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# Assessment of Adiposity Indices among Female Staff in University of Nigeria Primary School Enugu Campus

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**A central fat pattern has adverse health implications in both children and adult. Because adiposity tracks from childhood into adulthood, the ability of simple anthropometric techniques to correctly measure truncal adiposity in adulthood needs to be assessed. This study assessed the adiposity indices among female staff of University of Nigeria Primary School Enugu Campus. A total number of forty nine (49) female staff who worked in University of Nigeria primary school participated in this study. Participants were selected using convenient sampling technique. Waist-hip ratio (WHR), waist circumference-height ratio (WCHR), percentage body fat (%BF), lean body mass (LBM), body adiposity index (BAI), free fat mass index (FFMI) and body mass index (BMI) were assessed using standard procedures. Data obtained was analyzed descriptively and with the use of Chi-Square at α=0.05. A total of 49 female staff participated in the study. Greater percentages (69.4%) of the female staff were above 41 years. Majority of the participants were married and with children (77.6%), and had a Bachelor degree (53.1%). Most of the participants had a WHR>0.85 (85.7%), had %BF>32% (35.1%), and LBM<60% (73.5%). Majority of the participants had BAI between 35-40% (36.7%), had FFMI between 19-24 (44.9%) and had BMI>30 (49.0%). There was a significant correlation between age and each of WHR (X2=7.885, p=0.048) and BMI (p=0.003). There was no significant association between age and each of WCHR (X2=2.246, p=0.523), %BF (X2=16.474, p=0.058), LBM (X2=0.326, p=0.798), BAI (X2 =9.128, p=0.955) and FFMI (X2=11.781, p=0.067). Body adiposity is high among female Staff of University of Nigeria Primary School and is associated significantly with age, BMI and WHR. The various indices are consistent in indicating the level adiposity among the participants.**

**Key words:** Primary School Teachers, Adiposity Indices, Anthropometry, Nigeria

## INTRODUCTION

The morbidity and mortality associated with being overweight have been known to the medical profession for more than 2000 years (Bray, 2006). Obesity is a chronic disease that is increasing in prevalence in adults, adolescents, and children, and is now considered to be a global epidemic. Screening for obesity can identify high

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risk patients who may not otherwise receive counseling about health risks, lifestyle changes, obesity treatment options, and risk factor reduction. Evaluation of an overweight or obese patient should include both clinical and laboratory studies; the combined information is used to characterize the type and severity of obesity, determine health risk, and provide a basis for selecting therapy (Hamzat and Ekechukwu, 2019).

In a clinical context, the term "overweight" usually connotes adiposity, an excess of body fat. In the absence of any direct or simple indirect methods of measuring total body fat, medical research workers often use formulae (indices) which relate body weight to stature. So far as we know the uses and limitations of such formulae have never been critically examined. It is obvious that no formula relating weight to height can measure adiposity; the most we can hope for is that values of the index will be highly correlated with adiposity. The index cannot distinguish between heaviness due to adiposity, muscularity, or oedema, and, if adiposity is in question, should not be used in investigations where differential water retention may have an important influence on body weight, nor to compare groups of unusually muscular persons, such as athletes, with groups not so selected. Given these limitations, an index should provide a convenient and objective way of selecting for more detailed study, groups in which weight is unusually high or low. It should also be useful as a basis of standardization, and as a variable in multiple regression analyses. To perform these functions satisfactorily an index should have the following characteristics (Billewicz *et al.;* 1962): (i) it should allow us to rank a group of subjects in the approximate order of their true relative adiposity, (ii) a given value of the index should, for each sex, imply on the average the same degree of relative adiposity at all heights, (iii) the index should, preferably, be easy to compute and invariant with respect to the units of measurement.

The strong association between obesity and cardio metabolic disorders motivated the development of several techniques used to determine body adiposity, such as body mass index (BMI), waist circumference (WC), and waist-hip ratio (WHR) (Suchanek *et al.,*2012; Vazquez *et al.,*2007) BMI being a general obesity indicator and both WC and WHR abdominal obesity indicators (Molarius *et al.,*1998). Recently, Bergman et al. (2011) proposed the body adiposity index (BAI) as an alternative to BMI to possibly overcome deficiencies in the latter method in assessing overweight and obesity.

The accumulation of fat in the abdomen region has been described as the type of obesity that offers the greatest risk for the health of the individuals. The incidence of diabetes, atherosclerosis, gout, urinary calculus and sudden cardiac death is high in some obese individuals. However, an adiposity aspect that draws attention to, is the regional distribution of fat in the body. This study sought to assess various indices of adiposity among female staff of University of Nigeria Primary School and to identify if there is an association between these indices and age of the participants.

## METHODS

A total of 49 female staff of University of Nigeria Primary School, Enugu campus participated in the study. The study used a cross sectional research design and focused on the assessment of adiposity indices among the primary school staff. Letter of recommendation was obtained from Department of Medical Rehabilitation Enugu, campus. A well-structured profoma including some socio-demographic characteristics and adiposity indices variables were used for the study (Adeniyi et al, 2013). Informed consent was gotten from the participants and the procedure of the process was carefully explained to them. In this study, the following indices were used in assessing body adiposity, they include:

i. Waist hip ratio: waist circumference divided by hip circumference (W/H) all in centimetres
ii. Waist circumference height ratio: waist circumference divided by height (WC/Ht) all in centimetres
iii. Body mass index: body mass divided by square of the body height expressed in unit of $kg/m^2$($mass/height^2$)
iv. Body adiposity index: it is a method of measuring body fat and is calculated using weight $\frac{100 \times \text{hip circumference}}{\text{in metres}} - 18$
    a. Height in meters × square root of height.
v. Lean body mass: it is a component of body composition, calculated by subtracting body fat weight from total body weight (lean mass + body fat). Lean body mass= body weight – body fat.
    a. This was calculated using:
    b. For women; LBM= (0.2956 × 10) + (0.41813 × Height) – 43.2933 (Hume, 1996)
vi. Body fat percentage: it is the percentage of total mass of fat divided by total body mass. This was calculated using:
    a. Adult body fat % = (1.20 × BMI) + (0.23 × age) – (10.8 × sex) - 5.4.
    b. Where sex= 1 for males and 0 for females (Coutinho and Kullo, 2014)
vii. Free fatty mass index: fat free mass/$height^2$. This was calculated using: (fat free body mass in kg) × height in $meters)^{-2}$. (Kouri, 1995, Ezeukwu et al, 2015)

## MATERIALS

The following items were used for the study.

i. A self-structured proforma was adopted in the study. It comprised of information on some of the respondent's socio-demographic data, some anthropometric measures such as height, weight, neck circumference, waist circumference, hip circumference were used.
ii. Stadiometer: this was used to measure height of participants
iii. Weighing balance: this was used to measure the weight of participants
iv. Tape rule: this was used to measure the waist circumference, hip circumference, neck circumference of the participants

### Procedure:

The weighing balance was placed on a hard and smooth ground and was set to the zero mark. The subjects removed their foot wears and other exogenous weight and stood erect, looking straight

**Table 1.** Socio-demographic Characteristics

| Variables | Frequency | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| Less than 30 | **7** | 14.3 |
| 31-40 | 8 | 16.3 |
| 41-50 | 17 | 34.7 |
| 0ver 50 | 17 | 34.7 |
| **Marital status** | | |
| Single | 11 | 22.4 |
| Married | 38 | 77.6 |
| **Children** | | |
| None | 10 | 20.4 |
| Yes | 39 | 79.6 |
| **Number of children** | | |
| None | 10 | 20.4 |
| 1 | 3 | 6.1 |
| 2-5 | 27 | 55.1 |
| Above 5 | 9 | 18.4 |
| **Education** | | |
| NCE | 11 | 22.4 |
| HND | 3 | 6.1 |
| BSc | 26 | 53.1 |
| MSc | 6 | 12.2 |
| PhD | 3 | 6.1 |

ahead and their weight readings were obtained. The height of the subjects was measured using stadiometer and carpenter's tape which was placed at the heels of the subjects and drawn upwards to measure the height. The 30 centimeter ruler was used as a pointer to mark the height of the subjects. The results were obtained in meters and then squared. The waists of the participants were measured at the narrowest point between the bottom of their ribs and their hip bones. Also the participants' hips were measured at the widest part of their buttocks.

The weight and height in kilograms and meters respectively were used to calculate the BMI of each individual. The results of the subjects were gotten by dividing their weight by the square of their height. Waist hip ratios were gotten by dividing their waist measurement by hip measurement (Victor et al., 2016).Other anthropometric measures were obtained using the respective anthropometric indices calculators

**Data Analysis:**
The statistical package for social sciences (SPSS) version 20 statistical software was used for data analysis. For continuous variables, mean values and standard deviations were calculated. Associations between variables were analyzed using Pearson Chi-Square. Values of $\propto$ set at 0.05 were considered statistically significant.

## RESULTS

**Socio-Demographic Characteristics of Participants**: A greater percentage (34.7%) of the teachers were above 40 years, most of them (77.6%) were married with children and majority (53.1%) of them were B.Sc. holders. About 55.1% of the women gave birth to between 2-5 children as shown in table 1.

**Anthropometric Measurements of the Participants:** The mean heights, weight, and waist circumference were 160.45 ± 5.70cm, 79.37 ± 16.04kg, and 97.66 ± 15.16cm respectively. Also, the mean waist hip ratio, waist circumference height ratio, percentage body fat, and lean body mass were 0.91 ± 0.09, 0.63 ± 0.10, 40.23 ± 11.67% and 44.79 ± 8.42% respectively. Finally, the mean body adiposity index, free fatty mass index and body mass index were 37.79 ± 8.12%, 24.43 ± 11.19kg/$m^2$ and 31.60 ± 8.72kg/$m^2$ as shown in table 2.

**Categorization of Adiposity Indices of the Participants:** Majority of the participants had a waist-hip ratio greater than 0.85 (85.7%), percentage body fat greater than 32 (53.5%), and waist circumference height ratio greater than 0.48 (93.9%). Majority (73.5%) of them had a lean body mass less than 60% and most (36.7%) of the participants had a body adiposity index that ranged between 35-40%, while most of them (44.9%) had a free

**Table 2.** Descriptive Statistics of Anthropometric Measurements

| Anthropometric measurements | Minimum | Maximum | Mean | Standard deviation |
|---|---|---|---|---|
| Height (cm) | 150.00 | 173.00 | 160.45 | 5.70 |
| Weight (kg) | 51.40 | 113.00 | 79.37 | 16.04 |
| Waist Circumf (cm) | 43.00 | 124.50 | 97.66 | 15.16 |
| WHR | 0.68 | 1.22 | 0.91 | 0.09 |
| WCHR | 0.46 | 0.99 | 0.63 | 0.10 |
| BF (%) | 15.40 | 57.80 | 40.23 | 11.67 |
| LBM (%) | 24.10 | 72.86 | 44.79 | 8.42 |
| BAI (%) | 23.21 | 56.03 | 37.79 | 8.12 |
| FFMI ($Kg/m^2$) | 15.20 | 71.80 | 24.43 | 11.19 |
| BMI ($Kg/m^2$) | 19.58 | 64.10 | 31.60 | 8.72 |

Key: BF- body fat; WHR- waist hip ratio; WCHR- waist circumference height ratio; LBM- lean body mass; BAI- body adiposity index; FFMI- free fatty mass index; BMI- body mass index

fatty mass that was between 19-24. Majority (49.0%) of the participants in this study had an estimated body mass index that was greater than 30 as shown in table 3.

**Association between Waist Hip Ratio and Age**: There was a significant association ($X^2$ = 7.885, p = 0.048) between waist hip ratio and age of the participants. Majority (38.1%) of staff who were 41-50 years had waist hip ratio greater than 0.85 indicating high health risks whereas majority (42.9%) of staff who are less than 30 years had waist hip ratio between 0.81 and 0.85 indicating moderate health risks as shown in table 4.

**Association between Waist Circumference Height Ratio and Age:** There was no significant association ($X^2$ = 2.246, p = 0.523) between waist circumference height ratio and age of the participants. Greater percentage (33.3%) of the staff who were less than 30 years had waist height circumference ratio between 0.42 and 0.48 indicating normal weight whereas 34.4% of staff who were above 40 years had their waist height circumference ratio greater than 0.48 indicating over weight as shown in table 5.

**Association between Percentage Body Fat and Age**: There was no significant association ($X^2$ = 16.474, p = 0.058) between percentage body fat and age. Majority (50%) of the staff who were less than 30years had their body fat percentage between 14 and 20% indicating normal weight whereas majority (55.6%) who were 41-50 years had their body fat percentage between 25 and 31% indicating average weight. About 20% of the staff who were 31 - 50 years had a body fat percentage greater than 32% indicating obesity as shown in table 6.

**Association between Lean Body Mass and Age:** There was no significant association ($X^2$ = 0.326, p = 0.955) between lean body mass and age. Majority (61.6%) of the staff who were between the ages of 41 years and above had their lean body mass greater than 68% indicating low fat whereas 36.1% of the staff who are between the ages of 41 and 50 had their lean body mass less than 68% indicating high body fat as shown in table 7.

**Association between Body Adiposity Index and Age:** There was no significant association ($X^2$ = 9.128, p = 0.167) between body adiposity index and age. Majority (33.3%) of the staff who were less than 30 years had their body adiposity index between 23 and 35% indicating normal weight whereas (54.4%) of the staff who were over 50 years had their body adiposity index greater than 40% indicating obesity as shown in table 8.

**Association between Free Fatty Mass Index and Age**: There was no significant association ($X^2$ = 11.781, p = 0.067) between free fatty mass index and age. Majority (40.9%) of the staff who were 41-50 years had their free fatty mass between 19 and 24 indicating normal weight whereas 53.3% of the staff who were above 50 years had

**Table 3.** Frequency Distribution of the Various Indices of Adiposity of the Participants

| Variables | Frequency | Percentage (%) |
|---|---|---|
| **WHR** | | |
| < 0.81 (Low Health Risk) | 0 | 0.0 |
| 0.81-0.85 (Moderate Health Risk) | 7 | 14.3 |
| > 0.85 (High Health Risk) | 42 | 85.7 |
| **BF** | | |
| 10- 24% (Normal) | 5 | 10.2 |
| 25-31% (Average) | 8 | 16.3 |
| > 32% (Obese) | 36 | 53.5 |
| **WCHR** | | |
| < 0.42 (Underweight) | 0 | 0.0 |
| 0.42-0.48 (Normal Weight) | 3 | 6.1 |
| > 0.48 (Obese) | 46 | 93.9 |
| **LBM** | | |
| > 68% (Low Fat) | 13 | 26.5 |
| < 68% (High Fat) | 36 | 73.5 |
| **BAI** | | |
| < 23% (Underweight) | 0 | 0.0 |
| 23-34% (Normal) | 15 | 30.6 |
| 35-40% (Overweight) | 18 | 36.7 |
| > 40% (Obese) | 16 | 32.7 |
| **FFMI** | | |
| < 19 (Low Adiposity) | 12 | 24.5 |
| 19-24 (Normal) | 22 | 44.9 |
| > 24 (High Adiposity) | 15 | 30.6 |
| **BMI** | | |
| <18.5 (Underweight) | 0 | 0.0 |
| 18.5-24.9 (Normal) | 7 | 14.3 |
| 25-29.9 (Overweight) | 18 | 36.7 |
| > 30 (Overweight) | 24 | 49.0 |

Key: BF- body fat; WHR- waist hip ratio; WCHR- waist circumference height ratio; LBM- lean body mass; BAI- body adiposity index; FFMI- free fatty mass index; BMI- body mass index

**Table 4.** Association between Waist Hip Ratio and Age

| Age (years) | WHR category | | | $X^2$ | p-value |
|---|---|---|---|---|---|
| | Low health risk n (%) | Moderate health risk n (%) | High health risk n (%) | | |
| < 30 | 0 (0.0) | 3 (42.9) | 4 (9.5) | 7.885 | 0.048* |
| 31-40 | 0 (0.0) | 2 (28.6) | 7 (16.7) | | |
| 41-50 | 0 (0.0) | 2 (28.6) | 15 (35.7) | | |
| >50 | 0 (0.0) | 0 (0) | 16 (38.1) | | |
| Total | 0 (100) | 7(100) | 42 (100) | | |

Key: WHR- waist/hip ratio

their free fatty mass greater than 24% indicating extreme fat. Greater percentage (33.3%) of staff that were 41-50 years had their free fatty mass less than 19 indicating less fat as shown in table 9.

**Association between Body Mass Index and Age:** There was a significant association ($X^2$ = 20.137, p = 0.003) between body mass index and age of the participants. About 42.9% of the staff who were less than

**Table 5**. Association between Waist Circumference Height Ratio and Age

| Age (years) | WCHR category | | | $X^2$ | p-value |
|---|---|---|---|---|---|
| | Underweight n (%) | Normal n (%) | Over weight n (%) | | |
| < 30 | 0 (0.0) | 1 (33.3) | 6 (13) | 2.246 | 0.523 |
| 31-40 | 0 (0.0) | 1 (33.3) | 8 (17.4) | | |
| 41-50 | 0 (0.0) | 1 (33.3) | 16 (34.8) | | |
| >50 | 0 (0.0) | 0 (0) | 16 (34.8) | | |
| Total | 0 (100) | 3(100) | 46 (100) | | |

Key: WCHR- waist circumference height ratio

**Table 6.** Association between Percentage Body Fat and Age

| Age (years) | BF category | | | $X^2$ | p-value |
|---|---|---|---|---|---|
| | Normal n (%) | average n (%) | Obese n (%) | | |
| < 30 | 0 (0.0) | 4 (50) | 3 (8.33) | 16.474 | 0.058 |
| 31-40 | 1 (20.0) | 3 (25) | 6 (16.66) | | |
| 41-50 | 1 (20.0) | 3 (25) | 14(38.89) | | |
| >50 | 3 (60.0) | 0 (0) | 13(36.11) | | |
| Total | 5 (100) | 8(100) | 36 (100) | | |

Key: BF- body fat

**Table 7.** Association between Lean Body Mass and Age

| Age (years) | LBM category | | $X^2$ | p-value |
|---|---|---|---|---|
| | Low fat n (%) | High fat n (%) | | |
| < 30 | 2 (15.4) | 3 (13.9) | 0.326 | 0.955 |
| 31-40 | 3 (23.1) | 6 (16.7) | | |
| 41-50 | 4 (30.8) | 13 (36.1) | | |
| >50 | 4 (30.8) | 12 (33.3) | | |
| Total | 13 (100) | 36(100) | | |

Key: LBM- Lean Body Mass

**Table 8.** Association between Body Adiposity Index and Age

| Age (years) | BAI category | | | | $X^2$ | p-value |
|---|---|---|---|---|---|---|
| | Under weight n (%) | normal n (%) | Over weight n (%) | Obese n (%) | | |
| < 30 | 0 (0.0) | 5 (33.3) | 3 (16.7) | 1 (6.2) | 9.128 | 0.167 |
| 31-40 | 0 (0.0) | 3 (20.0) | 3 (16.7) | 3 (18.8) | | |
| 41-50 | 0 (0.0) | 4 (26.7) | 10 (55.6) | **7** (43.8) | | |
| >50 | 0 (0.0) | 3 (20.0) | 2 (11.1) | 5 (31.2) | | |
| Total | 0 (100) | 15(100) | 18 (100) | 16 (100) | | |

Key: BAI- body adiposity index

30 years had body mass index between 18.5 and 24.9 indicating normal weight; whereas, 54.2% of the staff who were over 50 years had their body mass index greater than 30 indicating obesity as shown in table 10.

**Table 9.** Association between Free Fatty Mass Index and Age

| Age (years) | FFMI category | | | $X^2$ | p-value |
|---|---|---|---|---|---|
| | Low Adiposity n (%) | Normal Adiposity n (%) | High Adiposity n (%) | | |
| < 30 | 2 (16.7) | 2 (9.1) | 3 (20.0) | 11.781 | 0.067 |
| 31-40 | 5 (41.7) | 4 (18.2) | 0 (0.0) | | |
| 41-50 | 4 (33.3) | 9 (40.9) | 4 (26.7) | | |
| >50 | 1 (8.3) | 7 (31.8) | 8 (53.3) | | |
| Total | 12 (100%) | 22(100) | 15 (100) | | |

Key: FFMI- free fatty mass index

**Table 10.** Association between Body Mass Index and Age

| Age (years) | BMI category | | | | $X^2$ | p-value |
|---|---|---|---|---|---|---|
| | Underweight n (%) | Normal n (%) | Over weight n (%) | Obese n (%) | | |
| < 30 | 0 (0.0) | 3 (42.9) | 3 (16.7) | 1 (4.2) | 20.137 | 0.003* |
| 31-40 | 0 (0.0) | 3 (42.9) | 3 (16.7) | 3 (12.5) | | |
| 41-50 | 0 (0.0) | 0 (0.0) | 10 (55.6) | **7** (29.2) | | |
| >50 | 0 (0.0) | 1 (14.3) | 2 (11.1) | 13 (54.2) | | |
| Total | 0 (0.0) | **7** (100) | 18 (100) | 24 (100) | | |

Key: BMI- body mass index

## DISCUSSION

The aim of this study was to assess the adiposity indices among female teachers in the University of Nigeria Primary School, Enugu campus. The study revealed that majority of the female staff were above the age of forty married and had children. The study also assessed the adiposity indices among staff using waist hip ratio, waist circumference height ratio, body fat percentage, body adiposity index, free fatty mass, lean body mass and body adiposity index. This is consistent with the work of Egbe *et al.,* (2014) on the assessment of anthropometric indices among residents of Calabar, south east Nigeria. They assessed body fat using waist hip ratio, waist circumference height ratio and body mass index. However, this is contrary to some previous studies on relationship between age and fatness which used methods such as measurement of skin fold thickness (Najjar and Rowland, 1987) or bioelectric impedance analysis. This method has however been reported to have some challenges with reliability (Silver *et al.,* 1993).

In a similar trend, the study assessed the association between various adiposity indices and age. Most investigators believe that body fat increases from young adult to middle age; and that the relationship between age and body fat in older individual is unclear (Going *et al.,* 1995). Previous studies on the relationship between body fat and aging found 1 of 2 patterns; either an increase in body fat until early old age followed by a decrease or a pattern of steadily increasing body fat with aging (Silver *et al.,*1993). However, this study reported that body fat increases with age, in consistence with the findings of American Society for Clinical Nutrition (1999). They found out that body fat increase with age especially in the middle ages. This is contrary to what they found out in Puerto Rican men where they found no significant relationship between age and fatness although relationship between age and body fat was linear and positively correlated. Notably, the study found out that none of the primary school staff was under weight. This could be as a result of their age and also may be as a result of parity since it is a known fact that parity plays a role in body adiposity.

The study showed a significant association between waist hip ratio and age, this may indicate that there could be an increasing health risk among the participants as age increases. This may also imply that aging could be associated with increased central adiposity. Waist hip ratio has been shown to be a good predictor of cardiovascular diseases among women (Huxley *et al.,* 2010; Cao *et al.,* 2018). In another study by Mehta *et al.,* (2014), it was reported that in females, age and menopause have significant effects on cardiovascular parameters. This may therefore imply that increase in waist-hip ratio as one gets older and as menopause approaches may predispose women to cardiovascular diseases.

In a similar trend, this study showed a significant association between body mass index and age. This is consistent with the work of Stevens *et al.* (1998) on the

effect of age on the association between body mass index and mortality. They noted that there was a significant association between age and body mass index and excess body weight increases the risk of death from any cause and from cardiovascular diseases in adults between 30 and 74 years. Also, a cohort study by Reas *et al*. (2007) on the changes in body mass index by age, gender, and socioeconomic status among Norwegian men and women (1990-2001) showed significant increase in BMI with age. However, the BMI scale has been shown to be a less accurate measure for body adiposity. For instance, an athlete with the same BMI as a non-athlete tends to have more muscle mass than body fat. Also, an older person with the same BMI will tend to have more body fat. It often overestimates body fat in those who are muscular and underestimate it in the elderly. Although studies have shown that percentage body fat increases with age, there was no significant association between percentage body fat and age in this study. In a study by Abolhasani *et al.*(2013), they observed that age and BMI had a significant correlation with body fat percentage and that body mass index correlation of body fat and age was enhanced, but that this effect was opposite in people with morbid obesity.

This study found no significant association between waist circumference height ratio and age. This is consistent with the work of Han *et* al. (1997) on the influences of age on waist circumference height ratio, they also reported that age has no influence on waist circumference height ratio. Furthermore, using waist circumference height ratio as an index of adiposity shows that only 3 participant had a normal body adiposity, while the rest had their waist circumference ratio greater than normal across all age groups; a higher percentage of participant within the age ranges of 41 years and above were overweight.

Finally, this study reported that there was no significant association between lean body mass and age although participants between 41-50 years had higher adiposity than other participants based on their lean body mass. Also there was no significant association between body adiposity index and age although 49% of the participants across all ages are obese with majority (54.2%) of them greater than 50 years. In a similar trend there was also no significant association between age and lean body mass although 69.4% of the participants have high body fat when assessed with lean body mass. These may therefore imply that age has a fairly unimportant influence on the adiposity of women.

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