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RESEARCH PAPER

LIPID PROFILE OF APPARENTLY HEALTHY ADULTS IN ABA METROPOLIS, SOUTH EASTERN NIGERIA

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ABSTRACT

This study was designed to evaluate the lipid profile pattern of apparently healthy adults in Aba metropolis and hence, identify the possible contributions of hyper lipidaemia in the ever increasing cardiovascular risk burden in our society. Subjects for this study were apparently healthy adult respondents who met the inclusion criteria and willingly granted their informed consent. They were measured for their weights (in kg), height (in metres), age, sex, body mass index (BMI), blood sugar and lipid profile. The data obtained were analyzed using the statistical package for social sciences and the student t-test was performed at $p \leq 0.05$. The results showed that 30% of the subjects had BMI in the overweight range (25-29.9kg/m^2) while 16.56% had BMI in obesity range ($\geq$ 30.00kg/m^2). A high mean total cholesterol (34%) and LDL (17%) cholesterol values were observed among healthy adults. Hyperlipidaemia was more prevalent among females than males and may be associated with the increasing cardiovascular risk burden.

Keywords: Lipid profile, Apparently healthy adults, Aba, Nigeria.

INTRODUCTION

Only limited data are available about the distributions of blood lipid concentrations and prevalence of hyperlipidaemias in Nigeria (Dahiru et al., 2007). In the early 1990s a national survey carried out to assess the pattern of non-communicable disease risk factors (including cardiovascular disease) excluded measurements of blood lipid concentrations (Akinkugbe, 1992). Serum cholesterol is a measure of the body lipid. 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. Serum lipid is measured as total cholesterol and its fractions (High Density Lipoprotein (HDL) cholesterol, Low Density Lipoprotein (LDL) cholesterol and Triglycerides. These parameters show a continuous distribution within any population or group, with levels varying with age, sex, race, diet, physical activity, weight, genetic-makeup and environmental factors (Akpa et al., 2006).

In the Framingham studies, the incidence of hyperlipidaemia in the population was estimated at about twenty two percent (22%), and it constituted the highest risk factor for cardiovascular diseases (Castelli and Anderson, 1986). Dyslipideamia is a well known and major risk factor for ischaemic heart disease, as elevated levels of triglycerides, total cholesterol, low density lipoprotein cholesterol and low levels of high density lipoprotein cholesterol are documented risk factors for atherogenesis (Mc Namara et al, 1992). It has also been shown that serum total cholesterol levels are continuously correlated with coronary heart disease (CHD) risk over a broad range of cholesterol values in various populations throughout the world (Law and Wald, 1994, Law et al., 1994). Numerous

studies have shown that the lowering of serum cholesterol levels slows down the progress of atherosclerosis which is demonstrable angio-graphically thus reducing the risk of CHD (Duffield et al., 1983).

It is generally thought that serum cholesterol levels are low in Nigerians because population screening carried out over two decades ago in Lagos and other parts of the country showed low mean total cholesterol levels of 3.54 ± 0.14 mmol/L (Onitiri et al., 1977). A nationwide survey for non-communicable diseases also showed the prevalence of hyperlipidaemia (serum cholesterol >5.2mmol/L) to be low at 4.0% (Akinkugbe, 1992). However, screening of an elderly population in Benin (Nigeria) later showed that 26.6% of the subjects had serum cholesterol above 5.2mmol/L (Ukoli et al., 1997).

Urbanization, increased consumption of western diets, and improvement in socio-economic activities coupled with changing population dynamics, are expected to influence the incidence pattern and prevalence of non-communicable diseases including hyperlipidaemia (Hodge et al., 1997, Okafor et al., 2008, Ike et al., 2007). It is therefore necessary to screen apparently healthy adults for lipid pattern in Aba, a city with a very high population density and dynamics in Nigeria where no such studies have been previously carried out.

MATERIALS AND METHODS

Study area: Aba, the study area is a cosmopolitan town located in Aba South and AbaNorth local Government Areas, Abia State, Nigeria. Aba is located at Latitude 5.1°N and Longitude 7.36°E with a population of about 4. 1million.

Study population: A total of three hundred and twenty apparently healthy adults made up of 162 females (50.63%) and 158 males (49.37%) were involved in the study. They were made up of traders, artisans, hospital staff, patient relations and visitors to the hospital.

Inclusion criteria: The inclusion criteria included a normal blood pressure in the absence of any anti-hypertensive drug use, normal fasting blood sugar in the absence of anti-diabetic medication and respondents who are non-smokers and do not take alcoholic beverages on a regular basis.

Ethical consideration: All the subjects who met the inclusion criteria for the study were recruited after obtaining verbal consent.

Data collection: The ages and genders of all the subjects who gave consent were documented. They were also weighed on light clothing using the DANS 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^2.

Sample collection and analysis: All respondents for lipid and glucose estimations were asked to do an overnight fast of at least 12-14 hours. Blood was stored in fluoride oxalate containing bottles (2mls) for glucose estimation and lithium heparin bottles (4mls) for, lipid essay. 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 analysed using a glucose oxidase method while the lipids were analysed using enzyme substrate method (Vincent, 1959).

Data analysis: The results were analysed using the SPSS version for windows. The mean and standard deviations of the measured parameters were calculated. The student t-test was used as appropriate with a P value of <0.05 considered as statistically significant.

RESULTS

The age range of the subjects was 20 years and above with a mean age of 48±4 years. The age and sex distribution of the subjects is shown in Table i. The range of the body mass indices (BMI) was 21.87 to 40.83 with a mean of 27.89±1.08. The mean BMI of the female subjects was 28.85±1.25 while that of the males was 26.75±1.05. The mean fasting blood sugar was 4.35±0.85mmol/L while the range was 3.88 – 7.15mmol/L. The age range and mean BMI values of subjects is shown in Table ii. International classification of lipid profile is shown in Table iiia.

The mean serum total cholesterol was 4.77+1.34 mmol/L. For males, the mean value was 4.74±1. 8mmol/L hundred and ten subjects (34.37%) had elevated cholesterol level of more than 5.17mmol. The prevalence of hypercholesterolaemia among males was 16.25% while the prevalence among females was 18.12%. These results are shown in Tables iiib, iv and v.

The overall mean LDL cholesterol was 3.41±1.06mmol/L. Among the female, the mean was 3.58+1.01 mmol/L and 3.22±1.20mmol/L among the male. Fifty-five subjects (17.20%) had elevated LDL of over 3.36mmol/L, twenty-two (6.8%) of them are males while thirty-three (10.3%) are females.

The mean serum concentration of HDL cholesterol was 0.97±0.6mmol/L. Among the males it was 0.99+0.40mmo/L while among the females of it was 0.96±0.36mmol/L. Decreased level of HDL cholesterol values less than 0.91mmol/L was considered as a risk factor for cardiovascular disease (CVD). There were one hundred and thirty two (132) subjects with decreased serum HDL cholesterol giving an overall prevalence of decreased HDL cholesterol of 41.25%. The prevalence among males was 18.75% and among females was 22.5%.

Three (3) females (0.94%) and a male (0.31%) were found to have elevated serum triglyceride level of above 2.26mmol/L, giving an overall prevalence of elevated triglyceride cholesterol of 1.25%. Analysis of the mean total cholesterol among the different age groups shows a steady increase with increasing age. The same pattern is seen with LDL cholesterol but the mean triglyceride remained almost constant in all the age groups as shown in table v.

Analyses of the BMI showed that about half of the subjects (53.43%) had normal body mass index, 30.00% had BMI in the overweight range (25 to 29.9kg/m^2) and about 17% had body mass index in the obesity range (30.0kg/m^2 and above as shown in Table vi.

Table I: Age and Sex distribution of subjects

Age Range	Male	Females	Total
20-29 yrs	36	43	79
30-39 yrs	40	52	92
40-49 yrs	37	35	72
50-59 yrs	24	18	42
60-69 yrs	21	14	35
Total	**158**	**162**	**320**

Table II: Age Range and Mean BMI values of subjects

Age Range (years)	BMI Range	Mean BMI Values
20-29 yrs	21.87 – 30.08	24.92±3.65
30-39 yrs	23.05 – 34.53	24.98 ± 3.80
40-49yrs	25.73 - 40.83	29.79±2.60
50-59 yrs	24.21 – 35.41	29.88±3.10
60-69 yrs	26.17 – 38.89	28.95±2.80

Table IIIa. International Classification of Lipid Profile (WHO, 1985)

Classification	Total cholesterol mmol/L	Low Density Lipoprotein mmol/L	HDL mmol/L	TG mmol/L	Glucose mmol/L
Desirable	<5.20	<3.36	<1.55	<2.26	<6.11
Borderline	5.20-6.18	3.36-4.11	0.91-1.53	2.26-4.50	6.11-6.94
High	>6.21	>4.14	-	>4.50	>6.94
Low	-	-	-	<0.91	-

Table IIIb: Mean Serum concentrations of cholesterol fractions among study population by sex

INDICES (Mmol/L)	SEX		TOTAL
	Male	Female	
Mean Total cholesterol	4.74±1.18	4.87±1.21	4.77±1.34
Mean LDL cholesterol	3.22±1.20	3.58±1.01	3.41±1.06
Mean HDL cholesterol	0.99±0.40	0.96±0.36	0.97±0.6
Mean Triglyceride	0.95+0.30	1.18±0.23	1.06±0.28
Mean HDL/TCH Ratio	0.21	0.20	

Table IV: Percentage of subjects with abnormal levels of plasma lipid fraction by sex.

Risk Factor	Male	Females	Total
Elevated LDL	22 (6.80%)	33 (10.38%)	55 (17.18%
Decrease HDL	60 (18.78%)	72 (22.50%)	132 (41.25%)
Elevated TCH	52 (16.25%)	58 (18.12%)	110 (34.37%)
Elevated TG	1 (0.31%)	3 (0.94%)	4 (1.25%)
Elevated TCH/HDL ratio	0.75	0.70	0.71

Table V: Relationship between age and mean cholesterol.

Age Range	Mean TCH mmol/L	Mean LDL mmol/L	Mean TG mmol/L	Mean HDL mmol/L
20-29 yrs	3.65±1.12	2.54±1.10	0.85±0.28	0.93±0.40
30-39 yrs	3.87±1.28	2.65±1.20	1.10±0.30	0.81±0.54
40-49 yrs	4.56±1.60	2.73±1.20	0.93±0.24	1.02±0.60
50-59 yrs	4.86±1.80	2.84±1.32	0.94±0.31	0.98±0.54
60.69 yrs	5.46±1.85	2.88±1.25	1.08±0.36	1.07±0.38

Table VI: Mean BMI Distribution among subjects.

BMI	Male	Female	Total
< 25.00	84±0.85	87±0.90	171 (53.43%)
25.0-29.90	47±1.25	49±1.30	96 (30.00%)
>30.00	26±1.1	27±1.20	53 (16.57%)
Total	157	163	320 (100%)

DISCUSSION

Limited information is available about the distributions of blood lipid levels and prevalence's of dyslipidaemia among healthy adults in Nigeria (Dahiru et al., 2007). The studies by Jarikre et al. (1966), Oparinde et al. (2005), Ukoh and Okonofuo (1990) were conducted among a selected population of hypertensive patients. Meludo et al. (2005) studied lipid fractions among college students aged between 20 and 25 years. The study by Bala (1998) gave an insight into the distributions of lipid components among elderly Hausa-Fulani subjects aged 65 years and above while Akuyam et al. (2006), carried out his study among pediatric age groups attending paediatric out-patient clinics. Perhaps, only Adedeji (2006) and Akpa et al. (2006) studied serum lipids profile among apparently healthy Nigerians. These studies demonstrate that dyslipidaemias are prevalent among adult Nigerians. Therefore, the present study provides new information on the distributions and prevalence of dyslipidaemias and serves as a baseline against which future changes can be assessed, at least for an urban city like Aba, South Eastern Nigerian.

The current study reveals a mean total cholesterol (TCH) level of 4.77±7.34 mmol/L in the population studied, a figure that is higher than studies in Zaria(Bala,1998) and Gambia (Vander-sande, 2000), (4.77 vs 4.44 and 4.30 respectively). This result is similar to the values reported by Akpa et al. (2006) in Port Harcourt with a mean cholesterol value of 4.76±1.06. This is however lower than the Caucasian value (4.77mmol/L vs 5.41mmol/L) as reported by Martins et al. (1986) and Fugerbery et al. (1992). This is in keeping with differences in dietary pattern

and socio-economic factors. In comparison to figures from previous studies from other parts of Nigeria, relative obesity, sedentary life styles and some degree of affluence in the cosmopolitan city of Aba, are some of the factors that may have contributed to the higher mean cholesterol recorded in this study. The prevalence of hypercholesterolaemia (total cholesterol $\geq$ 5.2mmol/L) in this study, is also much higher at 34 percent for the same reason when compared to the level in the general population (Akinkugbe, 1997). There is also a gender disparity in the degree of hypercholesterolaemia. The prevalence of hypercholesterolaemia among males is 11.0 percent while the prevalence among females is 16 percent. This disparity is similar to the results of studies in Zaria (Bala, 1998) and Aba (Ngwogu et al., 2012).

The relationship between increased level of both total and LDL cholesterol and the risk of coronary heart disease (CHD) is well established in the literature (Law et al., 1994). It has been demonstrated that every 10mg/dl increase in total or LDL cholesterol triggers 10 percent increase in risk of cardiovascular disease (especially CHD). Also for each 5mg/dl increase in HDL cholesterol there is a corresponding 10 percent reduction in the risk of cardiovascular disease (CVD) (Brown and Browner, 1996). Again, total cholesterol generally increases with age up to 50-60 years in men and then starts to decline, while in females the increase may continue until 70 years (Karvonem, 1989).

A total number of 55 subjects (17.8%) in this study had elevated LDL cholesterol, while the overall mean LDL cholesterol is high at 3.41mmol/L. These findings together with the observed high prevalence of hypercholesterolaemia indicate a high risk for cardiovascular diseases in the population under study. Medical literature has established LDL cholesterol as a better marker for cardiovascular risk factor than total cholesterol (Akpa et al, 2006), thereby making our findings rather worrisome. The reasons for this high values is also related to several factors such as urbanization, sedentary lifestyles, dietary habits and obesity. The mean BMI in the study population is 28.98kg/m^2 and about 17 percent of subjects are obese. Obesity, which has become a modern day scourge in developed countries, is now common in our environment and is a major risk factor for cardiovascular diseases (Ngwogu et al., 2012).

The mean HDL cholesterol level of 0.97$\pm$0.6mmol/L in this study is low and is similar to values from other Nigerian studies (Jarikre et al., 1966, Taylor and Agbedana, 1971). Also, when the mean HDL/total cholesterol ratio is calculated, the values are also lower than that seen in same studies (0.20mmol/L vs 0.26-0.32mmol/L) (Taylor and Agbedana, 1971, Gordon et al., 1977), because of the higher total cholesterol. A very striking feature of this result is that one hundred and thirty-two subjects (41.25%) had depressed levels of HDL cholesterol and again the female gender is worse hit. The protective effect of HDL cholesterol against coronary heart disease risk has been established, the higher the value of HDL cholesterol the less the risk (Law et al., 1994, Fugerbery et al., 1992, Karvonem, 1989). The role of HDL/TCH ratio in CHD is also well documented (Bala, 1998). Thus the normal mean total cholesterol recorded in this study does not necessarily indicate freedom from cardiovascular risk because of the low levels of HDL and HDL/TCH ratio. In fact, the population under study is at a very high risk of frequent development of cardiovascular diseases.

The triglyceride prevalence in this study is low at 1.25 percent (one male and 3 females). It is however comparable to the results of rural and urban women in Gambia (Vander-sande et al., 2000). Analysis of lipid profile distribution showed increasing lipid levels with rise in age as documented by Taylor and Agbedana (1971) and Gordon et al. (1977). This rise in mean serum cholesterol with rise in age is related to the improvements in social and economic status, reduction in physical activity, excessive dietary intake of fatty food, 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 prevalence of cardiovascular disorders such as hypertension, stroke and CHD.

This study therefore demonstrates that hyperlipidaemia and dyslipidaemia are prevalent among apparently healthy adults in urban city of Aba, suggesting a need for urgent public health intervention. Further large scale urban survey of non communicable diseases in the country is therefore necessary at this time.

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AUTHOR(S) CONTRIBUTION

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