# ANTHROPOMETRIC INDEXES CORRELLATE OF BODY FAT PERCENTAGE AMONG NIGERIANS

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## BACKGROUND

Obesity is associated with many chronic diseases including type 2 diabetes, cardiovascular disease and some cancers[1] and in fact, it is a significant risk factor for type 2 diabetes mellitus.[2]

Many anthropometric indexes are now being used in clinical practice to identify and determine the prevalence of obesity. Body Mass Index (BMI) is often used to reflect total body fat, however, waist circumference (WC), waist-to-hip ratio (WHR) and waist-to- height ratio (WHtR) are used as surrogates for intra-abdominal adiposity and they predict obesity-related health risks better than BMI.[3] This study determined the relationship between common anthropometric indexes and percentage body fat (% BF).

## METHODOLOGY

Ninety four volunteer adult subjects were recruited consecutively to participate in this cross sectional hospital based study which was carried out at our endocrine outpatients' clinic between January and March 2014. Anthropometric parameters of all subjects were measured using the standard protocol and BMI was calculated as body weight in kilograms divided by the square of height in metres (kg/m2) square.[4] Percentage body fat (%BF) of each subject was measured by bioelectrical impedance analysis (BIA) method according to the standard protocol with the aid of a portable BIA device (Supplied by OMRON Healthcare Europe BV) which measured impedance across the body from legs on a stand-on scale following the manufacturer's instructions.

Data analyses were done using SPSS statistical software version 17 for Windows. Student's t-test was used to compare means between two numerical variables while Pearson correlation statistic was performed to determine relationship between numerical variables. Continuous data were reported as Mean ± Standard deviation, while categorical data were reported as number N(%). Level of statistical significance was set at P value less than 0.05.

## RESULTS

Of the participants, 61.7% were females, 38.3% were males, with their mean age being 62.9 ± 12.2 years. Their mean body mass index (BMI), waist circumference (WC) and waist to hip ratio (WHR) were 26.5 ± 5.3 kg/m2, 94.5 ± 13.0 cm, and 0.95 ± 0.07 respectively. The mean % BF was 33.2 ± 10.8 %, see Table 1. There was a significant and a strong positive correlation between % BF and BMI (r = 0.79, P<0.001),WC (r = 0.71, P <0.001). However, the % BF had a weak correlation with WHR (r = 0.13, p = 0.200).Meanwhile, a stronger relationship was demonstrated between %BF and WHR among men than women, see Table 2.

Table 1. Age and obesity-related characteristics of subjects

| Parameters | All Subjects(a) N = 94(100%) | Female Subjects (b) N= 58 (61.7%) | Male Subjects (c) N= 36 (38.3%) | P Value (b Vs c) |
|---|---|---|---|---|
| Age (years) | 62.9 ± 12.2 | 62.6 ± 12.5 | 63.4 ± 12.0 | 0.754 |
| Height (cm) | 1633 ± 8.2 | 159.8 ± 6.1 | 168.8 ± 8.1 | 0.0001* |
| Weight (kg) | 70.8 ±14.1 | 71.5 ± 15.7 | 69.7 ± 11.2 | 0.542 |
| BMI (kg/m$^2$) | 26.5 ± 5.3 | 27.8 ± 5.5 | 24.4 ± 4.3 | 0.002* |
| WC (cm) | 94.5 ± 13.0 | 97.6 ± 12.2 | 89.5 ± 12.6 | 0.003* |
| HC (cm) | 99.9 ± 11.7 | 104.3 ± 10.6 | 92.7 ± 9.8 | 0.0001* |
| WHR | 0.95 ± 0.07 | 0.94 ± 0.07 | 0.96 ± 0.07 | 0.057 |
| %BF | 33.2 ± 10.8% | 39.7 ± 7.3% | 22.8 ± 6.3% | 0.0001* |

*= p value less than 0.05, HC = Hip circumference, WC = Waist circumference, WHR = Waist to hip ratio.

Table 2. Correlation between percentage body fat measured and other anthropometric indexes of subjects (A correlation coefficient of 1 describes a perfect agreement)

| Parameters | All Subjects N = 94 (100%) | | Female Subjects N = 58 (61.7%) | | Male Subjects N = 36 (38.3%) | |
|---|---|---|---|---|---|---|
| | r-value | p-value | r-value | p-value | r-value | p-vavlue |
| WC (cm) | +0.71* | 0.0001 | +0.77* | 0.0001 | +0.79* | 0.0001 |
| HC (cm) | +0.76* | 0.0001 | +0.74* | 0.0001 | +0.60* | 0.0001 |
| WHR | +0.13 | 0.200 | +0.32* | 0.014 | +0.71* | 0.0001 |
| BMI (kg/m$^2$) | +0.79* | 0.0001 | +0.92* | 0.0001 | +0.86* | 0,0001 |

*= p value less than 0.05, r = Pearson's correlation coefficient, HC = Hip circumference

## DISCUSSION

BIA has been used for estimation of the %BF and found to correlate well with other methods, including DEXA) which is now recognised as the gold standard method.[5]

Our study also demonstrated a very strong positive and significant correlation of %BF with BMI and WC for all subjects both males and females. However, we also demonstrated a weak correlation of %BF with WHR in all our subjects although more marked among our female subjects. These findings are suggestive of the fact that WHR may be a far less accurate surrogate marker of adiposity among adult Nigerian population.

Waist circumference (WC) is the most frequently used measure of 'central obesity', particularly for population surveillance.[6] Unlike WHR, only one measurement is required per individual, and the cost of the equipment (a tape measure) is negligible. In addition, taking WHR measurements requires more body contact between the operator and subject than for WC measurements, which can lead to ethical issues in the collection of data since it can be more inconvenient and embarrassing to measure.

Many studies have suggested that the accumulation of body fat around the waist may present a higher risk to health than fat deposited in other parts of the body.[3, 6] Including waist measurements in addition to BMI in routine clinical assessment of obesity should enable the proportion of the population at risk of obesity-related ill health to be more accurately described and would add minimal expense or inconvenience to the data collection process.

## CONCLUSION

BMI and WC are better surrogate markers of obesity than WHR among adult Nigerians most especially for women. Therefore, routine use of WHR in our clinical practice to assess obesity should be less emphasized. We advocate for combine use of BMI and WC for assessment of obesity and its related ill health among adult Nigerians.

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