C and a preponderance of small, dense LDL-C particles. This profile is typically associated with the metabolic syndrome and type 2 diabetes mellitus. [1]

The TC, TG, and HDL-C can be assayed while LDL-C is usually calculated. LDL-C constitutes about 60-70% of total serum cholesterol. [2]

There are no rigid numeric definitions of dyslipidemia. [3]

Standardized definitions for dyslipidemia

National Cholesterol Education Program/Adult Treatment Panel III (NCEP/ATP III) Definition [4] : The Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in adults, which is one of the most current and most frequently referenced diagnostic criteria for dyslipidemia, defines dyslipidemia as follows:

- Total cholesterol >5.17 mmol/l (>200 mg/dl)
- LDL-C >3.36 mmol/l (>130 mg/dl)
- HDL-C <1.03 mmol/l (<40 mg/dl) for males, <1.3 mmol/l (<50 mg/dl) for females
- Serum TG >1.7 mmmol/l (> 150 mg/dl).

It further classified the risk associated with various lipid levels as follows:

- LDL-C: mg/dl (mmol/l)
  <100 (<2.58) Optimal
  100-129 (2.58-3.33) Above optimal
  130-159 (3.36-4.11) Borderline high
  160-189 (4.13-4.88) High
  ≥190 (>4.91) Very high
- TC: mg/dl (mmol/l)
  <200 (<5.17) Desirable
  200-239 (5.17-6.18) Borderline high
  ≥240 (>6.20) High
- HDL-C: mg/dl (mmol/l)
  <40 (<1.03) Low
  >60 (>1.55) High
- TG: mg/dl (mmol/l)
  <150 (<3.87) Normal
  150-199 (3.87-5.13) Borderline high
  200-499 (5.17-12.87) High
  >500 (12.90) Very high.

Earlier studies from Nigeria reported that dyslipidemia was rare amongst Nigerians. Onyemelukwe and Stafford in 1981 suggested that protective cholesterol (HDL-C) was significantly higher in tropical Africa, [18] while Kesterloot *et al.* in Benin, South South Nigeria in 1989 showed that blacks had a low prevalence of dyslipidemia. [19]

This review of 13s recent studies showed that dyslipidemia is highly prevalent in Nigeria. All the studies except two defined their subjects using the ATP III criteria. The two other studies used the WHO criteria and the European Atherosclerosis Society criteria respectively.

Apparently healthy Nigerian adults

- Odenigbo and Oguejiofor [20] in 2008 evaluated the prevalence of dyslipidemia in apparently healthy professionals in Asaba, South South Nigeria, using the ATP III criteria. They found a very high prevalence of dyslipidemia (60.0%) with low HDL-C being the commonest pattern of dyslipidemia (60%). Other patterns of dyslipidemia reported were high LDL-C (51%), TC (23%) and TG (5%) levels.
- Agboola-Abu and Onabolu [21] reported high prevalence of dyslipidemia among individuals of upper social class attending Igbinedion Hospital and Medical Research Centre, Okada in South South Nigeria. Most of the subjects (60.4%) had hypercholesterolemia while 22.6% had elevated TG.
- Osuji *et al*. [22] in 2010 studied prevalence of overweight/obesity and dyslipidemia amongst a group of women attending "August" meeting at Naze, Owerri, South East Nigeria and found very high (60.5%) prevalence of dyslipidemia. Low HDL-C was the commonest dyslipidemia

pattern (37.6%). Other patterns were high TG (34.1%) and TC (31.4%) levels.

- Sani *et al*. [23] in 2010 from Katsina, North West Nigeria, cross-sectionally studied modifiable cardiovascular risk factors among apparently healthy adult Nigerians. They found high prevalence of dyslipidemia with low HDL-C being the commonest dyslipidemia (59.3%). Other dyslipidemia patterns were high TC (28.3%), LDL-C (25.7%) and TG (15.0%) levels.

The elderly

- Odenigbo and Oguejiofor [24] in 2010 studied the prevalence of dyslipidemia in elderly subjects in Asaba, Delta State, South South Nigeria. This cross-sectional study involved 176 subjects recruited sequentially from attendees to the quarterly medical lectures of the Ebreme foundation, a nongovernmental organization (NGO). Dyslipidemia was highly prevalent (69.9%) with elevated LDL-C being the commonest and low HDL-C being the least common dyslipidemias. Elevated LDL-C was found in 60.9% of males and 62.1 % of females, elevated TC in 44.5% of males and 51.5% of females, high TG in 12% of males and 16.4% of females, and low HDL-C in 10.9% of males and 1.5% of females.

Diabetic subjects

- Jisieike-Onuigbo, Unuigbe, Oguejiofor *et al.* in 2010 evaluated the prevalence of dyslipidemia among adult diabetic subjects with overt diabetic nephropathy in Anambra State, South East Nigeria using the WHO criteria. They reported very high prevalence of dyslipidemia with hypertriglyceridemia being the commonest dyslipidemia (66.7%). Other dyslipidemias were elevated TC (62.5%), reduced HDL-C (58.3%), and elevated LDL-C (45.8%).
- Ogbera, Fasanmade, Chinenye *et al*. [25] in 2009 "characterized lipid parameters in Diabetes Mellitus in Nigeria." This collaborative report from three tertiary centers in Nigeria-Lagos State University Teaching Hospital (LASUTH), Lagos University Teaching Hospital (LUTH),and University of Port Harcourt Teaching Hospital (UPTH) revealed extremely high prevalent rates of dyslipidemia (89.0%) with elevated LDL-C (74.0%) and low HDL-C (53.0%) being the commonest dyslipidemia. Other patterns were high TC (42%) and TG (13%) levels.
- Okafor, Fasanmade, and Oke [26] in 2008 studied the pattern of dyslipidemia among Nigerians with type 2 diabetes mellitus presenting to LUTH, Lagos, South West Nigeria, using ATP III criteria. Prevalence of dyslipidemia was extremely very high (89.1%) with low HDL-C being the commonest dyslipidemia (88%) and high TG levels the least (25.0%). Other patterns were elevated LDL-C (58.9%) and TC (55.2%) levels with combined dyslipidemia (64.5%).
- Idogun, Unuigbe *et al*. [27] in 2007 from Benin, South South Nigeria assessed serum lipids in Nigerians with type 2 diabetes mellitus complications using ATP III criteria. Prevalence of dyslipidemia was between 25% and 69% with combined dyslipidemia (high TC and TG levels) being common. Dyslipidemia was highest in patients with diabetic nephropathy.
- Agaba *et al*. [28] from North Central Nigeria also reported high prevalence rate of dyslipidemia in type 2 diabetes mellitus subjects with the commonest patterns being high TC (43.5%) and TG (34.8%) levels.

Hypertensive subjects

- Akintunde *et al*. [29] in 2010 studied dyslipidemia among newly diagnosed hypertensives (pattern and clinical correlates) in Osogbo, South West Nigeria. Dyslipidemia was highly prevalent overall (58.9%)-Isolated dyslipidemia (41.1%) and combined dyslipidemia (17.8%). Low HDL-C was the commonest dyslipidemia (47.9%). Other patterns were high LDL-C (23.3%), TG (15.3%) and TC (8.6%) levels.
- Ojji *et al.* in 2009 [30] from Abuja, North Central Nigeria studied prevalence of dyslipidemia in normoglycemic subjects with newly diagnosed hypertension using ATP III criteria. Dyslipidemia was prevalent with low HDL-C being the commonest dyslipidemia (45.8%). Other dyslipidemias were high LDL-C (17%), TC (11.1%), and TG (7.6%) levels.

Diabetic hypertensive

- Isezuo *et al*. [31] from Sokoto, North West Nigeria did a comparative analysis of lipid profiles among patients with type 2 diabetes mellitus, hypertension, and concurrent type 2 diabetes mellitus and hypertension, using the European Atherosclerosis Society criteria. Dyslipidemia was common with the most frequent pattern being elevated TG (31.1%) and TC (20.8%) levels. They reported that dyslipidemia did not differ significantly among the three groups and that concurrent diabetes mellitus and hypertension do not result in excess hyperlipidemia than when either condition occurs alone

Impact of dyslipidemia

Dyslipidemia is a common disorder but most patients are not diagnosed and therefore not treated. [7] The burden of the condition is very high in terms of morbidity, mortality, and medical costs. Dyslipidemia is the second most prevalent cardiovascular risk factor. [8] Hypertriglyceridemia when associated with high LDL-C significantly increases the risk of coronary heart disease (CHD). [9] WHO estimates in 2002 [10] showed that dyslipidemia accounted for 18% of ischemic heart disease, 56% of stroke, and more than 4 million deaths per year globally. Dyslipidemia together with CHD are leading causes of death for both men and women of all races and ethnicities in the United States of America. [11] Epidemiologic data show a continuous graded relationship between the total plasma cholesterol concentration and coronary risk, especially for younger men below the age of 40 years. [12] The age-standardized and sex-standardized mortality ratios in patients with hypercholesterolemia are 4-5 times higher than those in the general population. [13] A decline in plasma TC has significant impact on the morbidity and mortality rate from heart diseases, especially in patients at higher risk. [14] Longitudinal studies have demonstrated that reducing plasma TC by 1% decreases CHD mortality by 2-3%. [15]

Meta-analysis of 38 primary and secondary prevention trials also demonstrated that for every 10% reduction in plasma TC, CHD mortality is reduced by 15% and total mortality risk by 11%. [16] Incidence of dyslipidemia is highest in patients with premature coronary artery disease (defined as coronary artery disease occurring before 55-60 years of age in men and before 65 years of age in women). In this group of individuals, prevalence of dyslipidemia is as high as 75-85%, compared to approximately 40-48% in age-matched controls without CAD. [17]

In Nigeria, few studies have been done to describe the prevalence, pattern, and distribution of dyslipidemia in various parts of the country. This study seeks to describe the prevalence of dyslipidemia in the Niger Delta region of Southern Nigeria.

METHODOLOGY

This is a cross-sectional, descriptive, community-based study is to be carried out using a total of 107 adults; in Amadi-ama and Fimie communities in Port-Harcourt City Local Government Area of Rivers state, in Southern Nigeria. Approval for this study was obtained from the Ethics Committee of the Rivers State Ministry of Health, Port-Harcourt.

The participants were all apparently healthy adults aged between 20-80 years and were chosen via convenience sampling.The communities were initially sensitized about this study via town criers and church announcements and those that met the inclusion criteria were told to meet in the to meet in church halls for screening. All the individuals who gave their consent were included in the study. Pregnant and lactating women as well as those who are obviously ill or wheel-chair bound were excluded from the study. Strict Covid-19 prevention protocols were adhered to.

A screenng questionnaire, was given to participants and no monetary or any form of inducement was required of them.

The requirements for participation include being >18yearsof age with no previous history of hypertension or diabetes.

Anthropometric evaluation- Well trained examiners measured the anthropometric indices and participants were required to wear light, thin clothing and no shoes.

The indices are: a) BMI (Body mass index is body weight/square of height, and the unit is kg/metre square.

b) Blood pressure
c) Blood sugar
d) Lipid profile

The body weight was measured using an analogue medical scale while the height was measured with a standard stadiometer. They were measured to the nearest 0.1kg and 0.1cm respectively.

The classes of BMI reported by WHO are ;

18.5-24.9kg/m^2-normal
25.0-29.9kg/m^2-overweight
>30kg/m^2–obesity
Classes of obesity include: class I -30-34kg/m^2
class II- 35-39.9kg/m^2
class III- >40Kg/m^2

Blood pressure was measured with a clinically validated electronic sphygmomanometer - OMRON digital fully automated blood pressure monitor. Values were obtained after resting for 5mins in a seated position, with 30 seconds interval between cuff inflation.

An average of 3 measurements were taken, and care was taken to select the cuff size according to the participant's arm circumference.

Assessments were performed in a dedicated room, with optimum temperature and lightning while respecting privacy.

Blood pressure values were categorised as follows:

(1) Normal: <120/80mm/hg
(2) Pre-hypertension: 120-139/80-89mm/hg
(3) Stage 1: 140-159/90-99mm/hg
(4) Stage 2: >The classes of BMI reported by WHO are ;

18.5-24.9kg/m^2-normal
25.0-29.9kg/m^2-overweight
>30kg/m^2–obesity

Classes of obesity include: class I -30-34kg/m^2
class II- 35-39.9kg/m^2
class III- >40Kg/m^2

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Blood pressure values were categorised as follows:

(1) Normal: <120/80mm/hg
(2) Pre-hypertension: 120-139/80-89mm/hg
(3) Stage 1: 140-159/90-99mm/hg
(4) Stage 2: >> 160/100mm/hg

Blood measurements- Blood sugar was assessed using a glucometer and strip, after the participant's thumb is pricked in order to get a drop of blood on the strip. While the lipid level was obtained using a 5ml syringe and needle to collect at least 5mls of venous blood into a heparin containing bottle and samples sent to the chemical pathology laboratory for analysis.

The European Atherosclerosis Society [5]: This society defined dyslipidemia as the presence of any of the following:

- TC >202 mg/dl (>5.2 mmol/l)
- HDL-C <35 mg/dl (<0.9 mmol/l)
- LDL-C >135 mg/dl (>3.5 mmol/l)
- TG >68 mg/dl (>1.75 mmol/l)
- Atherogenic index AI (TC ÷ HDL-C) > 5.8.

World Health Organization (WHO) [6] : The WHO defined dyslipidemia as the presence of any of the following:

- TG 150-400 mg/dl (1.7-4.5 mmol/l)
- TC >200 mg/dl (>5.2 mmol/l)
- LDL-C >135 mg/dl (>3.5 mmol/l)
- HDL-C <35 mg/dl (<0.9 mmol/l in men) or <40 mg/dl (<1.0 mmol/l in women)
- AI >5.

Some form of education on life style modification was also given to the participants accordingly. Data were analysed using the IBM SPSS Version 23.0.

RESULTS

Socio-demographics

A total of 107 respondents between the ages of 23 and 80 years were screened for Dyslipidemia(a metabolic syndrome component) . Majority were females (74.8%; n=80), married (58.9%; n=63) and between 41 and 50 (37.4%; n=40). The mean age was 49.4±13.7 years. The results also revealed that 43 (40.2%) of the respondents had tertiary education, 50 (46.7%) were self-employed and 67 (62.6%) earned less than N100,000 as monthly income, which is considered low (table 1).

Table 1: Socio-demographic Characteristics

	Frequency (n=107)	Percent
Age		
21-30 years	9	8.4
31-40 years	19	17.8
41-50 years	40	37.4
51-60 years	15	14.0
Over 60 years	24	22.4
Mean Age (SD)	49.4 (13.7)	
Sex		
Male	27	25.2
Female	80	74.8
Marital Status		
Single	20	18.7
Married	63	58.9
Divorced	1	0.9
Separated	3	2.8
Widowed	20	18.7
Level of Education		
Primary	27	25.2
Secondary	32	29.9
Tertiary	43	40.2
Non-formal	5	4.7
Occupation		
Self-employed	50	46.7
Unemployed	19	17.8
Student	7	6.5
Others	24	22.4
Civil Servant	5	4.7
Retired	2	1.9
Monthly Income		
Low	67	62.6
Medium	20	18.7
High	20	18.7

SD=Standard deviation**.**

Life style characteristics/Medical history/Risk Factors for Dyslipidemia

Only 11 (10.3%) of the respondents smoke tobacco and were all previous smokers, 28 (26.2%) currently drink alcohol, 84 (78.5) do not consume adequate amount of fruits and vegetables, 16 (15.0%) add extra salt to their meal and 51 (47.7%) do no engage in physical activities. Thirty-five (32.7%) of the respondents reported history of hypertension while 43 (40.2%) reported family history of hypertension, similarly, 14 (13.1%) reported history of diabetes while 19 (17.8%) reported family history of diabetes (table 2).

Table 2: Life style characteristics/medical history

	Frequency (n=107)	Percent
Tobacco Use		
Never Smoked	96	89.7
Previous Smoker	11	10.3
Alcohol Consumption		
Current Drinker	28	26.2
Previous Drinker	31	29.0
Never Drank	48	44.9
Fruit and Vegetable Consumption		
Adequate	23	21.5
Inadequate	84	78.5
Salt Consumption		
Add extra salt to meal	16	15.0
Do not add extra salt to meal	91	85.0
Engage in Physical Activity		
Yes	56	52.3
No	51	47.7
History of Hypertension		
Yes	35	32.7
No	72	67.3
Family History of Hypertension		
Yes	43	40.2
No	64	59.8
History of Diabetes		
Yes	14	13.1
No	93	86.9
Family History of Diabetes		
Yes	19	17.8
No	88	82.2

Prevalence of Dyslipidemia.

The prevalence of the various components of metabolic syndrome was also accessed and it was found that18 (16.8%) had reduced high density lipoprotein cholesterol, 6 (5.6%) had raised triglyceride (table 2).

70 (65.4%) of the respondents had high blood pressure, 54 (50.5%) had raised blood sugar, 48 (44.9%) had abdominal obesity, 31 (29.0%) had high BMI.

Table 3: Prevalence of Dyslipidemia in the study population

	Frequency (n=107)	Percent
High blood pressure	70	65.4
Raised blood sugar	54	50.5
Abdominal obesity	48	44.9
High BMI	31	29.0
Reduced high density lipoprotein cholesterol	18	16.8
Raised triglyceride	6	5.6

Metabolic syndrome (Dyslipidemia as a component) prevalence was accessed across socio-demographic features of respondents. The prevalence of metabolic syndrome was significantly increased across respondents' marital status. The prevalence was 10% among singles, 44.4% among married, 55.0% among widows 66.7% among separated, and 100.0% for the divorced (x2=12.885, p=0.009). Other sociodemoraphics factors assessed did not show statistical difference (p<0.05). See table 4 below.

Table 4: Prevalence of Metabolic Syndrome (Dyslipidemia as a component) By Respondents' Socio-demographics

	Metabolic syndrome		□2	p-value
	Present (n=44)	Absent (n=63)		
Age group				
21-30	1 (11.1%)	8 (88.9%)	8.783	0.067
31-40	4 (21.1%)	15 (78.9%)		
41-50	20 (50.0%)	20 (50.0%)		
51-60	7 (46.7%)	8 (53.3%)		
Over 60	12 (50.0%)	12 (50.0%)		
Gender				
Male	7 (25.9%)	20 (74.1%)	3.444	0.063
Female	37 (46.3%)	43 (53.8%)		
Marital status				
Single	2 (10.0%)	18 (90.0%)	12.885#	**0.009***
Married	28 (44.4%)	35 (55.6%)		
Separated	2 (66.7%)	1(33.3%)		
Widowed	11 (55.0%)	9 (45.0%)		
Divorced	1 (100.0)	0 (0.0%)		
Level of education				
Non-formal	2(40.0%)	3 (60.0%)	1.967#	0.617
Primary	9 (33.3%)	18 (66.7%)		
Secondary	12 (37.5%)	20 (62.5%)		
Tertiary	21 (48.8%)	22 (51.2%)		
Occupation				
Self-employed	23 (46.0%)	27 (54.0%)	9.422#	0.084
Unemployed	8 (42.1%)	11 (57.9%)		
Student	0 (0.0%)	7 (100.0%)		
Others	8 (33.3%)	16 (66.7%)		
Civil servant	3 (60.0%)	2(40.0%)		
Retired	2 (100.0%)	0 (0.0%)		
Monthly income				
Low	27(40.3%)	40 (58.7%)	0.153	0.926
Medium	9 (45.0%)	11 (55.0%)		
High	8 (40.0%)	12 (60.0%)		

*=Statistically significant; #=Fisher's Exact Test

The multinomial logistic regression was used to identify significant predictors of metabolic syndrome. None of the socio-demographic variables included in model was found to significantly predict metabolic syndrome with the crude odds ratio, however, when the odds ratio was adjusted for confounders, it was found that age significantly predicted metabolic syndrome. The result showed that the odds of developing metabolic syndrome was about 7.5% less unlikely in persons between 21-30 years of age compared to those above 60 years of age (AOR=0.075, 95% CI for AOR=0.007-0.785, p=0.031). See table 5.

Table 5: Association of Socio-demographics and Metabolic Syndrome

	COR	95% Confidence Interval for COR		p-value	AOR	95% Confidence Interval for AOR		p-value
		Lower Bound	Upper Bound			Lower Bound	Upper Bound	
Age group								
21-30	0.125	0.013	1.160	0.067	0.075	0.007	0.785	**0.031***
31-40	0.267	0.068	1.042	0.057	0.313	0.069	1.423	0.133
41-50	1.000	0.363	2.751	1.000	1.077	0.342	3.398	0.899
51-60	0.875	0.240	3.185	0.839	0.695	0.168	2.872	0.615
Over 60	1				1			
Gender								
Male	0.407	0.155	1.069	0.068	0.371	0.123	1.119	0.078
Female	1				1			
Level of education								
Non-formal	0.698	0.106	4.607	0.709	0.617	0.075	5.088	0.654
Primary	0.524	0.193	1.422	0.205	0.358	0.118	1.087	0.070
Secondary	0.629	0.247	1.597	0.329	0.564	0.194	1.646	0.295
Tertiary	1				1			
Monthly income								
Low	1.012	0.365	2.805	0.981	0.845	0.242	2.956	0.792
Medium	1.227	0.350	4.307	0.749	1.276	0.296	5.493	0.743
High	1				1			

COR=Crude Odds Ratio; AOR=Adjusted Odds Ratio; *=Statistically significant

Gender distribution of Dyslipidemia (a component of metabolic syndrome)

Table 6 compared the various components of metabolic syndrome across the gender of respondents. It was shown that blood pressure status (□□2=4.762, p=0.029) and waist circumference (□2=24.729, p<0.001) were significantly higher among females than among males, whereas high density lipoprotein cholesterol (□2=14.765, p<0.001) was significantly reduced among males than among females. BMI status, although higher among females than males, did not show statistically significant difference, but was close to statistical significance (□2=3.517, p=0.061). Also, fasting blood glucose and triglycerides did not show any statistically significant difference across gender disparity. See table 6.

Table 6: Gender distribution of metabolic syndrome components

	Gender			
	Male (n=27)	**Female (n=80)**	**□2**	**p-value**
Blood pressure				
Normal	14 (37.8%)	23 (62.2%)	4.762	**0.029***
High	13 (18.6%)	57 (81.4%)		
Fasting blood glucose				
Normal	14 (26.4%)	39 (73.6%)	0.078	0.780
High	13 (24.1%)	41 (75.9%)		
Waist circumference				
Normal	26 (44.1%)	33 (55.9%)	24.729	**<0.001***
High	1 (2.1%)	47 (97.9%)		
BMI				
Normal	23 (30.3%)	53 (69.7%)	3.517	0.061
High	4 (12.9%)	27 (87.1%)		
High density lipoprotein cholesterol				
Normal	16 (18.0%)	73 (82.0%)	14.765	**<0.001***
Reduced	11 (61.1%)	7 (38.9%)		
Triglyceride				
Normal	25 (24.8%)	76 (75.2%)	0.221	0.641
High	2 (33.3%)	4 (66.7%)		

*=Statistically significant

DISCUSSION

All through a vast array of trials and studies, it has been consistently shown that elevated levels of LDL cholesterol increase a person's risk for the development of atherosclerotic plaques and subsequent vascular disease. In stark contrast, high-density lipoprotein (HDL) cholesterol assists in regulating cholesterol levels to prevent imbalances that would increase the risk of atherosclerotic vascular disease. Each patient's LDL cholesterol goal is conditional on their overall cardiovascular risk, and medical therapy should be independently tailored to the patient. Managing risk factors, such as hyperlipidemia, to diminish the risk for atherosclerotic cardiovascular disease is referred to as "primary prevention." The grounds for lowering LDL cholesterol derives from widespread epidemiologic data that reveals a positive, continuous correlation between LDL cholesterol levels, cardiovascular events, and patient mortality.

Treatment of hyperlipidemia continues to evolve as we better conceptualize the underlying pathophysiology, and we concurrently improve on preceding medical therapies.

Dyslipidemia is a global pandemic and a major risk factor for cardiovascular disease. The burden of the disease in terms of morbidity, mortality, and medical costs is immense. It is a leading cause of death for both men and women of all races and ethnicities in the United States of America [11] and WHO [10] holds it accountable for more than 4 million deaths annually, globally. Higher prevalence of dyslipidemia in Caucasians or developed nations compared to Blacks or developing nations is reported severally in literature. The American Heart Association [32] in 2006 estimated that a third of all Americans (over 100 million people) have TC levels>200 mg/dl (moderately high levels), while 34 million adult

Americans have TC levels>240 mg/dl (high levels necessitating treatment). Goff *et al.*[33] in their Multi Ethnic Study of Atherosclerosis (MESA) which focused on dyslipidemia prevalence, treatment, and control and which involved a multicenter cohort of 6814 persons, aged 45-84 years, free of clinical cardiovascular disease at baseline, recruited from six US communities, reported an overall dyslipidemia prevalence of 29.3%. Non-Hispanic whites (males 36.9%, females 24.4%) recorded higher prevalence compared to Blacks (males 31.2%, females 29.1%).

Dyslipidemia was previously thought to be rare in Black Africa, including Nigeria. Early reports suggested that blacks have lower prevalence of dyslipidemia possibly due to genetic, nutritional, and environmental factors. [19] Some believed that protective (HDL-C) cholesterol was significantly higher in Tropical Africa, [18] similar to reports showing that populations with increased intake of fish and marine mammals have high levels of HDL-C.

Our findings show that the current state of dyslipidemia in Southern Nigeria clearly contradicts previous perceptions. Our review shows that dyslipidemia is no longer rare in Nigeria and that the gap in dyslipidemia prevalence compared to Caucasians is not only closing but that the high prevalence values obtained is comparable to Caucasian values. This transition cuts across all the focal groups evaluated. While many of the studies which were carried out in urban locations did not adduce reasons for this high prevalence value, some postulated that this may be closely linked to rapid urbanization and western diet with most urban cities saturated with fast food outlets and increasing sedentary lifestyle which contrasts with our previous highly active agrarian based lifestyle. Ironically, while it took Europe and North America centuries to experience gradual modification of lifestyle where diet based on high intake of carbohydrates replaced the traditional hunter gatherer diet rich in proteins, [34] similar transition is occurring in the developing world in decades only.

Among apparently healthy Nigerian adults, very high prevalence values were obtained - 60% (Odenigbo and Oguejiofor), [20] 60.5% (Osuji *et al.*), [22] and 59.3% (Sani *et al.*). [23] The pattern of dyslipidemia was consistently low HDL-C and high LDL-C.

Dyslipidemia is believed to be very common in both diabetic and hypertensive subjects and our findings were consistent with this expectation. Idogun *et al.*[27] reported a dyslipidemia prevalence of 25-69% in Nigerians with type 2 diabetes,mellitus complications, similar to the report from Akbar [35] (25-60%) among diabetic subjects in Saudi Arabia. Prevalence of dyslipidemia in Black Africans with type 2 diabetes mellitus appears indeed to be rising to very high levels. In Nigeria, the prevalence of dyslipidemia in this population was extremely high (89.0%: Ogbera *et al.*[25]; 89.1%: Okafor *et al.*[26]). In South Africa, Vezi *et al.*[36] reported a comparatively very high prevalence rate of 90.3% in the same population.

Among hypertensive cohorts, the pattern of high prevalence of dyslipidemia persists in Black Africans. Akintunde *et al.*[29] from Nigeria reported a prevalence of 58.9% compared to report from Congo (40.0%) by Lepira *et al.*[37]

CONCLUSION

Dyslipidemia is highly prevalent in Nigeria and Black Africa at a rate currently comparable with Caucasian values. The pattern and prevalence of dyslipidemia in the NigerDelta region of Southern Nigeria studied was almost consistently low HDL-cholesterol and high LDL-cholesterol. Hence, we recommend periodic fasting lipid profile screening for adult Nigerians, especially apparently healthy Nigerians of the upper social class and Nigerians with other cardiovascular disease risk factors. This will enhance early detection and treatment and reduce the high burden of this underdiagnosed and undertreated disease.

Limitation

The small sample size in this study is a major limitation factor. The findings, therefore should be confirmed with a much larger sample size..

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Conflicts of interest

There are no conflicts of interest.

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