ORIGINAL ARTICLE

Diet, Alcohol Consumption and Serum Lipid Levels of Elderly Men and Women of Ibo Extraction in the Delta State of Nigeria

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ABSTRACT

Background: Serum lipid levels are directly associated with the development and progression of coronary heart disease especially in the elderly, and lifestyle factors can modify this association.
Objective: This study aims to determine the effect of diet and alcohol consumption on lipid profile of elderly subjects in Asaba, Delta State, Nigeria.
Methodology: Elderly subjects attending quarterly medical lectures organized by a non-governmental organization at the Federal Medical Centre, Asaba were recruited. Information on diet, alcohol consumption and hypertension were obtained and serum lipids were determined using standard cholesterol / low density lipoprotein and cholesterol precipitating reagents.
Results: They were 110 males and 66 females. The prevalence of hypercholesterolemia was 47%. Elevated total cholesterol and low density lipoprotein cholesterol were associated with consumption of high fatty diet and absence/high alcohol consumption, although, this was not statistically significant ($p= 0.3$).
Conclusion: Dyslipidaemia is prevalent in our elderly population and low dietary fat and moderate alcohol consumption are associated with better lipid parameters.

Keywords: *Dyslipidaemia, elderly population, lifestyle factors*

INTRODUCTION

The effect of abnormal serum lipids on the progression of arteriosclerosis and consequent cardiovascular disease cannot be overemphasized. Several studies have shown that high low density lipoprotein (LDL) and triglyceride (TG) levels are directly associated with increased cardiovascular morbidity and mortality while high levels of high density lipoprotein (HDL) have an inverse association.[1,2,3,4] Lifestyle factors such as diet, alcohol consumption, cigarette smoking and physical activity have all been shown to affect the strength of the relationship between serum lipids and arteriosclerosis.[5] Polychronopoulos, *et al* reported in their study that a diet rich in non-refined cereals, fruits, vegetables, polyunsaturated fatty acids and moderate alcohol consumption reduces risk of cardiovascular disease by improving lipid profile.[6] Diabetes, including impaired glucose tolerance and hypertension, had been shown to modify the effect of dyslipidaemia on cardiovascular disease risk.[7]

Although the dietary habits or preferences of elderly men and women in the Delta have been previously documented, its association with their serum lipid levels is still not known.[8] Odenigbo, *et al* had earlier reported a relatively high prevalence of dyslipidaemia among apparently healthy educated adult population in South-South, Nigeria.[9] Since dyslipidaemia is one of the major risk factors for cardiovascular disease which is a leading cause of death in the elderly, this study aims to determine the lipid profile of these elderly subjects and establish any association with their dietary habits and alcohol consumption.

METHODOLOGY

This was a cross-sectional study conducted at Asaba, capital of Delta State in South-South, Nigeria. One hundred and seventy-six elderly subjects attending quarterly medical lectures organized by a non-governmental organization at the Federal Medical Centre, Asaba were recruited into the study after obtaining their informed consent. The study lasted for two months, from April to May 2009. Ethical approval was obtained from the Ethical Committee of the Federal Medical Centre, Asaba. All subjects fasted overnight before the collection of blood samples.

A structured questionnaire on socio-demographic data such as age, sex, level of education, marital status, occupation, dietary habits and daily alcohol consumption was administered on each participant. Alcohol consumption was graded according to reports from population based studies.[10,11] In females, alcohol consumption of <10g/day = little, 10-19g/day = moderate, and ≥20g/day = high. In males, values <20g/day = little, 20-39g/day = moderate, and ≥40g/d = high. Blood pressure (BP) was measured on the right arm and in the sitting position using Accoson mercury sphygmomanometer (England). Participants with BP ≥140/90mmHg or those on anti-hypertensive drugs were reported as having hypertension.

Six millilitres (ml) of venous blood was obtained from the ante-cubital fossa while observing universal precautionary measures. Four millilitres was withdrawn into lithium heparin containers and centrifuged at 4000rpm within an hour of collection. The supernatant sera were stored at -8^{0}C until analysis. Standard cholesterol LDL precipitating reagent kits from Randox Laboratories Limited, United Kingdom were used to determine total cholesterol, LDL cholesterol and HDL-cholesterol. Triglyceride was estimated using kits made by Biosystems Reagents and Instruments, Biosystems S.A. Costa Brava 30, Barcelona, Spain.

Enzymatic colorimetric methods were employed for the estimation of plasma total cholesterol and triglyceride as described by Allain, *et al* and Buccolo, *et al*, respectively.[11,12] HDL-cholesterol was also determined using enzymatic colorimetric methods after separation from other lipoproteins using a mixture of phosphotungstic acid and magnesium chloride. LDL-cholesterol was

calculated using the formula of Friedwald, *et al*.[12,13,14]

The remaining 2ml was collected in a fluorinated bottle, and was used to determine fasting plasma glucose (FPG) using the glucose oxidase method FPG >5.6mmol/l was considered impaired fasting glycaemia and documented as abnormal.[15] Values of total cholesterol, triglycerides and LDL cholesterol above 5.17mmol/l, 1.7mmol/l and 2.58mmol/l, respectively were taken as elevated and abnormal while HDL cholesterol less than 1.03mmol/l was documented as low. Cut-off values were according to the National Cholesterol Evaluation Program, Adult Treatment Panel 111(NCEP, ATP 111).[2] The laboratory analyses were carried out at the chemical pathology laboratory of the Federal medical centre, Asaba.

DATA ANALYSES

All statistical analyses were performed using SPSS (statistical package for social sciences) version 15.0. Categorical variables were tested by the chi-squared test, and Spearman's rho non-parametric correlation was used to test for association between variables. Continuous variables were presented as mean± standard deviation using the student's t-test. One–way ANOVA was used to test for associations between means and Bonferroni correction for multiple comparisons was used to correct for type1 errors. Statistically significant associations was taken as p-values <0.05.

RESULTS

Of the 176 elderly subjects studied, 110 were males giving a male to female ratio of 1.7 to 1. The majority of the study population were aged 60-69years (43.8%) followed by those aged 70-79years (29%), the age group 50-59years constituted 18.2%, and 9.1% were 80years and above. Ninety-two (52.3%) had tertiary education, 37 (21%) had secondary education and 42 (24%) had primary education. Only 5 (2.8%) had no formal education. Most of them were married (74%) and had retired from active service (71%).

One hundred and twenty-three (69.3%) respondents admitted to a daily consumption of a high carbohydrate diet, 23 (13%) consume a high protein diet and 6 (3.4) preferred a fatty diet. Nevertheless, more than 80% of the subjects took moderate to high quantities of fruits and vegetables daily. Less than half of the subjects consume alcohol. Of the 70 (39.7%) who took alcohol, 58 (82.8%) were males and 12 (17%) were females (*p<0.001*). Forty (57%) take small quantities of alcohol daily, 29 (41%) take moderate alcohol and only 1 (1.4%) admitted to being a heavy drinker. Hypertension (blood pressure ≥ 140/90mmHg) was documented in 71 (66.4%) males and in 56 (85%) females, while abnormal FPG was observed in 27 (24.5%) males and 12 (18%) of females (*Table 1*).

Table 1. Lifestyle and clinical characteristics of the study population

DIET PREF.	MALE	FEMALE	Chi²	P-Value
CHO	74(68.5)	49(74.2)		
Protein	18(16.7)	5(7.6)	5.265	0.15
Fat	5(4.6)	1(1.5)		
FRUIT/VEG				
Mod-high fruit	98(89)	50(75.7)	6.297	0.098
Mod-high veg	102(92.7)	55(83.3)	5.600	0.13
ALCOHOL INTAKE				
Small	29(26)	11(16.7)		
Moderate	28(25.5)	1(1.5)	24.87	0.000
High	1(0.9)	0(0)		
Raised BP	71(66.4)	56(84.8)	7.152	0.01
Abnormal FPG	27(24.3)	12(18.2)	0.968	0.32

PREF = preference, CHO = Carbohydrate, VEG = Vegetable, FPG = fasting plasma glucose

The mean total cholesterol was 4.96±1.02 in males and 5.23±0.92 in females. The mean triglyceride in males and females were 1.23±0.99 and 1.38±1.25, respectively. The mean LDL was 2.87±0.81 in males and 2.97±0.82 in females. The mean HDL in males was 1.55±0.4, and 1.7±0.4 in females. The mean lipid values were not significantly

different statistically in males and females except for HDL (*p=0.02*) (*Table 2*).

Table 2. Mean concentration of lipids in males and females

Lipids (*mmol/L*)	Mean conc.±SD		t-value	p-value
	Males	Females		
Total Cholesterol	4.96±1.02	5.23±0.92	-1.74	0.08
Triglycerides	1.23±0.99	1.38±1.23	-0.87	0.39
LDL	2.87±0.81	2.97±0.82	-0.83	0.41
HDL	1.55±0.40	1.70±0.42	-2.33	0.021

The prevalence of hypercholesterolemia was 47% (44.5% of men and 51.5% of women, *p=0.65*). We also observed that LDL was high in 61% (61% of men and 62% of women *p=0.2*), TG was elevated in 13% (12% of men and 15% of females, *p=0.9*) and HDL was low in 7.3% (11% of men and 1.5% of women, *p=0.06*) (*Table 3*). Interestingly, 10(16.3%) of the men who had normal total cholesterol had low HDL while only 1 (3%) of females with normal total cholesterol had low HDL values.

Table 3. Lipid pattern in elderly males and females

Lipid	Male (*n=110*)	Female (*n=66*)	Total (*n=176*)	Chi sq.	p-value
T. Chol.	49(44.5)	34(51.5)	83(47)	0.83	0.65
TG	13(12)	10(15)	23(13)	0.58	0.9
LDL	67(61)	41(62)	108(61)	6.03	0.2
HDL	12(11)	1(1.5)	13(7.3)	5.41	0.06

T. chol = Total cholesterol, TG = Triglyceride, LDL = low density lipoprotein, HDL = high density lipoprotein.

Serum total cholesterol and LDL cholesterol were found to be higher in subjects who consume a high fatty diet daily when compared to those who consume a daily high carbohydrate or protein diet. Serum HDL cholesterol was also lower in these subjects. However, multiple comparison showed the difference was not statistically significant (*p>0.05,* respectively). Hypercholesterolemia was associated with absence/high alcohol consumption but not with little/moderate alcohol intake. Again, this association was not statistically significant (*p=0.3*). The association between alcohol and other lipid parameters was not statistically significant (*p>0.05*), respectively. Nevertheless, HDL was found to be significantly higher in the lone respondent who admitted to high daily alcohol consumption (*p=0.002*). Serum lipids were also higher in subjects whose blood pressures were 140/90mmHg and above and in those with impaired fasting glycaemia though it was not statistically significant (*Table 4*).

Table 4. Mean Lipid values according to lifestyle and clinical characteristics

Food Pref.	TC	TG	LDL	HDL
CHO	5.08±1.05	1.37±1.26	2.89±0.86	1.62±0.42
Protein	4.86±0.98	0.9±0.28	2.89±0.73	1.56±0.46
Fat(6)	5.12±0.55	1.02±0.23	3.23±0.67	1.38±0.17
p-value	0.76	0.27	0.73	0.5
Alcohol Intake				
Small	4.88±0.81	1.27±0.64	2.71±0.72	1.61±0.46
Moderate	4.88±1.15	1.52±0.54	2.89±0.88	1.38±0.37
High	5.2	0.6	2.4	2.5
None	5.18±1.0	1.28±1.08	2.99±0.82	1.67±0.38
p-value	0.29	0.58	0.29	0.002
BP				
Normal	4.93±1.01	1.28±1.25	2.89±0.84	1.53±0.4
Raised	5.12±0.98	1.3±1.03	2.92±0.8	1.64±0.42
p-value	0.27	0.93	0.81	0.13
FPG				
Normal	5.04±1.02	1.17±0.63	2.89±0.81	1.61±0.41
Abnormal	5.13±0.89	1.68±1.94	2.95±0.81	1.61±0.42
p-value	0.62	0.009	0.72	0.97

Food pref. = food preference, CHO = Carbohydrate, BP = Blood pressure, FPG = Fasting plasma glucose

Spearman's bi-variate correlation showed a significant positive association between total cholesterol and all the other lipid parameters (*p<0.001*), respectively. Alcohol consumption showed a positive correlation with HDL

cholesterol which was statistically significant (*p=0.046*). Diet on the other hand had a negative correlation with lipids and alcohol consumption but these were not statistically significant (*p>0.05*), respectively (*Table 5*).

Table 5. Spearman's correlation of dietary preference, alcohol consumption and serum lipids

	TC	TG	LDL	HDL	ALCOH.	FOOD PREF.
TC	1					
TG	0.24(0.01)**	1				
LDL	0.84(0.00)**	-0.001(0.9)	1			
HDL	0.52(0.00)**	0.126(0.09)	0.08(0.27)	1		
ALCOH.	0.14(0.06)	-0.047(0.54)	0.139(0.07)	0.15(0.046)*	1	
FOOD PREF.	-0.02(0.8)	-0.05(0.56)	0.05(0.5)	-0.03(0.7)	-0.127 (0.09)	1

TC = Total cholesterol, TG = Triglyceride, LDL = Low density lipoprotein, HDL = High density lipoprotein, ALCOH = Alcohol, FOOD PREF = Food preference.

*** Correlation is significant at 0.01 level* **Correlation is significant at 0.05 level*

DISCUSSION

Several epidemiological studies have assessed blood lipids in the elderly both locally and overseas.[7,16,17,18] There is little debate about an elevated plasma cholesterol level, particularly an elevated plasma LDL cholesterol level, increasing the risk of cardiovascular disease.[2,19] Data from inter- and intra-population studies have clearly demonstrated that as total and LDL cholesterol levels increase, the risk of cardiovascular disease also increases.[20,21] A strong association had also been reported between dietary fatty acids and elevated plasma cholesterol levels.[22]

Our study showed that 47% of the participants had elevated total serum cholesterol level and this is in keeping with the report from the National Health and Nutrition Examination Study (NHANES) in the USA which showed that roughly 50% of adult male and female in that country have elevated total blood cholesterol.[21]

Another study that investigated blood lipids among Greek adults reported that 48% of men and 55% of women aged above 50years have hypercholesterolaemia.[6]

In Nigeria, the prevalence of hypercholesterolemia is reported to be significant among healthy adults in the middle and upper social class.[8,23,24] The mean TC level of 5.09mmol/l reported in this study is comparable to the 4.58mmol/l reported by Adedeji, *et al* in South-West Nigeria and the 4.8mmol/l reported by Odenigbo, *et al* in South-South Nigeria.[8,25] Serum LDL cholesterol was elevated in 6 out of every 10 males and females. The high prevalence of LDL hypercholesterolemia compared to other lipid parameters observed in this study is consistent with reports by other authors in Nigeria.[8,24,25,26] The mean LDL cholesterol in this population is above optimal, irrespective of dietary preference and alcohol consumption.

Since most of our study population are educated, it is possible that the carbohydrate/protein consumed are more of the refined type contained in western diets than the more complex ones contained in traditional African diets. This may explain the abnormal LDL cholesterol in the subset which preferred carbohydrate / protein meals. Nevertheless, total cholesterol and LDL cholesterol were higher in subjects who preferred fatty meals, had abnormal fasting glycaemia and elevated blood pressure but lower in subjects who took mild to moderate alcohol.

Serum LDL cholesterol also shows a positive correlation with total cholesterol which was statistically significant. These findings are

consistent with reports that hypertension, diabetes and fatty meals with attendant obesity are associated with elevated lipid levels while mild to moderate alcohol consumption has been associated with lower lipid levels.[6] Based on the recent NCEP ATP 111 guidelines, that individuals with elevated LDL C and more than two risk factors for coronary heart disease should start on anti-lipidemic drugs, it appears that a considerable number of our elderly patients should be started on lipid lowering agents.

Concerning TG, 12% of males and 15% of women have elevated TG. It is lower than the 23% reported by Agboola-Abu, *et al*.[25] However, the mean TG of 1.23mmol/l in males and 1.38mmol/l in females are considered desirable according to the NCEP ATP 111 criteria. Higher triglycerides in subjects with impaired fasting glycaemia and hypertension than in those with normal blood pressure and normoglycaemia in this work is not surprising as atherogenic dyslipidaemia associated with the metabolic syndrome is characterized by hypertriglyceridaemia.[28] Moreover, some researchers are of the opinion that hypertriglyceridaemia (and not hypercholesterolaemia) is associated with myocardial infarction.[29]

Serum HDL C was low in 11% of males and 1.5% of females. A wide range of scientific evidence suggests that the prevalence of low HDL C is higher in males than females even among the elderly.[30] It has been documented that even for those with normal levels of total cholesterol the risk of myocardial infarction is high when HDL C is low. We observed in this study that 16.3% of men and 3% of females with desirable levels of total cholesterol have low HDL C levels. This underlines the necessity for calculating the total to HDL cholesterol ratio (Atherogenic Index) for the evaluation of blood lipids in the prevention of cardiovascular disease in our clinics.

CONCLUSION

The prevalence of dyslipidaemia is high in our elderly population and abnormalities in LDL C are the most common. A diet rich in fat is associated with worse lipid parameters while mild to moderate alcohol consumption is associated with better lipid parameters. Considering the high prevalence of dyslipidaemia in this population, we recommend that screening for dyslipidaemia be considered essential for all elderly persons presenting to the clinic followed by adequate and effective intervention including dietary counseling.

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