# CHOLESTEROL PROFILE OF ADULTS RESIDENT IN EASTERN NIGERIA

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## SUMMARY

**Objective:** The present study aims to determine a cholesterol profile for people living in this part of Eastern Nigeria. This will enable recommendation of a range of normal Cholesterol levels for the people living in this part of the world.

**Method:** Total serum cholesterol, HDL, LDL, VLDL and triglycerides levels were determined in about 200 apparently healthy subjects – males and females. Both enzymatic and mathematical methods were used to achieve these results.

**Results:** Mean total serum cholesterol level for male was 4.39 ± 0.21 (mmol/l) while value obtained for females was 4.5 ± 0.22. The difference observed was not statistically significant. The values obtained for cholesterol fractions include – HDL 2.07 ± .01 for males and that obtained for females was 1.28 ± .06. LDL levels were 2.75 ± 0.13 for males and 2.98 ± 0.14 for females. VLDL values showed 0.27 ± 0.02 for males and 0.25 ± 0.02 for females. Values obtained for triglycerides were 0.29 ± 0.09 for males and females 0.25 ± 0.01. The difference observed in the values for the male and female subjects were not statistically significant.

**Conclusion:** Cholesterol values for males and females in this part of Eastern Nigeria are similar. The values, however, seem lower than those for Europeans and Americans.

***Key Words:*** *Cholesterol Profile, Eastern Nigeria*

## INTRODUCTION

Numerous angiographic trials have shown that atherosclerotic process can be modified by reducing the levels of cholesterol[1-5]. Cholesterol accounts for almost all of the sterol in plasma. It exists as a mixture of unesterified (30-40%) and esterified (60-70%) forms, and the proportion of the two forms is fairly constant within and between normal individuals. A variety of factors can help bring about elevated plasma levels of cholesterol and the accompanying well documented increased risk for coronary artery diseases; the most obvious vehicle is a high fat or cholesterol diet[6].

Elevated cholesterol level (.>200mg/dl) is related to the pathological changes associated with atherosclerosis and coronary artery disease[7]. Cholesterol may cause impairment of vasodilatation to acetylcholine in the aorta and a reduction in ATP-induced relaxation[8] .

In spite of the seriousness of atherosclerosis it is often difficult to diagnose it by non-invasive techniques. Evaluation of metabolic changes associated with the arterial wall and development of atherosclerotic lesions at an early stage would be useful. Endothelial cell damage play important role in early pathogenesis of atherosclerosis[9,10]. It has also been shown[11] that serum lipoprotein abnormalities especially elevated low density lipoprotein (LDL) and significantly reduced levels of high density lipoproteins (HDL) are closely related to atherogenesis[4].

New experimental evidence has shed light on a number of fundamental processes that contribute to atherosclerotic plaque formation

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and coronary heart diseases[6]. Recent data suggest that oxidized low density lipoprotein (LDL) may be more avidly bound and taken up by macrophages and thus more atherogenic than unmodified LDL[12]. Hypercholesterolemia, hypertension and possibly other factors may induce changes in endothelial structure and function which are early events associated with arterial injury [13,14].

Most literature on cholesterol studies is on Caucasian values. There is little information on cholesterol profile in Africans. Since this profile is influenced by environmental factors, the levels accepted as normal in residents of Europe and America may not be appropriate for Africa s. The present study aims to determine the cholesterol profile of adult Nigerians. The study will also highlight a simple formula for deriving some of the cholesterol sub-fractions.

## MATERIALS AND METHODS

A set of 127 male and 78 female subjects aged 25-70 years from diverse backgrounds and who were apparently healthy were selected for the study. Subjects showing factors such as obesity, diabetes, heavy smoking and alcoholism that may adversely affect the results were excluded from the study.

Samples of venous blood were collected from the subjects in heparinized tubes before breakfast, stored at 4°C and analyzed within 48hrs of collection.

Total serum cholesterol, HDL fraction, LDL fraction and VLDL fraction were measured. Total serum cholesterol was determined using enzymatic methods a s described by Allain CC et al[15], applying the Randox Cholesterol Kit (Randox, England). HDL fraction was isolated by HDL-Cholesterol precipitant method described by Friedwald WT et al[16]. LDL was calculated with a formula from total cholesterol and triglycerides (LDL-cholesterol = Total Cholesterol – Triglycerides/2.2 –HDL-Cholesterol). Triglycerides were isolated enzymatically as described by Henry JB[17] and the Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults[18]. It was necessary to isolate triglycerides before determining the levels of LDL and VLDL. The latter was calculated using a formula (VLDL-cholesterol = Plasma Triglycerides/2.825 mmol/L)[19].

Results were analyzed using the Student T-test and ANOVA.

## RESULTS

The results (table 1) showed that mean total cholesterol value for men and women were 4.39 ± 0.21 and 4.5 ± 0.22 respectively. The difference observed between the mean value for males and the females was not statistically significant. Neither were there statistically significant differences in the values of HDL, LDL, VLDL and Triglycerides for both sexes.

The study also looked at the profile of the parameters under study against age (tables 2 and 3). Total cholesterol concentration increased steadily with age for both sexes ($P<0.05$). The increase is more apparent in the male subjects. ANOVA showed no significant variation ($r =0.07$) between male and female subjects. Variations of mean within both groups were not found to be statistically significant.

For HDL-cholesterol, no statistically significant difference was observed between age groups in the both sexes. However, the HDL values for males appeared to be generally higher than those for the females ($p<0.05$).

LDL values seemed to be increasing with age in both males and females. The differences observed were, however not statistically significant ($r =0.16$).

VLDL values showed a trend similar to that observed in LDL. The variations observed between the population means were not statistically significant ($r =0.14$).

Triglyceride showed no variation in mean values neither within either group nor between the groups.

**Table 1 Serum Cholesterol, its sub-fractions and Triglycerides in Healthy Subjects***

| Sex | Total Cholesterol | HDL | LDL | VLDL | Triglycerides |
|---|---|---|---|---|---|
| Males (n=127) | 4.39 ± 0.21 | 2.07 ± 0.01 | 2.75 ± 0.13 | 0.27 ± 0.01 | 0.29 ± 0.09 |
| Females (n=78) | 4.5 ± 0.22 | 1.28 ± 0.06 | 2.98 ± 0.14 | 0.25 ± 0.01 | 0.25 ± 0.01 |

*Mean ± SEM mmol/L

**Table 2: Total Cholesterol, its Sub-fractions and Triglycerides in Healthy Adult Males**

| age | n | Mean | | | | |
|---|---|---|---|---|---|---|
| | | Total Cholesterol | HDL | LDL | VLDL | Triglycerides |
| 26 – 35 | 20 | 3.92 | 1.5 | 2.2 | 0.29 | 0.87 |
| 36 – 45 | 47 | 4.27 | 1.38 | 2.7 | 0.28 | 1.04 |
| 46 – 55 | 49 | 4.54 | 3.13 | 2.9 | 0.29 | 0.27 |
| 56 – 65 | 8 | 5.1 | 1.29 | 3.6 | 0.27 | 0.60 |
| 66 - 75 | 3 | 4.8 | 1.3 | 2.3 | 0.23 | 0.06 |

**Table 3 Total Cholesterol, its Sub-fractions and Triglycerides in Healthy Adult Females**

| age | n | Mean | | | | |
|---|---|---|---|---|---|---|
| | | Total Cholesterol | HDL | LDL | VLDL | Triglycerides |
| 26 – 35 | 18 | 4.26 | 1.37 | 2.67 | 0.27 | 1.06 |
| 36 – 45 | 34 | 4.61 | 1.31 | 3.10 | 0.25 | 1.14 |
| 46 – 55 | 15 | 4.71 | 1.17 | 3.24 | 0.36 | 1.50 |
| 56 – 65 | 9 | 4.25 | 1.35 | 3.73 | 0.27 | 0.94 |
| 66 - 75 | 2 | 4.5 | 1.13 | 2.84 | 0.25 | 1.35 |

## DISCUSSION

Plasma lipid and lipoprotein concentration vary within and among populations and under different conditions within a given individual [17,18]. Technical factors may also account for variation of values obtained in measurement; such variability poses problems for the selection of cut-off points for the diagnosis and treatment of hyperlipidaemia. Thus the selection of cholesterol level of 6.284 mmol/L (240mg/dl) to identify high blood cholesterol[19] is partly based on its defining the upper quartile of the US adult cholesterol profile. This level is much higher than the mean cholesterol level recorded for either sex in this study. Use of this cut-off point, therefore, in other populations, including Eastern Nigeria, where cholesterol profile differ would lead to a greater or lesser proportion of individuals being so defined.

Factors that contribute to the subject's usual cholesterol level include age, sex and body weight, behavioral factors such as diet, alcohol use, and exercise; genetic factors such as primary dyslipidemia, and chronic disorders such as hypothyroidism, obstructive liver disease or kidney disease. In the temperate regions, slight seasonal variation in cholesterol occurs, in that cholesterol levels are higher in the winter[19].

The dietary intake of cholesterol has important influence on plasma cholesterol levels, the effects taking one to two weeks to become apparent. Several medications can alter lipid levels. These include oral contraceptives, postmenopausal estrogens and various anti-hypertensive drugs. A high proportion of the population in Europe and America use these drugs. Although these drugs are also used in Nigeria, fewer persons do so. These behavioral and environmental differences may explain the differences in serum lipids between persons living in America and persons living in Nigeria.

As different populations have varying levels of cholesterol and its fractions, it will be misleading to rigidly extrapolate one population values unto another. This is the reason why different cut-off points must be created for

different populations. This study results seem to give credence to the suggestion that different populations have different cut-off points for the parameters measured. However, similar and larger studies need to be conducted in this region to establish proper cut-off points for these parameters.

## CONCLUSION

Apart from HDL, the mean levels of cholesterol and its sub-fractions in residents of Eastern Nigeria seem to be similar for both males and females. Mean HDL level seems to be higher in males than in females.

Larger studies would enable confirmation of the findings of this study and establishment of normal reference levels for these lipids for residents of this region.

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