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# ORIGINAL ARTICLE

## Assessment of lipid profile in middle and upper class individuals in Abia State, Nigeria based on life-style and dietary habits

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**Assessment of lipid profile in some middle and upper class individuals based on their life-style and dietary habit was carried out using 35 volunteer human 19 males and 16 females. Their life-style and dietary habit were determined using a questionnaire. Anthropometric measurements of weight, height, waist and hip circumferences were taken, Body Mass Index (BMI) and waist hip ratio (WHR) were calculated, while the lipid profile was determined using standard biochemical procedures. The results of the anthropometric measurements showed that the mean weight, height and Body Mass Index (BMI) were 80.1±13.8 kg, 1.7±1.1 m, 26.4±4.9 kg $m^{-2}$, respectively for the males and 78.5±16.5 kg, 1.6±1.2 m and 25.8±5.5 kg $m^{-2}$, respectively for the females. There was no statistically significant difference ($p > 0.05$) in all the anthropometric parameters measured for both sexes except for waist/height ratio (WHR). The results of the lipid profile showed that the mean total cholesterol (TC), High density lipoprotein-cholesterol (HDL-C) and triglycerides (TRG) were within normal reference range. Both sexes however, had mean low density lipoprotein-cholesterol (LDL-C) of 101.8±45.2 mg $dL^{-1}$ and 119.5±43.7 mg $dL^{-1}$ for males and females respectively. The total cholesterol/high density lipoprotein (TC/HDL-C) ratio revealed that mean values for the males and the females were 4.5±1.1 and 4.9±2.1 respectively. Correlation analysis showed positive correlations between BMI and LDL-C (r=0439; p=0.018), WHR and TAG (r=0.488; p=0.003), waist circumference (WC) and TRG (r=0.379; p=0.025). A high prevalence of overweight/obesity and dyslipidaemia (high LDL-C and triglycerides) were observed among the adults. Appropriate interventions such as regular exercise and periodic lipid profile screening should be advocated.**
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**Keywords**: Lipid profile, dietary habit, anthropometry, Abia State

## INTRODUCTION

Cardiovascular disease is one of the major chronic diseases which is a leading cause of death worldwide (Gupta, 2001). In Nigeria and other developing countries, the prevalence of cardiovascular diseases is rising at an alarming rate due to adoption of western lifestyle (Yusuf *et al.*, 2001; Nwaneli, 2010). Obesity and dyslipidaemia are important risk factors associated with cardiovascular diseases in both developed and developing countries (James *et al.*, 2001; WHO, 2005). Obesity is associated with excess fat accumulation in the body (The European Information Council, 2006; Schwandt, 2010). Dyslipidaemia refers to a clinical condition caused by alterations in lipids thereby raising cholesterol and triglyceride levels in a variety of lipoprotein fractions. The lipid fractions which are usually of concern are total cholesterol, triglycerides, low density lipoprotein cholesterol (LDL-C) and high density lipoprotein cholesterol (HDL-C) (Smitha, 2006).

Anthropometry has been reported to easily reflect any changes in lipid concentration in the human body (Briel *et al.*, 2009). As such, a number of anthropometric indicators have been recommended for the identification of cardiovascular risk factors and these include body mass index (BMI) as well as waist and hip circumferences (Rexrode *et al.*, 2001). The BMI is regarded as an indicator of overall adi-

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posity, while the waist circumference is an indication of central fat distribution (Rexrode *et al.,* 2001). According to a WHO report, the prevalence of overweight and obesity in Nigeria are 26.8% and 6.5%, respectively (WHO, 2011). Obesity was previously reported to be problem of high income countries, but now rising dramatically in low and middle income countries especially among the urban settings (WHO, 1995; WHO, 2006). The increase in the prevalence has been shown to be associated with continuous modernization and technological advancement of the developing countries (Callabero, 2001). This in turn has led to rapid lifestyle changes which includes physical inactivity (WHO, 2006), consumption of calorie dense diets, alcohol intake and tobacco use (Callabero, 2001). These have all been shown to have major impact in the development of cardiovascular and other chronic diseases (Collabero, 2001).

In Nigeria and other African cultures, overweight and obesity are socially acceptable as sign of affluence (Victor *et al.,* 2003). Furthermore, obesity is seen among affluent business executives and middle aged females with sedentary lifestyles (Azinge, 1997). Ebere *et al.,* (2009) noted that work patterns in Africa are becoming sedentary due to improvement in technology and civilization. Adegun and Konwea, (2009) reported that most jobs in the civil service are sedentary and basically involves spending hours in the office sitting. The monitoring and management of lipid profile in humans is a major tool in prevention/or amelioration of cardiovascular disease morbidity and mortality among middle and upper socioeconomic strata, in resource-poor settings like Nigeria. This study is aimed at assessing the lipid profile in middle and upper class individuals in Abia State, Nigeria based on their life-style and dietary habit.

## MATERIALS AND METHODS

### Study design and subject selection

This cross sectional study was conducted between April to July, 2012 in Umuahia, Abia State, Nigeria. A total of 35 subjects were purposively selected from State and Federal Ministries in Umuahia metropolis namely Michael Okpara University of Agriculture, Umudike, Federal Medical Centre, Umuahia, National Root Crop Research Institute (NRCRI), Abia State Polytechnic, Aba and State Judiciary, Umuahia. Informed consent was obtained from the study participants after requirements for the study were fully explained. Inclusion criteria included adults who were apparently healthy (i.e. had no medical complaints, normal blood pressure and physical examination revealed no abnormalities), not on medications for any chronic ailment and were willing to participate in the study. Adults excluded were pregnant women and adults who were chronically ill. The study protocol was approved by the ethics committee of the Federal Medical Centre, Umuahia.

### Socio-demographic information

A detailed self-designed semi-structured questionnaire was administered to each consented study participant for socio-demographic information including age, marital status, lifestyle activities (exercise, smoking and alcohol consumption), educational background, income level, as well as dietary habits.

### Anthropometric assessment

Body weight of the subjects was measured to the nearest 0.1 kg using HANSON bathroom scale (model 89 DK, China). Weight was measured with study participants standing upright in the middle of the platform with their body weight evenly distributed on both legs and in light clothing before readings were taken to the nearest 0.1 kg. Height was measured to the nearest 0.1 m using a locally constructed wooden frame affixed with graduated non -elastic measuring tape. The subjects were asked to stand erect with their heads placed in an upright position before measurements were taken. The anthropometric data of height and weight were used for computing body mass index (BMI) as weight (kg) divided by height ($m^2$). Waist circumference measurement was taken with the use of a non-stretchable tape from the mid-point between the lower costal region and the iliac crest, while hip circumference was measured by placing the tape at the point of the greatest circumference around the hip. Waist hip circumference ratio (WHR) was calculated by dividing the waist circumference by the

hip circumference (WHO, 2001). All measurements were taken in duplicates according to standards and the mean values were used (WHO, 1995).

**Biochemical parameters**

Capillary blood samples were obtained from finger prick after 12 hours of overnight fasting between the hours of 8:00 am and 9:00 am using a lancet. Two drops of blood were placed on the Alere Cholestech LDX ® analyser (Alere Inc. Health Care Diagnostic, USA) for the estimation of total cholesterol (TC), triglyceride (TRG), High density lipoprotein cholesterol (HDL-C) and Low density lipoprotein cholesterol (LDL-C). All biochemical parameters were analyzed according to procedures established by the manufacturers. The reference ranges and cut-off for TC, TRG, HDL-C and LDL-C were according to the classification of NCEP (2001).

**Classifications**

Study participants were classified according to their BMI as follows: underweight (BMI <18.49 kg $m^{-2}$), normal (BMI=18.50-24.99 kg $m^{-2}$), overweight (BM=25.00-29.99 kg $m^{-2}$) and obese (BMI>30.00 kg $m^{-2}$) (WHO, 2001). Abdominal obesity was defined as waist to hip ratio of >0.95 in males and >0.80 in females (WHO, 2001).

**Statistical analysis**

Data were analyzed using SPSS version 16. Student *t*-test was used to determine differences between male and female study participants. Pearson correlation coefficient was used to determine association between numerical variables, while Chi square ($X^2$) was used for categorical variables. A p-value of less than 0.05 was regarded as statistically significant for all comparisons.

## RESULTS

Table 1 represents the socio-demographic characteristics, dietary and lifestyle habits of the studied population. About half (54.3%) of the studied population were females, most of the participants (42.9%) were within the age group of 31-40 years while about half (56.1%) earned income greater than N200 000 per month. Dietary and lifestyle habits revealed that majority of the adults (82.9%) ate thrice a day. Most of them (68.6%) consumed snacks at least twice a week and this was significantly higher in females (84.2% *vs.* 50.0%) ($p<0.05$). Carbonated drinks were mainly consumed by 91.4%, about (34.3%) consumed alcoholic beverages twice a week while about half (51.4%) do not use supplements daily.

The data on the mean anthropometric measurements of the studied participants are presented in Table 2. There was no significant difference ($p>0.05$) in all the anthropometric parameters between both sexes except WHR in which the males had significantly higher value ($1.0\pm0.2$; $p=0.002$) compared to their females counterparts ($0.94\pm0.1$). Body weight indicators (BMI and WHR) stratified by gender showed that the males were more likely to be overweight (50%) compared to females (21.1%; $p>0.05$). In the case of WHR, the females (89.5%) were more at risk of abdominal obesity than the males (68.8%). The differences were however not statistically significant ($P>0.05$).

The result for the lipid profile in Table 3 showed that the mean TC, HDL-C and triglyceride (TRG) were within the reference range. The males and females however had mean LDL- C values of $101.8\pm4.5$ and $119.5\pm43.7$ mg $dL^{-1}$, respectively; however, these values were slightly higher than the reference range. The TC/HDL-C ratio revealed that the mean value for males and females were $4.5\pm1.1$ and $4.8\pm2.1$, respectively. In both cases, they were within the normal range.

Correlation analysis revealed that there was a significant positive correlation between BMI and LDL-C ($r=0.439$; $p=0.008$), WHR and TRG ($r=0.488$; $p=0.003$) and WC and TRG ($r=0.379$; $p=0.025$) (Table 4).

## DISCUSSION

Obesity has become a modern day scourge in developed countries and is rising in developing countries (Ngwogu *et al.,* 2012). The results of this study indicates that mean BMI values obtained of $26.4\pm4.9$ kg/$m^2$ and $25.8\pm5.5$kg/$m^2$ were similar to $27.57\pm4.28$ and $29.78\pm6.35$kg/$m^2$ reported for a group of apparently healthy male and female civil

**Table 1: Socio-demography, dietary and lifestyle habits of the adults according to gender**

| Variables | Total (n = 35) | Males (n=16) | Female (n=19) | $X^2$; P-value |
|---|---|---|---|---|
| ***Age group*** | | | | |
| 20-30 | 1(2.9%) | 0(0.0%) | 1(5.3%) | 12.43; 0.006* |
| 31-40 | 15(42.9%) | 5(31.3%) | 10(52.6%) | |
| 41-50 | 6(17.1%) | 5(31.3%) | 1(5.3%) | |
| 51-60 | 13(37.1%) | 6(37.5%) | 7(36.8%) | |
| ***Income per month*** | | | | |
| <N200 000 | 20(56.1%) | 7(43.8%) | 13(68.4%) | 0.61; 0.330 ns |
| >N200 000 | 15(43.9%) | 9(56.3%) | 6(31.6%) | |
| ***Number of meals consumed daily*** | | | | |
| Twice | 6(17.1%) | 2(12.5%) | 4(21.1%) | 0.45; 0.504ns |
| Thrice | 29(82.9%) | 14(87.5%) | 15(78.9%) | |
| ***Consumption of snacks at least twice a week*** | | | | |
| Yes | 24(68.6%) | 8(50.0%) | 16(84.2%) | 4.72; 0.030* |
| No | 11(31.4%) | 8(50.0%) | 3(15.8%) | |
| ***Consumption of carbonated drinks at least twice a week*** | | | | |
| Yes | 32(91.4%) | 15(93.8%) | 17(89.5%) | 0.20; 0.653 ns |
| No | 3(8.6%) | 1(6.2%) | 2(10.5%) | |
| ***Consumption of alcohol at least twice a week*** | | | | |
| Yes | 12(34.3%) | 8(50.0%) | 4(21.1%) | 3.23; 0.072ns |
| No | 23(65.7%) | 8(50.0%) | 15(78.9%) | |
| ***Daily use of supplements*** | | | | |
| Yes | 17(48.6%) | 7(43.8%) | 10(52.6%) | 0.274; 0.600 ns |
| No | 18(51.4%) | 9(56.2%) | 9(47.4%) | |

**Table 2: Anthropometric characteristics of the adults according to gender**

| Variables | Males (n=19) | Females (n=16) | Total (n=35) | p-value |
|---|---|---|---|---|
| ***Body weight indicators*** | | | | |
| Weight (kg) | 80.1±13.8 | 78.5±16.5 | 79.3±15.2 | 0.369 ns |
| Height (m) | 1.7±1.1 | 1.62±1.2 | 1.7±1.1 | 0.161ns |
| BMI (kg $m^{-2}$) | 26.4±4.9 | 25.8±5.5 | 26.1±4.9 | 0.389ns |
| WC (cm) | 99.26±13.24 | 98.86±13.24 | 100.5±10.5 | 0.057ns |
| HC (cm) | 103.5±11.3 | 115.7±28.3 | 110.13±22.8 | 0.105ns |
| WHR | 1.0±0.2 | 0.9±0.1 | 0.9±0.1 | 0.002* |
| ***BMI categories*** | | | | |
| Underweight | 1 (6.2%) | 1 (5.3%) | 2 (5.7%) | $X^2$=3.44: 0.33ns |
| Normal | 5 (31.2%) | 10 (52.6%) | 15 (42.9%) | |
| Overweight | 8 (50.0%) | 4 (21.1%) | 12 (34.3%) | |
| Obese | 2 (12.5%) | 4 (21.1%) | 6 (17.1%) | |
| ***WHR categories*** | | | | |
| Safe | 5 (31.2%) | 2 (10.5%) | 7 (20.0%) | $X^2$=2.33: 0.21ns |
| At risk | 11 (68.8%) | 17 (89.5%) | 28 (80.0%) | |

**Table 3: Mean lipid profile of the adults according to gender**

| Parameter | Males (n=19) | Females (n=16) | Total (n=35) | P-value | Normal range |
|---|---|---|---|---|---|
| TC (mg $dL^{-1}$) | 183.0±50.7 | 196.4±43.6 | 190.3±46.7 | 0.290 | <200 |
| LDL-C (mg $dL^{-1}$) | 101.8±45.2 | 119.5±43.7 | 113.4±42.2 | 0.700 | <100 |
| HDL-C (mg $dL^{-1}$) | 42.1±10.8 | 43.3±8.8 | 42.7±9.6 | 0.270 | 39.9-59.9 |
| Triglyceride (mg $dL^{-1}$) | 192.4±140.2 | 154.57±107.4 | 171.9±12.3 | 0.367 | <150 |
| TC/HDL-C ratio | 4.52±1.1 | 4.80±2.1 | 4.67±1.7 | 0.212 | 4.0-6.0 (male); 3.7-5.7 (female) |

**Table 4: Correlation coefficients of some anthropometric indices with lipid fractions in the adults**

| | HDL | TC | TRG | LDL | TC/ HDL ratio |
|---|---|---|---|---|---|
| Age | -0.15 | -0.16 | 0.25 | -0.30 | -0.04 |
| Weight | -0.10 | 0.21 | -0.15 | 0.33 | 0.19 |
| Height | -0.18 | -0.28 | -.35* | -0.12 | -0.18 |
| BMI | 0.04 | 0.30 | -0.22 | 0.44** | 0.17 |
| HC | -0.09 | 0.34* | -0.17 | 0.49* | 0.29 |
| WC | -0.03 | 0.20 | 0.38* | -0.03 | 0.17 |
| WHR | 0.02 | 0.01 | 0.49** | -0.27 | -0.02 |
| HDL | | 0.31 | 0.00 | 0.14 | -0.57** |
| TC | | | 0.35* | 0.84** | 0.54** |
| TRG | | | | -0.15 | 0.31 |
| LDL | | | | | 0.55** |

**p<0.05, **p<0.01, BMI= Body mass index, HC= Hip circumference, WC= waist circumference, WHR= waist hip ratio*

servants in Asaba, Nigeria (Odenigbo *et al.,* 2008). The high prevalence of obesity (17.1%) recorded in this study was comparable to that obtained among adults in Aba (16.5%) (Ngwogu *et al.,* 2013), but was higher than 6.8% obtained among civil servants in Ebonyi state of Nigeria (Ugwuja *et al.,* 2013). A higher rate (25.8%) was however observed for a group of bankers in Ibadan (Leshin and Fadupin, 2013).

The prevalence of abdominal obesity indicated by WHR was high (80%). The reason for the high prevalence of overweight and obesity in this study may not be unconnected with sedentary lifestyle and dietary habits of the subjects. Although, physical activity level was not assessed in this study, it has been reported that most civil servants in Nigeria are not engaged in physically demanding jobs (Ukegbu *et al.,* 2013). Their job involves mainly sitting and spending long hours in the office. Improved transportation systems which encourage sedentary lifestyles could also be responsible for the high rates of obesity observed in this study. Shephard and Belady, (1999) and Oluseye *et al.,* (2012) reported that a reduction in sedentary lifestyle would be of help in preventing excess weight gain. Assessment of their dietary habits revealed regular consumption of snacks, carbonated soft drinks and alcohol. This goes further to explain the high prevalence of overweight and obesity among the subjects. Snacks have been shown to be high in fat, carbohydrates and refined sugars and these are important risk factors for obesity and cardiovascular diseases (Amin *et al.,* 2008).

Alterations in lipid profile are important in the development of cardiovascular diseases (NCEP, 2001). Mean lipid values for males and females did not differ significantly between both sexes. The results are consistent with other studies (Edo and Adediran, 2011; Eno and Enofe, 2013). The lack of difference between both sexes could be due to the fact that they were from a similar socioeconomic and cultural background. Mean TC values of 190.3 mg $dL^{-1}$ was within the desirable range (<200 mg $dL^{-1}$) (NCEP, 2001). This corroborates results of other studies in Aba (Ngwogu *et al.,* 2013), Port Harcourt (Akpa *et al.,* 2006) and Asaba (Odenigbo *et al.,* 2008). The values however differed from the 211.2 mg $dL^{-1}$ reported among a group of adults in Benin, Nigeria (Edo and Enofe, 2013).

The relationship between high LDL-C and the risk of cardiovascular diseases is well documented (Tande *et al.,* 2004). The mean LDL-C (113.4 mg

$dL^{-1}$) recorded in this study was higher than normal range (<100 mg $dL^{-1}$) and this indicates a high risk of cardiovascular disease. The high rate of obesity as well as westernized lifestyles of these adults may have contributed to the elevated LDL-C observed. Mean HDL-C was normal for both males and females and compared well with the desirable range. HDL-C is regarded to have a protective effect against cardiovascular risk factor and the higher the value, the less the risk (Law *et al.,* 1994). The mean HDL-C was similar to that reported for apparently healthy adults in Asaba (Odenigbo *et al.,* 2008) but differed from the 64.8 mg $dL^{-1}$ reported among hospital workers in a teaching hospital in Benin (Edo and Enofe, 2013). Triglycerides values for men and women were higher than recommended range for males and females. The values however agree with the 114 mg $dL^{-1}$ reported for 103 teaching staff of a university in Sana'a city, Yemen (Alhaj, 2013).

The ratio of total cholesterol (TC) to HDL-C has been reported to have a greater predictive value for cardiovascular diseases (Kocaoghe *et al.,* 2005). The mean value for males (4.8 mg $dL^{-1}$) and females (4.5 mg $dL^{-1}$) were within the acceptable range. This does not however indicate that the subjects are entirely free from cardiovascular risk since they also had elevated LDL-C and triglyceride values. The mean values however corroborate results of Ighosotu and Tonukari (2010) which reported TC/HDL-C ratio of 4.33 among a group of adults in Delta state.

Excess abdominal fat accumulation and obesity have been reported to be important independent risk factors for dyslipidaemia and other diseases (NCEP, 2001; Tande *et al., 2004*). Analysis of the relationship between lipid profile parameters and anthropometry showed a significant positive correlation suggesting a direct relationship between obesity and cardiovascular diseases. These results are consistent with other studies (Almajed *et al.,* 2011; Alhaj, 2013; VanDijk *et al.,* 2012), but differed from that conducted among urban and rural adults in Abuja (Okpara and Adediran, 2013) which found no relationship between anthropometric measures and lipid profile fractions. Caution should be exercised in interpreting data from this study for the general population. This is due to the small sample size and cross sectional nature of the study. These considerations do not however invalidate the findings of this study.

## CONCLUSION

The result of this study indicates that obesity was high. Elevated LDL-C and triglycerides were the common lipid abnormalities present in this group of adults and these predispose them to increased risk of cardiovascular diseases. Health education intervention programs should be instituted in various establishments with the aim of motivating adults to adopt healthier lifestyles such as regular exercise and periodic lipid profile screening.

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## COMPETING INTERESTS

The authors declare that they have no competing interests.

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