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Dyslipidaemia, a Risk Factor for Cardiovascular Disease. A Study of Its Prevalence in a Rural Population of the Niger Delta Region of Nigeria

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Abstract **Original Research Article**

Background: Dyslipidaemia is a major cardiovascular risk factor for coronary artery disease, atherosclerosis, hypertension and stroke. With increasing urbanisation and socioeconomic improvement, changing population dynamics there is a rising trend in the prevalence of dyslipidaemia. This study aims to determine the pattern of dyslipidaemia. ***Methods:*** This is a cross-sectional survey of lipid profile among 572 adults in a rural community of Etche ethnic nationality of the Niger Delta Region of Nigeria. RESULTS: The mean age was 39.08±17.5 with a range of 18 years to 95 years. Male to female ratio of 1:2.6. The commonest form of dyslipidaemia pattern in this study was high LDL-cholesterol in 31.8% which was significantly more in females (X^2=6.09; p= 0.02). This was followed by low HDL-cholesterol (30.2%), hypertriglycerides (6.7%) and total cholesterol (4.1%). ***Conclusion:*** This rural population of the Niger Delta region is facing a high of low HDL-C and high LDL-C.

Keywords: Dyslipidaemia, Prevalence, Rural, Niger Delta.

INTRODUCTION

Dyslipidaemia is a major cardiovascular risk factor for coronary artery disease, atherosclerosis, hypertension and stroke. With increasing urbanisation and socioeconomic improvement, changing population dynamics there is a rising trend in the prevalence of dyslipidaemia [1]. Hence dyslipidaemia has emerged as an important CVD risk factor in developing country. Studies done in the Niger Delta region of Nigeria also points to increasing prevalence of dyslipidaemia [2].

The role of LDL-C in the development of CVD cannot be overemphasized as there is documented evidence that high levels of LDL-C not only cause atherosclerosis but pharmacological interventions that reduce LDL-C cholesterol are associated with stabilization and regression of atherosclerosis in proportion to the cholesterol lowering achieved [3]. Low levels of HDL-C have been consistently reported in cardiovascular diseases.[4] It is evident that elevated cholesterol, low HDL, high TG and high LDL are all risk factors for CVD. Elevated levels of low density lipoprotein is a well established cardiovascular risk factor and studies have demonstrated a reduction in clinical events in both men and women when the levels are lowered [5].

The National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III, as well as the American Heart Association (AHA) guidelines for cardiovascular disease prevention in women, reinforce LDL-C as the primary target of therapy [6]. LDL-C levels are generally lower in women than in men until menopause, when levels increase and LDL particles become smaller, denser, and therefore more atherogenic [7].

The Framingham Heart Study established both HDL-C and triglycerides as important predictors for coronary events [8]. This association was noted to be independent of total cholesterol level and applied to both sexes. This study was the first to suggest that triglyceride and HDL levels may have greater predictive potential in women compared with men. The Lipid Research Clinics' Follow-Up Study also demonstrated that both HDL-C and triglycerides were better predictors of coronary risk and cardiovascular mortality in women than total cholesterol or LDL-C [9].

In 1995, a meta-analysis performed by Hokanson *et al*., revealed that an increase in triglycerides of 1 mmol/L was associated with a 76% increased risk of cardiovascular disease in women versus 32% in men. In both ATP III and the AHA guidelines for women, non-HDL-C is a secondary target

of therapy [10]. On average, women have HDL-C levels approximately 10 mg/dL greater than those of men, which may help account for the disparity in cardiovascular events between men and women.

Data from the Heart and Estrogen/progestin Replacement Study indicate that lipoprotein(a) is an independent predictor of the risk of recurrent CHD in postmenopausal women [11]. Hypertriglyceremia and low high-density liopoproteinaemia are two components of the atherogenic profile seen in DM [12]. Elevated low density lipoprotein (LDL-C) has also been found to be an independent risk factor for the development of cardiovascular disease and is often reported to be the commonest lipid abnormality found in patients with DM [13].

The presence of elevated cholesterol levels is known to play a key role in both the initiation and progression of atherosclerosis, as well as in the clinical consequences such as myocardial infarction, stroke, peripheral vascular disease, and heart failure [16, 4]. Hypercholesterolemia has also been implicated in the process of atherogenesis and a curvilinear relationship has been documented between increasing cholesterol and increasing incidence of CVD [14].

Interventions should focus on increased physical activity, weight reduction, and addressing specific risk factors, such as hypertension, prothrombotic state, and dyslipidaemia. Rural sub-Saharan Africa is undergoing both economic and health transition [15]. It therefore becomes necessary to document the pattern of dyslipidaemia as it will be useful in planning future health services.

METHODOLOGY

This is a cross-sectional survey of lipid profile among adults in a rural community of Etche ethnic nationality of the Niger Delta Region of Nigeria. The vast majority of the study population are involved in subsistence farming which involves use of manual farming implements and trekking of long distances to farm. The main crops cultivated are cassava, maize, okro, pumpkin vegetable. Some also own plantain plantation. The general level of physical activities was high as most villagers move around within the community and surrounding communities by trekking except for a few who use bicycles and motorbike. A stratified sampling method was used for the purpose of data collection.

CONDUCT OF THE STUDY

The conduct of the study fell into 3 stages as depicted in table 1. There was an overlap between stages I and II. Stage I was useful in gaining the confidence of the leadership and people of the community and enhancing their acceptance of the research team. This was particularly important as venopuncture (blood-letting) was part of the activities carried out by the research team.

COMMUNITY MOBILIZATION

- Meeting with the community Chiefs.
- General familiarization tour of the community.
- Visit to the Health centre
- Meetings with compound heads, church leaders.

STAFF AND INSTRUMENT PREPARATION

- Recruitment and training of field assistants
- Preparation of questionnaire.
- Pre -test questionnaire.
- Selection of Households
- Assembly and check of instruments.

DATA COLLECTION

- Pilot study.
- Administration of questionnaire
- Clinical measurement/ blood collection sessions/Analysis of specimens

BLOOD PRESSURE MEASUREMENT

Auscultatory method using Mercury Sphygmomanometer and appropriately sized cuff was the method and equipment of choice in checking subject's blood pressure according to standard protocol.

BLOOD GLUCOSE

Venous blood samples were obtained from study subjects using 5-ml specimen tubes containing fluoride oxalate after an 8 to 12hour fast. Plasma samples were conveyed in ice pack to the chemical department laboratory of university of Port Harcourt teaching hospital. Venous blood Glucose was measured by the Glucose oxidase method [16].

LIPID PROFILE AND URIC ACID MEASUREMENT

Additional blood sample (5ml) was collected in a lithium heparin tube. Samples were conveyed in ice pack to chemical pathology laboratory of university of Port Harcourt teaching Hospital. Plasma total cholesterol and triglycerides were determined by the Colorimetric enzymatic method [17], (Randox laboratories ltd, Crumlin, Co. Antrim, United Kingdom). Plasma high density lipoprotein cholesterol (HDL cholesterol) were measured by the same enzymatic method after precipitation with dextran sulphate/magnesium chloride. Low density lipoprotein (LDL cholesterol) was estimated according to the formula LDL cholesterol = total cholesterol – HDL cholesterol - triglycerides/2.2 [18].

All these analyses were done in the chemical pathology laboratory of university of Port Harcourt teaching Hospital, Port Harcourt, Rivers state.

ETHICAL CONSIDERATION

Informed consent from the village Chiefs/leaders including religious leaders was obtained. Approval of the Ethics committee of the University of Port Harcourt Teaching hospital was obtained.

STATISTICAL ANALYSIS

Statistical analysis was done using Statistical Package for Social Sciences (SPSS Inc, Chicago, IL) version 17. Results were expressed as either mean values (standard deviation) or proportions. Comparison for statistical significance was by student's t test for Continuous variables and chi-square analysis for categorical variables. Epi info statistical package version 3.5.1 was used for chi-square for trend analysis. A p-value of ≤0.05 was considered statistically significant.

For the purpose of this study;
BMI was calculated as weight (kg)/height (m^2)
Under weight- < 18.5 Kg/m^2
Normal Weight- 18.5 to 24.9 Kg/m^2
Overweight- 25 to 29.9 Kg/m^2
Obesity- > 30 Kg/m^2
3. Waist Circumference;
Normal- <102cm for males, <88cm for females
Abnormal- ≥102cm for males, ≥88cm for females
4. Waist-hip-ratio;
Normal - < 1 for males, < 0.9 for females
Abnormal ≥1 for males, ≥0.9 for females
5. Hypertension was defined using the JNC 7 (Joint National Committee on Prevention, Evaluation, and Treatment report) criteria of blood pressure ≥ 140/90 mmHg or self-reported anti-hypertensive medication use.
6. Diabetes mellitus was defined using fasting plasma glucose (FPG) ≥ 7.0 mmol/l (126 mg/dl) and individuals who were previously known to have diabetes based on history of drug medication were also classified to have diabetes.
7. Total cholesterol of > 6mmol/L, TG > 1.8mmol/L, HDL-C <1.0mmol/L and LDL-C ≥ 3mmol/L were taken as abnormal values.
8. Hyperuricemia was defined as ≥420mmol/L for males and ≥360 mmol/L for females.

RESULTS

This study was a descriptive cross-sectional study involving 572 persons in a rural community in the Niger Delta region of Nigeria. The mean age was 39.08±17.5 with a range of 18 years to 95 years. Male to female ratio of 1:2.6. Table-1 which shows age and sex distribution of the study group revealed that more than half of the student participants were below the age of 40 years.

PREVALENCE OF DYSLIPIDAEMIA

The commonest form of dyslipidaemia pattern in this study was high LDL-cholesterol in 31.8% which was significantly more in females (X^2=6.09; p= 0.02). This was followed by low HDL-cholesterol (<1mmol/l) in 153 subjects (30.2%) and the difference between males and females was not statistically significant(x^2 =0.23; P= 0.74).

The highest prevalence of low HDL-C for both gender was in the young age group of 18-29 years while the highest rate of high LDL dyslipidaemia was in the young age group of 30-39 years (36.8%) amongst males unlike in the females which had a rise as the age groups increased and highest rate in the 60-69 age group (48.4%). Total cholesterol was high in 4.1% of subjects and commoner in females than males (x^2=1.47, p=0.44). There was a 6.7% high triglycerides with essentially equal rates in both sexes (males 6.8%; females 6.7%; x^2= 0.004; P = 1.00).

Table-1: Age and Sex Distribution of Study Group

AGE GROUP (years)	OVERALL		MALES		FEMALES	
	Number	%	Number	%	Number	%
18-29	222	38.8	51	31.9	171	41.5
30-39	74	13.0	22	13.8	52	12.6
40-49	106	18.5	32	20.0	74	18.0
50-59	74	13.0	19	11.9	55	13.3
60-69	66	11.5	21	13.1	45	11.0
70 and above	30	5.2	15	9.3	25	3.6
Total	**572**	**100**	**160**	**28.0**	**412**	**72.0**

Table-2: Gender Differences in the Means of Anthropometric Parameters

VARIABLE	TOTAL		MALES		FEMALES		p VALUE
	Number	Mean±SD	Number	Mean ±SD	Number	Mean±SD	
BMI	549	22.14±3.60	160	22.07±3.10	389	22.17±3.80	0.77
WC	562	72.42±9.90	160	73.99±9.30	402	71.79±10.1	0.017*
WHR	562	1.04±0.90	160	1.09±0.10	402	1.03±0.82	0.00*

BMI= Body mass index; WC = Waist circumference; WHR= Waist-hip-ratio;
*= Significant.

DISCUSSION

This study revealed a low prevalence for both hypercholesterolaemia and hypertriglceridemia, with high- LDL and low -HDL prevalence rates been high. The normal range of total cholesterol, triglycerides, LDL-C and HDL-C obtained in this study is expected considering the high physical activity level and high intake of diet rich in fruits and vegetables of this rural community. The low prevalence of hypercholesterolaemia reported in the present study is comparable to previous rural studies in Nigeria [21, 22] and Cameroon [23]. It is however, much lower than the findings by Akpa *et al.*, [24] in a study of healthy adult in Port Harcourt, Nigeria. The metropolitan and industrialised nature of Port Harcourt with lot of fast food centres may be the explanation for the high prevalence reported by Akpa et.al since westernized diet is known to be associated with high serum lipids [25]. Additionally, the sample size used for the Port Harcourt study was small (92 subjects) and may not be the true reflection of the study population. A high prevalence of 40% in a rural South African community [26] may be related to the higher cut off value of > 6.5mmol/l used and involvement of only the middle aged and the elderly who are more prone to hypercholesterolaemia [25]. The present study had forty percent of its study population in the young age group.

Hypertriglyceridaemia is emerging as an independent risk factor for cardiovascular disease [27], though there are paucity of reported work on this in the Niger Delta region and Nigeria at large. Report from a sub-urban community in Iraq 152 gave a slightly higher prevalence of 8.2% than the prevalence found in this study. A much higher prevalence rate for hypertriglyceridaemia was reported in the study by Vezi *et al*., in South Africa [28]. This South African study was however among diabetic who are more prone to lipid anomalies [12]. The prevalence of high LDL-C in this study was much lower than 51% reported by Odenigbo *et al.*, [2] in 2008 in Asaba, Nigeria and 66.1% by Vezi *et al*., in 2005. Similarly Odenigbo *et al*., [2] and Vezi *et al.*, [27] also reported prevalence rates of 60% and 60.7% respectively for low HDL-C which was higher than the 30.2% reported in the present study. Dietary lifestyle differences between the study population of the present study and that of Asaba may explain the higher prevalence reported by the Asaba study since the Asaba study was an urban study with reported evidence of "western diet" lifestyle unlike the present study which is a rural based study with high consumption of diet rich in vegetables and fruits in the study population .The South African study was done among diabetics and this explains such high prevalence rate [12]. In males, there was a higher rate in the 4th decade of life while in females, LDL showed an increasing pattern with increasing age till the 7th decade and then declined. In both sexes, hypertriglyceridaemia and low HDL-C were commoner in the male gender unlike in the females where hypercholesterolaemia and high LDL were commoner.

CONCLUSION

This rural population of the Niger Delta region is facing a high of low HDL-C and high LDL-C.

REFERENCES

1. Mula-Abed WA, Chilmeran SK. Prevalence of dyslipidemia in the Iraqi adult population, Saudi Med J. 2007 Dec;28(12):1868-74.
2. Odenigbo CU, Oguejiofor OC, Odenigbo UM, Ibeh CC, Ajaero CN, Odike MA. Prevalence of dyslipidaemia in apparently healthy professionals in Asaba, South -South Nigeria, Niger J Clin Pract. 2008 Dec; 11(4):330-5.
3. O'Keefe JH, Cordain L, Harris WH, Moe RM, Vogel R. Optimal low-density lipoprotein is 50 to 70 mg/dl: lower is better and physiologically normal. Journal of the American College of Cardiology. 2004 Jun 2;43(11):2142-6.
4. Bello-Sani F, Bakari AG, Anumah FE. Dyslipidaemia in persons with type 2 diabetes mellitus in Kaduna, Nigeria. International Journal of Diabetes and Metabolism. 2007 Apr;15(1):9-13.
5. Miettinen TA, Pyörälä K, Olsson AG, Musliner TA, Cook TJ, Faergeman O, Berg K, Pedersen T, Kjekshus J, Group FT. Cholesterol-lowering therapy in women and elderly patients with myocardial infarction or angina pectoris: findings from the Scandinavian Simvastatin Survival Study (4S). Circulation. 1997 Dec 16;96(12):4211-8.
6. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation 2002; 106: 3143–3421
7. Blake GJ, Otvos JD, Rifai N, Ridker PM. Low-density lipoprotein particle concentration and size as determined by nuclear magnetic resonance spectroscopy as predictors of cardiovascular disease in women. Circulation. 2002; 106: 1930–7.
8. Castelli WP, Garrison RJ, Wilson PWF, Abbott RD, Kalousdian S, Kannel WB. Incidence of coronary heart disease and lipoprotein cholesterol levels. The Framingham Study. JAMA, 1986; 256: 2835–8.
9. Bass KM, Newschaffer CJ, Klag MJ, Bush TL. Plasma lipoprotein levels as predictors of cardiovascular death in women. Arch Intern Med. 1993; 153: 2209–16.
10. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and

Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. Circulation. 2002; 106: 3143–3421

11. Shlipak MG, Simon JA, Vittinghoff E, Lin F, Barrett-Connor E, Knopp RH, Levy RI, Hulley SB. Estrogen and progestin, lipoprotein (a), and the risk of recurrent coronary heart disease events after menopause. Jama. 2000 Apr 12;283(14):1845-52.
12. Johnson RJ, Titte S, Cade JR, Rideout BA, Oliver WJ. Uric acid, evolution and primitive cultures. Semin Nephrol. 2005; 25:3-8
13. Nesto RW. Beyond low-density lipoprotein: addressing the atherogenic lipid triad in type 2 diabetes mellitus and the metabolic syndrome. *Am J Cardiovasc Drugs.* 2005**;** 5:379**–**387.
14. Brunzell JD, Davidson M, Furberg CD, Goldberg RB, Howard BV, Stein J, Witztum JL. Lipoprotein management in patients with cardio metabolic risk. Consensus statement from the American Diabetes Association and the American college of Cardiology Foundation. *Diabetes Care.* 2008; 31:811**–**822.
15. Leeder S, Raymond S, Greenberg H: A Race against time. New York, Columbian University, New York; 2004.
16. Trinder P. Determination of blood glucose using 4 –aminophenazone as oxygen acceptor. Journal Clin Path. 1969; 22:246.
17. Tietz NW. Clinical Guide to Laboratory Tests, Second Edition W.B Saunders Company, Philadelphia, USA. 1990; 554-556.
18. Friedwald WT, Levy RI, Fredrickson DS. Estimation of the Concentration of Low Density Lipoprotein Cholesterol in Plasma without Use of Preparative Ultracentrifugation. Clin Chem. 1972; 18:499-502
19. Eknoyan, G. Adolphe Quetelet (1796-1874)—the average man and indices of obesity". Nephrol. Dial Transplant. 2008; 23(1): 47–51.
20. Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7). The seventh report of the Joint National Committee. *Arch Intern Med* 1993; 153: 154-83.
21. Okesina AB, Oparinde DP, Akindoyin KA, Erasmus RT. Prevalence of some risk factors of coronary heart disease in a rural Nigerian population. East Afr Med J, 1999; 76:212-6.
22. Ezenwaka EC, Akanji AO, Akanji BO, Unwin NC, Adejuwon CA. The prevalence of insulin resistance and other cardiovascular disease risk factors in healthy elderly southwestern Nigerians. Atherosclerosis. 1997; 128(2):201-211.
23. Fezeu L, Balkau B, Kengne A, Sobngwi E, Mbanya J. Metabolic syndrome in a sub-Saharan African setting: central obesity may be the key determinant. Atherosclerosis. 2007, 193(1):70-76.
24. Akpa MR, Agomuoh DI, Alasia DD. Lipid profile of healthy adult Nigerians in Port Harcourt, Nigeria. Niger Journal Med. 2006, 15(2):137-140.
25. Perez A, Wagner AM, Carreras C, Gimenez G, Sanchez-Queseda JL, Rigla M. Prevalence and phenotypic distribution of dysipidaemia in type 1 diabetes mellitus. *Arch intern Med.* 2000; 160:2756–2762.
26. Charlton KE, Schloss I, Visser M, Larmbert EV, Klobe T, Levitt N. Norman Temple, Waist circumference predicts clustering of cardiovascular risk factors in older South Africans. Cardiovascular Journal of south Africa. 2001; 12:142-150.
27. Ginsberg HN. Identification and treatment of hypertriglyceridaemia as a risk factor for coronary heart disease. Curr cardiol Rep, 1999; 1(3) 233-7.
28. Vezi ZB, Naido DP. Dyslipidaemia among black patients with type 2 diabetes. Cardiovascular Journal of south Africa. 2005; 16: 194-198.