

## Serum cholesterol level in a typical suburban commercial community in Nigeria

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**Abstract.** Forty-one apparently healthy businessmen and -women and an equal number of government workers matched for age and sex underwent serum cholesterol determinations. The mean serum cholesterol levels of businessmen and -women were significantly higher than those of their government worker counterparts ( $p < 0.001$ ). The marked increase in the serum cholesterol of the business subjects was attributed to their overindulgence and/or eating habits and lack of physical activity. The cardiovascular risk implications of the high cholesterol value and other risk co-factors such as obesity and alcoholism observed among the business subjects are highlighted. We advise that for communities similar to the one described here, public enlightenment programmes about the health benefits of periodic medical assessment and recreational physical activities are necessary. A further comprehensive study of lipid, lipoprotein and other risk factors in these subjects should be encouraged.

**Key words.** Cholesterol level; suburban commercial community; business subjects; government workers; Nigeria.

In recent times, the global quest for the reduction of the incidence and prevalence of cardiovascular diseases has been rekindled. Data on lipid parameters and risk factors such as smoking, alcoholism, obesity and diabetes mellitus are available from surveys of cardiovascular disease occurrence in different populations<sup>1-5</sup>. Reports from Africa have consistently showed a low incidence of cardiovascular disease in Africans when compared with Caucasians or American blacks<sup>6,7</sup>. Amongst the risk factors, serum cholesterol has been unequivocally incriminated in the pathogenesis of atherosclerotic coronary heart disease (CHD)<sup>8,9</sup>. In Nigeria, cholesterol levels have been measured, and the results showed lower cholesterol concentration in Nigerians than in Caucasians or American blacks<sup>10-12</sup>. Taylor and Agbedana<sup>11</sup> examined cholesterol levels in subjects from groups of high and low socioeconomic backgrounds, defined on the basis of the level of income and academic achievement, and related higher levels in the higher class to eating habits. Recent studies have also associated high cholesterol levels with eating disorders, and the simultaneous onset of obesity<sup>13-15</sup>. In the present study, we took into account the present-day situation in Nigeria, where level of academic achievement no longer tallies with income. We therefore decided to measure cholesterol level and other cardiovascular risk

variables in traders, who are difficult to classify on the basis of socioeconomic level because their income cannot be easily assessed.

### Materials and methods

Eighty-two apparently healthy subjects of both sexes were studied and grouped as follows:

Group A consisted of 21 businessmen drawn from the suburban Nnewi area. The subjects in this group had a mean weight of  $80.5 \pm 2.6$  kg, they were non-smokers, and 18 of them were obese ( $31.5 \pm 2.1$  kg/m<sup>2</sup> mean  $\pm$  SD) as defined by the body mass index (BMI). BMI was calculated as weight/height<sup>2</sup> (kg/m<sup>2</sup>), and subjects with BMI values above 25 were regarded as obese<sup>16</sup>. Twelve of the subjects in this group were regular alcohol consumers, on average of three to six bottles (1.8–4.0 l) of beer a day.

Group B consisted of 20 businesswomen drawn from the same environment as group A. The subjects in this group had a mean weight of  $75.1 \pm 5.0$  kg, they were non-smokers, and 16 of them were obese ( $29.8 \pm 3.4$  kg/m<sup>2</sup> mean  $\pm$  SD). Five of the subjects in this group were regular alcohol consumers.

Group C consisted of 21 male government workers residing in the same environment as the subjects in group A. The subjects in this group had a mean weight of  $65.6 \pm 3.2$  kg, they were non-smokers, and five of them were obese ( $29.6 \pm 2.0$  kg/m<sup>2</sup> mean  $\pm$  SD). Ten of the subjects in this group were regular alcohol consumers.

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Table 1. Demographic profile of subjects.

	Businessmen	Businesswomen	Male govt. workers	Female govt. workers
Number of subjects	21	20	21	20
Age (years)	20–50	20–50	20–50	20–50
Weight (kg)	80.5 ± 11.9	75.1 ± 22.4	65.6 ± 14.7	60.5 ± 18.3
Obesity (kg/m <sup>2</sup> )	18	16	5	4
Smoking habit	nil	nil	nil	nil
Alcohol intake (1.8–4.0 l/day)	12	5	10	3
Contraceptives and other drugs	nil	nil	nil	nil
Pregnancy	-	nil	-	nil

Values expressed as mean ± SD.

Group D consisted of 20 female government workers residing in Nnewi. They had a mean weight of  $60.5 \pm 4.1$  kg. They were non-smokers, and four of them were obese ( $28.5 \pm 1.2$  kg/m<sup>2</sup>). Three of the subjects in this group were regular alcohol consumers.

All the subjects were matched for age. The range was 20–50 years (see table 1). The subjects in groups B and D were neither pregnant, lactating mothers nor on oral contraceptives. None of the subjects were on any lipid-altering drugs. All the subjects in groups C and D were relatively more educated than the traders (groups A and B). All the subjects were exposed to the same conventional Nnewi diet, which consists mainly of high amounts of carbohydrates, plant and animal protein, with low fat and vegetable levels.

**Collection of serum samples and methods.** All the subjects fasted for 10–12 h prior to blood collection for cholesterol analysis. Eight milliliters of venous blood was withdrawn from each subject into a sterile container, allowed to clot, and the serum separated for cholesterol determination. Total cholesterol (TC) was determined by the modified Liebermann–Burchard reaction as described by Searcy and Berquist<sup>17</sup>. The TC assay was standardized and quality-controlled by using pooled sera and by commercial reagents with known values.

**Statistical analysis.** Analysis of variance was used to assess the variability between and within the four groups of subjects. The level of statistical significance in the mean values of TC between the various groups was determined by the two-tailed independent *t* test.

## Results

As shown in figure 1, the mean TC level of businessmen was significantly higher than the value for male government workers ( $p < 0.001$ ). Similarly, the mean TC value of the businesswomen was significantly higher ( $p < 0.001$ ) than the value for female government workers. The comparison between the mean TC of the businessmen versus businesswomen, as well as that

between male government workers versus female government workers, showed no significant differences. See figure 1.

## Discussion

Our finding of a marked increase in the mean TC level of businesspeople when compared with government workers is at variance with previously reported values observed in Nigerians of different socioeconomic classes<sup>11, 12, 18, 19</sup>. The mean TC values of  $327 \pm 22.5$  mg/dl for businessmen and  $306 \pm 24.4$  mg/dl for businesswomen observed in this study are twofold higher than the values reported by previous workers<sup>11, 18, 19</sup> for the high income socioeconomic class, and about threefold higher than the values observed in low-income class<sup>11</sup> Nigerians. In fact, the mean TC level of our business subjects was even higher than the mean TC value reported by Ononogbu<sup>19</sup> for London subjects. On the other hand, the mean TC value for the government workers is consistent with the previously reported values for the same age range and socioeconomic status in

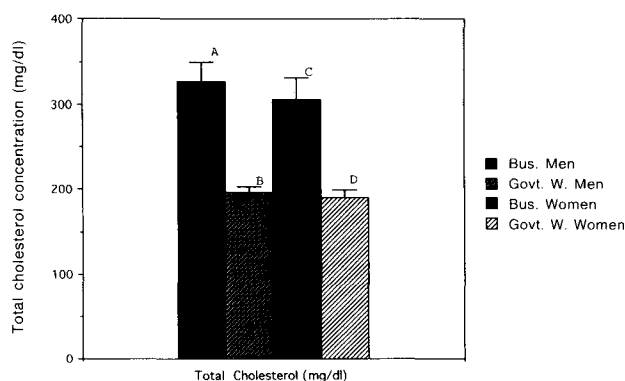


Figure 1. Serum cholesterol levels in two groups of subjects: businessmen/women and government workers. Govt. W. Men = government workers, men. Govt. W. Women = government workers, women. Bus. Men = businessmen; Bus. Women = businesswomen. A vs B =  $p < 0.001$ ; A vs C = n.s.; C vs D =  $p < 0.001$ ; B vs D = n.s., where n.s. = not significant.

Nigeria<sup>11, 12, 18, 19</sup>. The high total cholesterol level observed in the businesspeople in Nnewi community is a disturbing finding, and the possibility of increased risk of developing coronary heart disease is of interest<sup>1, 2, 8, 20, 21</sup>.

Previous reports have consistently shown the rarity of atherosclerosis in Africans<sup>7, 12, 18</sup>. However, in recent years, the lifestyle of most Nigerians has changed, and many individuals now eat various kinds of western food, and engage in little or no physical activity. The business subjects (traders), though not very highly educated, are usually rich, and they indulge in overeating and regular alcohol consumption; thus their eating habits and lifestyle are a bit different from those seen in other Nnewi residents. The traders also live a sedentary life because they stay in their shops for many hours with very limited movement. Thus, the combination of overeating, high cholesterol level and a sedentary lifestyle among the business subjects could be responsible for the high obesity rate<sup>22, 23</sup>.

In a study by Lewis et al.<sup>24</sup> in four European communities, which showed an increase in mean total cholesterol levels in the order Naples < Geneva < London < Uppsala, the values were much lower than the mean TC value observed in our business subjects. Obesity was found to be commoner in London and Naples than in Uppsala and Geneva. Recent reports have implicated low levels of physical activity both as a cause and as a consequence of weight gain<sup>22</sup>, and obesity as an adaptation to a high fat diet<sup>13–15</sup>. Some of the business subjects had abdominal obesity. This was, ironically, misinterpreted by some people as a social status symbol – despite the fact that abdominal obesity has been recently implicated as a strong indicator of risk for cardiovascular disease<sup>25</sup>. The unexpected findings of raised cholesterol level, obesity and regular alcohol intake among Nnewi business subjects have highlighted the possibility of a high risk for coronary heart disease among our traders. The presence of a University Medical School/Hospital in Nnewi has provided reasonable social interaction between the traders and the health workers; and some traders have benefited from advice and education about the advantages of regular exercise and periodic medical assessment. Although it was not possible to determine other lipoprotein fractions in this study, the observed rise in total cholesterol level has stimulated much interest in this group; and large-scale serial lipid, lipoprotein and other risk factors study have been projected.

In conclusion, it is noteworthy that as the lifestyle in some communities in Africa (Nigeria) continues to change, careful consideration will have to be given to ways of assessing socioeconomic level and defining study groups. The level of education may well no longer be correlated with income and lifestyle. Groups such as traders, who may not previously have been considered, may be at high risk. We therefore recommend that for communities similar to the one described here, it is highly desirable for all health workers to embark on public enlightenment programmes about the health benefits of periodic medical assessment and the importance of recreational physical activities. Above all, comprehensive lipid, lipoprotein and other risk factor studies should be made of subjects with a background like that described here.

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