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PREVALENCE OF DYSLIPIDAEMIA IN APPARENTLY HEALTHY PROFESSIONALS IN ASABA, SOUTH SOUTH NIGERIA.

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ABSTRACT

Background: Hypercholesterolaemia is a major risk factor for coronary heart disease (CHD) especially in industrialized societies. Coronary heart disease is becoming an increasing cause of death even in the developing world.

Objective: To determine the prevalence of dyslipidaemia in apparently healthy professionals in a developing economy.

Method: One hundred apparently healthy professionals were recruited from several professions by stratified random sampling. This population was believed to be at higher risk of dyslipidaemia considering their more likely "western diet" lifestyle. Total cholesterol, LDL-cholesterol, HDL-cholesterol and Triglycerides were determined using standard cholesterol LDL precipitating reagents/kits.

Results: The mean age of the subjects was 41.5 9 $\pm$ 8.22 years (range 29 to 58 years) with male to female ratio of 1:1.2. Mean total cholesterol was 180.69 $\pm$ 36.248 mg/dl (4.67 $\pm$ 0.94 mmol/L), LDL cholesterol 122.68 $\pm$ 44.42 mg/dl (3.17 $\pm$1.15mmol/L), HDL-cholesterol 37.47$\pm$ 9.91 mg/dl (0.96 $\pm$ 0.26mmol/L) and Triglyceride 83.139$\pm$66.888 mg/dl (0.94$\pm$0.76mmol/L).
Using the Third Report of the NCEP Expert Panel on Detection. Evaluation and Treatment of high blood cholesterol in Adults (ATP III) definition and risk classification, 5% of the study population had hypercholesterolaemia, 23% elevated total serum cholesterol, 51% elevated LDL-cholesterol and 60% low HDL-cholesterol, with females recording better overall lipid profile.

Conclusion: Dyslipidaemia was highly prevalent in the population studied, with low HDL- cholesterol being the most frequent lipid abnormality. Dyslipidaemia is becoming a serious health problem in the developing world also, even among the apparently healthy, and necessitates periodic lipid profile screening.

Key Words: Prevalence, Dyslipidaemia, NCEP (National Cholesterol Education Programme), ATP III (Adult Treatment Panel III). *(Accepted 19 December 2007)*

INTRODUCTION

Hypercholesterolaemia is a major risk factor for coronary heart disease (CHD) and remains a major public health problem.[1] It is a common disorder but most patients are not diagnosed and therefore do not receive proper treatment.[2]
Hypercholesterolaemia and CHD are common especially in industrialized societies and CHD remains the leading cause of death for both men and women of all races and ethnicities in the United States.[3,4] CHD is also becoming an increasing cause of death in the developing world.[5] A variety of factors hypertension, hypercholesterolaemia, diabetes, cigarette smoking, left ventricular hypertrophy acting in concert, are associated with increased risk of atherosclerotic plaques in coronary arteries and other arterial beds[6,7]. Epidemiologic data have shown a continuous graded relationship between the total plasma cholesterol concentration and coronary risk,[8] these data being especially true for younger men below the age of 40 years.[9]
In patients with hypercholesterolaemia, the age-standardized and sex-standardized mortality ratios are 4-5 times higher than in the general population,[10] but a decline in plasma total cholesterol has a significant impact on the morbidity and mortality rate from heart diseases, especially in patients at higher risk.[11] Longitudinal studies have demonstrated that a plasma total cholesterol reduction of 1% results in a decrease of CHD mortality of 2-3%[12] while a meta-analysis of 38 primary and secondary prevention

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trials found that for every 10% reduction in serum cholesterol, CHD mortality would be reduced by 15% and total mortality risk by 11% [13]. Serum cholesterol concentrations in the blood is composed of several major fractions which are categorized according to their relative density.

Serum total cholesterol (TC) has been used to screen adults at risk of CHD but more recent data emphasize the advantages in knowing the concentration of lipid fractions such as LDL-cholesterol and HDL-cholesterol. High concentrations of

LDL-cholesterol are a particularly important risk factor for atherosclerosis [14,15] as oxidized LDL-cholesterol leads to atherogenesis through a number of mechanisms.[16,17]

Nutritional and lifestyle factors affect TC and HDL-cholesterol. High intake of saturated and trans fatty acid, dietary cholesterol, cigarette smoking and obesity increase plasma TC and decrease HDL-cholesterol levels. Physical activity, unsaturated fat and moderate alcohol consumption increase HDL-Cholesterol. [18-23]

Low HDL-cholesterol is another important risk factor for atherosclerosis. The Framingham study reported that the risk for myocardial infarction increases by about 25% for every 5mg/dl (0.13 mmol/L) decrement in HDL-cholesterol below median values for men and women,[24] while a high serum HDL-cholesterol (above 60 mg/dl or 1.6mmol/L) is cardioprotective. Data from the lipid research clinics and the Framingham heart study suggest that TC (or LDL-cholesterol) to HDL-cholesterol ratio may have greater predictive value for CHD than serum TC or LDL-cholesterol alone.[25]

Hypertriglyceridaemia is also associated with an increased risk of cardiovascular disease [26] and is often associated with reduced levels of HDL-cholesterol.

The Third Report [27] of the Expert Panel on Detection, Evaluation and Treatment of high blood cholesterol in adults (ATP III) classified the risk associated with various LDL cholesterol concentrations (see table 1) and also defined dyslipidaemia as total serum cholesterol $\geq$200mg/dL (5.17mmol/l) and/or LDL cholesterol 100mg/dL (2.58mmol/l) and or HDL cholesterol < 40mg/dL (< 1.03 mmol/l).

The prevalence of dyslipidaemia varies with the population studied and the definition of dyslipidaemia. Incidence is highest in patients with premature coronary disease defined as occurring before 55 to 60 years of age in men and before 65 years in women. In this setting, the prevalence of dyslipidaemia is as high as 75 to 85 percent as compared to approximately 40 to 48 percent in age-matched controls without coronary disease. [28]

In Nigeria, prevalence data on dyslipidaemia among apparently healthy adults are scanty. This study seeks to provide this data by applying the ATP III definition for dyslipidaemia on apparently healthy professionals resident in Asaba, capital city of oil rich Delta State in South South Nigeria.

SUBJECTS, MATERIALS & METHODS

Following ethical clearance from the ethical committee of the Federal Medical Centre Asaba, one hundred apparently healthy professionals belonging to the upper and middles social classes were recruited from Asaba metropolis. The study population consisted of 51 males and 49 females. Informed consent was obtained from each participant and they were recruited by stratified random sampling. Their professions ranged from medicine, law, banking, police force, and senior civil service. Their more affluent lifestyle presumably predisposes them to the condition of interest - dyslipidaemia. Structured questionnaires were used to evaluate these lifestyle factors including current consumption of alcoholic beverages, cigarette smoking, patronage of "fast foods" centers and frequency of defined exercise programme. Other appropriate demographic data and measurable physical variables were obtained and Body Mass Index (BMI) calculated.

All subjects fasted for 12 to 14 hours prior to venepuncture and their lipid profile investigated as detailed.

Blood samples were collected into sterile lithium heparin containers and centrifuged within an hour of collection for 10 minutes. The plasma was separated from the red cells into plain bottles and stored frozen pending analysis. Standard cholesterol LDL-precipitating reagent kit from Randox Laboratories Limited, United Kingdom was used to determine Total cholesterol, LDL-cholesterol and HDL-cholesterol while triglyceride was estimated using kit by Biosystems Reagents and Instruments, Biosystems S.A. Costa Brava 30, Barcelona Spain. For total cholesterol estimation, 10 micromls of serum, standard and distilled water were added respectively to 1000 micromls of reagent mixed and incubated at 37°C for 5 minutes. Absorbance of samples and standard was measured against reagent blank at 546nm.

For HDL-cholesterol estimation, 500 micromls of sample and 1000micromls of precipitant was added, mixed and allowed to stand for 10 minutes at room temperature. The tubes were centrifuged for 10 minutes at 4000 rpm. 100 micromls of supernatant was assayed for HDL-cholesterol using the procedure same for total cholesterol estimation. The principle behind this methodology is based on the quantitative precipitation of low density lipoproteins (LDL and VLDL) and chylomicron fractions by the addition of phosphotungstic acid, in the presence of magnesium ions. After centrifugation, the cholesterol concentration in the HDL fraction which remains in

the supernatant is determined.
LDL-cholesterol was determined as the difference between total cholesterol and the cholesterol content of the supernatant after precipitation of the LDL-cholesterol fraction by polyvinylsulphate, in the presence of polyethylene glycol monomethyl ether.
To 0.1ml of precipitated solution in a centrifuge tube, 0.2ml of sample was added. These were mixed and allowed to stand for 15 minutes at room temperature. The mixture was then centrifuged for 15 minutes at 4000rpm using enzymatic colorimetric method. For triglyceride estimation, to 1000 microlitres of reagent in tubes for samples, standard and blank, 10microlitres of sample, standard and distilled water was added respectively. The content was mixed and incubated for 5 minutes at 37°C. Absorbance of the samples and standard was measured against reagent blank at 546nm.
Lifestyle factors were investigated by questionnaires frequency of defined exercise programme, smoking, alcohol consumption and patronage of "fast foods" centres. Appropriate demographic data and measurable physical variables were obtained and Body Mass Index (BMI) calculated.

Data Analysis
Data were entered into a data analysis proforma, coded and entered into the SPSS computer software system. Mean and standard deviations were calculated and the Chi-square test used to test for significance in the associations between sex and outcome measures.

RESULTS
The mean age of the study subjects were 41.59± 8.22 years (range 29-58 years) and the sex distribution (51 females, 49 males) almost equal (ratio 1.2:1). Thirty three (33%) of the study population were obese (BMI 30kg/m^2), comprising 11males (22.4%) and 22 females (43.1%) and the difference in the proportion of obese females to males was statistically significant (^{2} = 6.00, df = 2, p < 0.05). Two (2%) of the study population (all males) currently smoked cigarettes and forty two (42%) currently consumed alcoholic beverages (30 males: 61.2%; 12 females: 23.5%). The most commonly used brand of alcohol was beer alone 15 (31.9%), palm wine and beer 14 (29.8%), spirit and beer 10 (21.3%) and palm wine alone 8 (17%). Over half of the respondents 53 (53%) patronized fast food centres with an almost equal sex distribution (27 males; 26 females). Thirty two percent (32%) frequent these centres less than once a week while 14% visit the centres at least once a week. Nineteen percent (19% : 11 males; 8 females) had a defined exercise programme carried out between once to three times per week.
The mean total cholesterol level of the study population was 180.69±36.248mg/dL (4.670.94mmo1/L).
Table 2 shows the sex distribution of total cholesterol (TC) of the study population using the ATP III classification. Seventy seven percent (77%: 37 males; 40 females) had desirable levels of total cholesterol (< 200mg/dL) while 23% (12 males; 11 females) had undesirable levels of TC. Of this latter group, 17% (9 males; 8 females) had borderline high values (200-239 mg/dL) and 6% (3 males; 3 females) had high TC (240mg/dL). Overall, the differences in the TC values between both sexes was not statistically significant (^{2}= 0.1204,df=1,p>0.05).
The mean LDL- cholesterol for the study population was 122.6844.42mg/dL (3.17±1.15mmo1/L).
Table 3 shows the sex distribution of LDL cholesterol of the study population using ATPIII classification. Forty nine percent (49%: 22 males; 27 females) had optimal levels of LDL cholesterol (<100mg/dl) while 51% (27 males; 24 females) had abnormal levels of LDL cholesterol (43% above optimal: 100-129mg/dL; 7% borderline high: 130-159mg/dL; 1% high: 160-189mg/dL; 0% very high:>190mg/dL). Optimal levels of LDL cholesterol was better in females than males (52.9% vs 44.9%) but the difference was not statistically significant (^{2}=0.647,df=1,p>0.05). The mean HDL-cholesterol for the study population was 37.47±9.91mg/dL (0.960.26mmo1/L)
Table 4 shows the sex distribution of HDL-cholesterol using ATPIII classification. Sixty percent (60%: 37 males; 23 females) had low HDL-cholesterol (<40mg/dL) while 40% (12 males; 28 females) had borderline high (40-59mg/dL) and high (60mg/dL) HDL cholesterol. The more desirable high HDL cholesterol profile was much better in females than males (70% vs 30%) and the difference was statistically significant (^{2}=9.6305,df =1,p<0.05). The mean triglyceride for the study population was 83.139±66.888mg/dL (0.94±0.76mmo1/L). Ninety five percent (95%: 45 males; 50 females) had normal triglyceride levels (<150mg/dL) while only 5% (4 males; 1female) had high triglyceride value (≥150mg /dL).

Legend To Table

Table 1 The NCEP (ATP III) risk classification for dyslipidaemia

Table 2 Sex distribution of total cholesterol using the ATP III classification (mg/dL)

Table 1: **The NCEP (ATP III) Risk Classification for Dyslipidaemia**

Total Cholesterol: mg/dl (mmol/L)	
<200 (<5.17)	desirable
200 - 239 (5.17 - 6.18)	borderline high
≥ 240 (≥ 6.20)	high
LDL cholesterol: mg/dl (mmo1/L)	
< 100 (< 2.58)	optimal
100-129 (2.58 3.33)	aove optimal
130-159 (3.36 4.11)	borderline high
160-189 (4.13 - 4.88)	high
≥ 190 (≥ 4.91)	very high
HDL cholesterol: mg/dl (mmol/L)	
< 40 (< 1.03)	low
> 60 (>1.55)	high

Table 2: **Sex Distribution of Total CholesteroL Using The ATP III Classification (mg/dl)**

ATPIII Classification (mg/dL)	**Male**	**Female**	**Total**
Desirable <200 mg/dL	37	40	77
Borderline High 200 – 239 mg/dL	9	8	17
High ≥ 240 mg/dL	3	3	6
Total	49	51	100

Table 3: **Sex Distribution of LDL Cholesterol Using the ATP III Classification (mg/dL)**

	SEX		
ATPIII CLASSIFICATION (mg/dL)	**MALE**	**FEMALE**	**TOTAL**
Optimal < 100 mg/dL	22	27	49
Above Optimal 100 – 129 mg/dL	24	19	43
Borderline High 130 – 159 mg/dL	2	5	7
High 160 – 189 mg/dL	1	0	1
Very High > 190 mg/dL	0	0	0
Total	49	51	100

Table 3 Sex distribution of LDL-cholesterol using the ATP III classification (mg/dL)

Table 4 Sex distribution of HDL-cholesterol using the ATP III classification (mg/dL)

Table 5 Comparison of results with some existing data on lipid levels in different populations

Table 4: **Sex Distribution of HDL Cholesterol Using The ATP III Classification (mg/dL)**

	Sex		
ATPIII Classification (Mg/dL)	**Male**	**Female**	**Total**
Low <40 mg/dl	37	23	60
Borderline High 40-59 mg/dl	12	26	38
High >60 mg/dl	0	2	2
Total	49	51	100

Table 5: **Comparism of Our Result (mmols/L) With Some Existing Data on Lipid Levels in Different Populations**

Countries	**Total Cholesterol**	**LDL Cholesterol**	**HDL Cholesterol**	**Triglycerid**
Nigeria+	4.67±0.94	3.17±1.15	0.96±0.26	0.94±0.76
Nigeria*	4.58±0.47	2.69±0.20	1.52±0.22	0.80±0.70
USA**	4.57±0.96	3.05±0.88	1.27±0.31	0.97±0.53
GB***	5.90±1.20	3.17±0.02	1.49±0.04	1.80±1.40

+ This study
* Adedeji [23]
** Sacks et al [31]
*** Thorogood et al [32]

DISCUSSION

In Nigeria, data on prevalence of hyperlipidaemia in apparently healthy Nigerian adults is scanty. Ahaneku et al[29] in a study conducted in the South East geographic zone in Nigeria found a mean TC of 7.3± 1.6mmol/L in out patient diabetics and 4.8± 0.68mmol/L in age and sex matched non-diabetic controls. The mean TC of their control population is similar to the findings in this study of 4.67± 0.94mmol/L in apparently healthy adults in South South Nigeria. Both studies also agree with the finding of Adedeji in Lagos (South West Nigeria).[23] Adedeji obtained a mean TC of 4.58±0.47mmol/L in apparently healthy volunteers in Lagos. Overall the mean serum TC levels of these Nigerian studies were within "desirable" levels (< 5.17mmol/L) using the ATP III classification.

It is empirically believed that Nigerians of the upper social class status have elevated plasma lipid levels. This belief may not be erroneous, as Agboola-Abu et al [30] in Nigeria evaluated the frequency of hyperlipidaemia in this sub-population and found an overall prevalence of hypercholesterolaemia of 60.4% and hypertriglyceridaemia 22.6%. The findings of this study is similar to the findings of Agboola-Abu et al. Using the NCEP (ATPIII) risk classification criteria, dyslipidaemia was highly prevalent in the population studied. Five percent (5%) had elevated serum triglycerides, 23% elevated total cholesterol (TC), 51% elevated LDL cholesterol and 60% low levels of HDL cholesterol. Females had overall better lipid profile values for triglycerides, TC and cholesterol fractions than males.

Table 4 compares findings in this study with some existing data on lipid levels in different populations. Overall, results for mean TC, LDL cholesterol and triglycerides levels in this study closely compared with local and Caucasian values. [31,32] However, mean HDL cholesterol was much lower than local and Caucasian figures thus suggesting that low HDL cholesterol [(40mg/dL); (1.03mmo1/L)] may be the major form of dyslipidaemia and marker of cardiovascular risk in apparently healthy Nigerian adults of middle and upper social class status.

CONCLUSION

Hyperlipidaemia is emerging as a serious health hazard in the developing economy, even among apparently healthy individuals. Elevated LDL cholesterol and especially low HDL cholesterol are the major lipid disorders prevalent.

It is recommended that lipid profile screening be integrated as part of the baseline medical assessment of adult Nigerians to facilitate early detection of dyslipidaemia and institution of appropriate prophylactic and therapeutic measures.

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