Lipid Profile of Healthy Adult Nigerians in Port Harcourt, Nigeria

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ABSTRACT

Background: *Hyperlipidaemia is a major cardiovascular risk factor for coronary artery disease, atherosclerosis, hypertension and stroke.*

It is thought that serum cholesterol levels are low in Nigerians as shown by results of a population survey done over twenty years ago. In addition the last national non communicable disease survey recorded a low prevalence of Hyperlipidaemia (4.0%) in Nigeria. With increasing urbanisation and socioeconomic improvement, changing population dynamics is expected to influence disease pattern and noncomminucable diseases are expected to rise. Thus there is a need to screen healthy adults for their lipid pattern in Port Harcourt a city with high population dynamics where such studies have not been previously reported.

Method: *A prospective descriptive population survey was carried out among healthy adults residing in Port Harcourt. A total of ninety two adults were screened after obtaining informed consent. Weight, height, blood pressure, fasting blood sugar and fasting lipid profile were measured. Results were analysed using simple statistical methods.*

Results: *A total of ninety two subjects were recruited into the study. Fourty seven (51.1%) of the subjects were males while fourty five (48.9%) were females. The age range of subjects was 24-59 years with mean of 38.84 ± 8.36 years. The mean BMI was 28.76 ± 5.91 Kg/m² There was no significant statistical difference between the mean BMI for males and females. The mean fasting blood sugar, mean total cholesterol and mean LDL cholesterol were 4.45 ± 0.89 mmol/L, 4.76 ± 1.06 mmol/L and 3.65 ± 0.89 mmol/L. The mean total triglyceride was 1.02 ± 0.30 mmol/L while the mean HDL was 0.90 ± 0.25 mmol/L. There was an increase in total cholesterol with increasing age and an increase in total cholesterol and LDL cholesterol with increasing social class. Subjects with total cholesterol above 6.5mmol/L constituted 31.52 % of study subjects. Subjects with BMI between 25-29 Kg/m² made up 43.48% of subjects while 33.69% of subjects had BMI above 30Kg/m².*

Conclusion: *A high mean total and LDL cholesterol values were observed among healthy adults in Port Harcourt. The prevalence of obesity was also found to be high.*

There is a need for public health action to address these findings especially as high serum cholesterol levels have a direct correlation with coronary artery disease. Further large scale urban survey of non communicable diseases in the country is therefore necessary at this time.

INTRODUCTION

Serum cholesterol is a measure of the body fat. The mean serum cholesterol level is a reflection of the body fat metabolism which is dynamic and depends on dietary fat consumption, endogenous fat synthesis and storage as well as fat catabolism [1]. Serum lipid is measured as total cholesterol and its fractions (High Density Lipoprotein [HDL] Cholesterol, Low Density Lipoprotein [LDL] Cholesterol, Very low density lipoprotein [VLDL] Cholesterol) and triglycerides. These parameters show a continuous distribution within any population or group, with level varying with age, sex, race, diet, physical activity, weight, genetic make up and environmental factors [2].

Increased serum lipids level i.e. hyperlipidaemia is a major risk factor for cardiovascular diseases such as coronary artery disease, atherosclerosis, hypertension and stroke.

The Framingham studies estimates the incidence of hyperlipidaemia in the population requiring treatment at about twenty two percent (22%) with hyperlipidaemia constituting the highest risk factor for cardiovascular disease in that study [3].

People with abnormally high serum cholesterol levels have an increased risk of artherosclerosis and coronary artery disease and the association between coronary artery disease and cholesterol is continuous throughout the range of cholesterol levels in the population and becomes stronger at higher levels [4].

Several studies have shown that the lowering of serum cholesterol levels induces regression and slows the progress of atherosclerosis which is demonstrable angiographically thus reducing the risk of coronary artery disease [5].

It is generally thought that serum cholesterol levels are low in Nigeria because population screening over

two decades ago in Lagos and other parts of the country showed low mean total cholesterol levels of 3.54±0.1 4 mmol/L [6] and a nationwide survey for non communicable diseases also showed the prevalence of hyperlipidaemia (serum cholesterol>5.2mmol/L) to be low at 4.0% [7]. However a screening among an elderly population in Benin earlier had shown a mean total cholesterol level of 4.82±1.03mmol/L and 27.6% of the subjects had serum cholesterol above 5.2mmol/L [8].

Urbanisation and socioeconomic improvements in the country coupled with changing population dynamics is expected to influence disease pattern.

Non communicable diseases including hyperlipidaemia are expected to show changes in prevalence. This has necessitated the need to screen healthy adults for lipids pattern in Port Harcourt, a city with a very high population change dynamics where no such studies has been carried out previously.

MATERIALS AND METHODS

A total of ninety two healthy adult Nigerians, forty five (45) females (48.91%) and forty seven males (51.09%) who met the inclusion criteria for the study were recruited after obtaining verbal consent. They were made up of hospital staff, patient relations and visitors to the hospital.

The inclusion criteria were;

A normal blood pressure in the absence of any antihypertensive drug use; Normal Fasting blood sugar in the absence of antidiabetic medication and Respondents who are non smokers and do not take alcoholic beverages on a regular basis.

All the subjects who gave consent were weighed on light clothing using the DANA ® weighing scale which was regularly standardized with a 10Kg steel weight. Height was measured using a standard meter rule mounted on a stand. From both measurements the body mass indices (BMI) was calculated using the formula BMI= Weight in Kg/Height in meters.

A fasting blood sample was collected from all the subjects. Blood was stored in fluoride containing bottles (2mls) for glucose estimation and lithium heparin bottles (4mls) for lipid assay. Samples were separated and assayed within three hours of collection. Blood pressure was taken from both arms in all the subjects after observing standard precautions.

Serum glucose was analyzed using glucose oxidase method while the lipids were analysed using enzyme substrate method. The Randox ® based on these method were used for the assay.

The results were analysed using the SPSSversion 11 for windows. The mean and standard deviation of the measured parameters were calculated. The students t-test was used as appropriate with a P value of < 0.05 considered as statistically significant.

RESULTS

A total of ninety two subjects made up of forty seven males (51.09%) and forty five females (48.91%) who met the inclusion criteria were recruited into the study.

The age range was 24-59years with a mean age of 38.84±8.36 years. The age and sex distribution is shown in table I. The range of the body mass indices (BMI) was 18.99 to 48.49 with a mean of 28.76±5.91. The mean BMI of the female subjects was 28.81±4.33 while that of the males was 28.34±4.11 and showed no statistical difference. The mean fasting blood sugar was 4.45±0.89mmol/L while the range was 3.0 to 5.0mmol/L. The mean total cholesterol in the subjects was 4.76±1.06mmol/L with a female mean of 4.64±1.0mmol/L and a male mean of 4.83±1.47mmol/L. The mean low density lipoprotein (LDL) cholesterol was 3.65±0.89mmol/L with a female mean of 3.54±0.96mmol/L while the mean in the male was 3.73±1.03mmol/L. The mean serum triglyceride was 1.02±0.03mmol/L, the female mean was 0.9±0.28mmol/L and the male mean was 1.04=0.35mmol/L. The mean high density lipoprotein (HDL) cholesterol was 0.90±0.25mmol/L with a female mean of 0.90±0.12mmol/L and a mean in males of 0.87±0.29mmol/L. These results are shown in Table II.

Analysis of mean total cholesterol among the different age groups show a steady increase with increasing age. The same pattern is seen with low density lipoprotein (LDL) cholesterol but the mean triglycerides remained almost constant in all the age groups Table III.

Analysis of the mean cholesterol level in different social classes show increasing mean total and low density lipoprotein cholesterol (TCH and LDL) with rise in social class and slight drop in the highest social class. The mean triglycerides also showed increasing level with increase in social class. Table IV.

Among the study subjects sixty four percent (64.13%) had total cholesterol within the normal range of less than 5.2mmol/L while 31.52% had total cholesterol levels of more than 6.5mmol/L. Table V. Analysis of the body mass indices (BMI) showed that only about one quarter (22.83%) had normal body mass index 43.48% had body mass index in the overweight range (25 to 29.9Kg/m²) and about a third (33.69%) had body mass index in the obesity range (30.0Kg/m² and above). Table VI.

Table I. Age and sex distribution of subjects

Age range	Males	Females	Total
20 - 29 yrs	3	6	9
30 - 39yrs	19	24	43
40 - 49 yrs	19	13	32
50 - 59 yrs	6	2	8
Total	47	45	92

Table II. Mean lipid, mean age and mean BMI values

Indices	Total	Females	Males
Mean TCH (mmol/L)	4.76±1.06	4.64±1.0	4.83±1.47
Mean LDL(mmol/L)	3.65±0.98	3.45±0.96	3.73±1.03
Mean TG (mmol/L)	1.02±0.3	0.99±0.28	1.04±0.35
Mean HDL (mmol/L)	0.90±0.25	0.90±0.24	0.87±0.29
Mean BMI (Kg/m2)	28.76±5.91	28.81±4.33	28.34±4.11
Mean Age (years)	38.84±8.36		

Table III. Age and mean cholesterol levels

Age range	Mean TCH Mmol/L	Mean LDL Mmol/L	Mean LDL Mmol/L	Mean HDL Mmol/L
20 - 29 yrs	4.36	1.04	3.33	0.82
30 - 39 yrs	4.76	0.99	3.61	0.91
40 - 49 yrs	4.67	0.98	3.62	0.87
50- 59 yrs	5.62	1.26	4.33	1.02

Table IV. Social class and mean cholesterol and BMI levels

Social class	Mean TCH Mmol/L	Mean TG Mmol/L	Mean LDL Mmol/L	Mean HDL Mmol/L	Mean BMI Kg/m2
5	4.58	0.94	3.57	0.80	34.80
4	4.66	0.98	0.98	0.93	36.55
3	4.67	1.04	1.04	0.87	40.30
2	5.15	1.11	1.11	0.88	38.93
1	4.74	0.95	0.95	0.96	39.42

Table V. Serum Lipid Distribution in Study Population

TCH	Male	Female	Total	%
<5.2mmol/L	29	30	59	64.13
5.2-6.5mmol/L	18	11	29	31.52
>6.50mmol/L	2	2	4	4.35

Table VI. Mean BMI Distribution

BMI	Male	Female	Total
<25.0	8	13	21(22.83%)
25.0-2 29.9	23		1740(43.48%)
>30.0	14	17	31(33.69%)
TOTAL	45	47	92(100%)

DISCUSSION

Several studies have previously documented the lipids pattern in adult Nigerians living in different urban centers and these show generally low lipids levels compared to Caucasian value[6-10]. The current study reveals a mean total cholesterol (TCH) level of 4.76± 1.06mmol/L in the population studied, a figure that is higher than that from studies in Lagos[6],Benin[8] and Jos[9] using similar enzyme substrate method of analyses(4.76 Vs 4.28, 3.64, 3.54 respectively). It is however lower than Caucasian values[11,12] (4.76 Vs 5.41) in keeping with differences in dietary pattern and socioeconomic factors. In comparison to figures from previous studies from other parts of Nigeria, relative affluence in the city of Port Harcourt, sedentary life styles, and obesity are factors that may have contributed to the higher mean total cholesterol seen in this study. The prevalence of hypercholesterolaemia (total cholesterol = 5.2mmol/L) is also much higher at 35.85% for the same reason when compared to the level in the general population[7].

The mean low density lipoprotein (LDL)cholesterol levels in this study is much higher than in other studies in Nigeria cited above and is similar to reported Caucasian values(3.65Vs 3.62). This finding suggest that while mean total cholesterol levels may be low or normal in the general population, low density lipoprotein (LDL) cholesterol level which is a better marker for cardiovascular risk factors is high and indicates high risk for cardiovascular diseases in the population. The reason for this high values is also related to several factors such as urbanisation, sedentary life styles, dietary habits and obesity as mean BMI in the study was more than $28.0Kg/m^2$ and about 33% of subjects were obese with body mass indices (BMI) of $30.0Kg/m^2$ or more. Obesity which has become a modern day scourge in developed countries is a major risk factor for cardiovascular diseases and has a prevalence of 33% in this study, similar to what is obtained in the USA[11,12]. These high levels of hypercholesterolaemia and obesity to values similar to that in developed countries would suggest that the period of demographic transition is over. We therefore need to wake up to the reality of non communicable diseases epidemic in this part of the country.

The mean HDL cholesterol level of 0.90±0.25mmol/L in the present study is low and similar to values from other Nigerian studies [10,14,15]. Also when the mean HDL/Total cholesterol ratio is calculated the values are also lower than that seen in the same studies (0.19Vs 0.26-0.32)[14,15] because of the higher mean total cholesterol. The place of HDL cholesterol and HDL/TCH ratio in predicting cardiovascular risk is well documented [16,17] thus a normal mean total cholesterol seen in this study does not necessarily indicate freedom

from cardiovascular risk because of the low levels of HDL and HDL/TCH ratio.

Analysis of lipid profile distribution between social classes show rising lipid levels with a rise in social class as previously documented by other workers in Nigeria[14,15]. The same trend is also observed in relation to age i.e. rising mean total cholesterol levels with rising age. The levels are however low at extreme of ages but the studied population did not include this age group for comparison. This rise in mean serum cholesterol with rise in age and social class is related to the improvement in social and economic status and reduction in physical activity and reduction in cholesterol metabolism associated with rise in age. This is also reflected in the higher body mass indices in the older age and higher social group. Thus, as age increases, there is corresponding increase in body mass index, increase in cholesterol levels and improvement in socioeconomic indices or status and also higher prevalence of cardiovascular disorders such hypertension, stroke and coronary artery disease.

In conclusion, a high mean total and low density lipoprotein cholesterol value is observed among healthy adults in Port Harcourt. The prevalence of obesity is also high and similar to that in developed affluent societies, both findings suggesting a need for urgent public health intervention especially because studies have shown a direct correlation between serum cholesterol levels and coronary artery disease rate and also predicts future occurrence of coronary artery disease morbidity and mortality[13].Further large scale urban survey of non communicable diseases in the country is therefore necessary at this time.

REFERENCES

1. Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults. Results of the National Cholesterol Education Programme. Arch of Int Med 1988; 148: 36-96.
2. Atherosclerosis Study Group.Optional resources for primary prevention of atherosclerotic diseases. Circulation 1984; 70: 15-205A.
3. Castelli WP, Anderson KA. Population at risk: Prevalence of high cholesterol levels in hypertensive patients in the Framingham study. Am J of Med 1986; 80(2A): 23-32.
4. Stamler J, Wentworth D, Neaton J. Is the relationship between serum cholesterol and risk of death from coronary artery disease continuos and graded? JAMA 1986; 256: 2823-2828.
5. Duffield R G M, Miller N E, Brunt J N H, et al. Treatment of hyperlipidaemia retards progression of symptomatic femoral artherosclerosis. Lancet 1983; 11:639-642.
6. Onitiri A, Sander M, Boyo AE. Serum lipids and lipoproteins in healthy Africans. Clin Chem Acta 1977; 811:57-61.
7. Committee on Non Communicable Diseases in Nigeria. Final report of a national survey on non-communicable diseases, Prevalence of hypertension in Nigeria. (Ed) O.O Akinkugbe. 2nd Ed.Lagos; Fed Min of Health and Social Services,1997.
8. Ukoli FAM, Bunker CH, Fabio A, et al. Sex differences in serum lipids pattern and their correlates in a Nigerian Urban Elderly Population. Nig Med J 1997; 32(3) 85-89.
9. Das SC, Isichei UP. Beta lipoprotein cholesterol, beta lipoprotein and triglycerides in a healthy Nigerian population. Nigerian postgraduate medical journal1997;4(3):88-92.
10. Jarikre EA, Ofoegbu CJ, Emuveyan EE. Reference Values for Nutritional indices in Urbanised Adult Nigerians living in the Lagos Area. J of Clinical Practice 1998; 1(1): 22-25.
11. Fugerberg B, Berhund A, Anderson OL, Berglund G. Weight reduction versus antihypertensive drug therapy in obese men with high blood pressure. Effects upon plasma insulin levels and associated changes in blood pressure and serum lipids. J. of Hypertension 1992;10: 1043-1061.
12. Martins MJ, Hulley SB, Browner WS, et al. Serum cholesterol, blood pressure and mortality implications from a cohort of 361662 men. Lancet 1986; 2: 933-936.
13. Taylor GO, Akande EO. Serum Lipids in Pregnancy and Socio-economic Status. Br. J. Obst. Gynaecol.1975; 82:297-302.
14. Taylor GO, Agbedana EO. A comparative study of plasma high density lipoprotein cholesterol in two groups of Nigerians of different socio-economic status. Trop Geog.Med1971;23:158-166.
15. Gordon T, Castelli WP, Hjortland M C, et al. High density lipoprotein as a protective factor against coronary heart disease. The Framingham study. Am J Med 1977;(62) 707-714.
16. Miller G J, and Miller N E. Plasma high density lipoprotein concentration and development of ischaemic heart disease. Lancet 1975; 1: 16-19.