

# Anthropometric Measure And Sexual Dimorphism In Young Adult Nigerians Resident In Calabar

A Igiri, M Ekong, P Odey

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## Abstract

Anthropometric measures were used to determine sexual dimorphism in young Nigerians.

This study was carried in the whole of the metropolis and was not institution-based.

In this study we recruited one thousand volunteers made up of five hundred each of males and females. Their mean ages were  $25.34 \pm 0.10$  and  $23.31 \pm 0.12$  for males and females respectively. Anthropometric parameters measured included; height, weight, neck circumference (Nc), biacromial diameter (BAD) and waist circumference (Wc). From these parameters, indices were calculated using standard formulas. Males had significantly ( $p < 0.01$ ) higher values for all the parameters measured except in Wc which was significantly lower ( $p < 0.01$ ). Waist-Neck-Waist ratio (Wc-Nc:Wc), Waist-Biacromial diameter-Waist ratio (Wc-BAD:Wc) and Neck-Waist-Biacromial diameter-Waist ratio (Nc:Wc-BAD:Wc) showed strong positive significant (0.01) correlations in females against the moderate correlations in males. These results indicate that sexual dimorphism exists in young Nigerians with Wc, Nc and BAD indices having the most predictive power in females.

## INTRODUCTION

Anthropometric measurements are vital and are used by companies for proper or adequate production and management of good and resources<sup>1</sup>. In medical anthropology and epidemiology, it is useful in the determination of the relationship between various body measurements and medical outcomes<sup>2,3,4,5</sup>. It also serves as biomarkers for disease conditions<sup>6,7</sup>, sex determination and stature estimation of adult skeletal remains<sup>8,9,10,11,12,13</sup>.

Such measurements like neck circumference (Nc), biacromial diameter (BAD), waist circumference (Wc), height and weight are very important markers to determine gender differences and disease conditions<sup>14,15,16,17</sup>.

These parameters may also be compared with other parameters serving as indices where they are used as biomarkers for disease condition<sup>14,15,16,17</sup>. In other situations, statistical concept of correlation may be used for comparative study of the relationship of various body parts<sup>1</sup>.

Data on Nigerian's anthropometry and sexual dimorphism is inadequate<sup>20,21</sup>. The need of these data for economic

planning and health care necessitated this study. Hence the study of young Nigerians resident in Calabar Metropolis was carried out to determine sex differences between males and females.

## MATERIALS AND METHODS

One thousand volunteers made up of five hundred (500) males and females each were recruited after informed consent. The subjects were young adult Nigerians by birth resident in Calabar Metropolis, an area in Cross River State in the South-South geopolitical region of Nigeria. The mean ages were  $25.34 \pm 0.10$  and  $23.31 \pm 0.12$  for males and females respectively.

Anthropometric measurements following the standard techniques were carried out<sup>15</sup>. Neck (Nc) and waist circumferences (Wc) and biacromial diameter (BAD), were measured to the nearest 0.1cm each, while height and weight were recorded to the nearest 0.1cm and 0.5kg respectively.

Body mass index (BMI), BAD-Nc, BAD-Wc, Nc:Wc, Nc-BMI, BMI-Nc:WC, BMI-BAD:Wc, Wc-Nc:Wc, Wc-BAD:Wc and Nc:Wc-BAD:Wc ratios were calculated using standard techniques<sup>15</sup>.

Statistical analysis was carried out using student t-test to compare the measured parameters between the males and the females. Pearson correlation was then used to establish the relationship between the parameters and their indices. The differences were accepted as significant when  $p < 0.01$ .

## RESULTS

The results showed that the males had significantly ( $p < 0.01$ ) higher values in all the measured parameters (neck circumference, biacromial diameter, height and weight) except in Wc where it was significantly lower compared to the females. These are as shown in Tables 1.

**Figure 1**

Table 1: Comparison of Mean Anthropometric Parameters in Male and Female Volunteers

Parameters	Male	Female
Neck circumference (cm)	38.08±0.10	33.78±0.06**
Biacromial diameter (cm)	37.96±0.11	34.8±0.06**
Waist circumference (cm)	73.86±0.19	77.04±0.29**
Height (m)	170.83±0.24	162.44±0.26**
Weight (kg)	68.01±0.24	60.51±0.34**

Results are expressed as mean± standard error of mean

\*\* Significant lower compared to the male ( $p < 0.01$ )

There were significant positive moderate correlations between BAD and Nc, Nc and Wc in both sexes. BAD-Wc ratio showed a significant positive moderate correlation in males but weak correlation in females. Nc-BMI correlates moderately in females but weakly in males, while BMI-Nc:Wc and BMI-BAD:Wc showed moderate and weak correlations in females and males respectively. Wc-Nc:Wc, Wc-BAD:Wc and Nc:Wc-BAD:Wc showed moderate and strong positive correlations in males and females respectively. Correlation results are as shown in Table 2.

**Figure 2**

Table 2: Correlation results in Male and Female Volunteers

Indices	Male (r)	Female (r)
BAD-Nc	0.627**	0.457**
BAD-Wc	0.453**	0.349**
Nc-Wc	0.497**	0.403**
Nc-BMI	0.242**	0.423**
BMI-Nc:Wc	-0.065	0.435**
BMI-BAD:Wc	0.112*	0.452**
Wc-Nc:Wc	0.496**	0.881**
Wc-BAD:Wc	0.405**	0.838**
Nc:Wc-BAD:Wc	0.619**	0.836**

\*\* Significant at ( $p < 0.01$ )

\* Significant at ( $p < 0.05$ )

## DISCUSSION

Male and female differ from each other genotypically and phenotypically<sup>22</sup>. During puberty to adulthood, the amount of muscle tissue increases especially in males. The males also develop larger lungs, hearts and a greater capacity for carrying oxygen in the blood in comparison with the females, and these are usually associated with greater strength and physical endurance<sup>23</sup>.

Changes also occur in the amount of subcutaneous fat. With the onset of the growth spurt, the relative proportion of subcutaneous fat decreases and this is greatest in males. The females thus enter adulthood with relatively more subcutaneous fat especially over the pelvis and on the breast, upper back and arms<sup>23</sup>.

The male had a longer biacromial diameter (BAD). Males tend to develop broader shoulder from puberty compared to the females<sup>23</sup>, and this may be a reason for the higher BAD. Lohman et al<sup>15</sup> reported that BAD is useful in the evaluation of sex-associated differences in physique.

The males also had a higher neck circumference (Nc). Nc of males are usually wider than those of the females<sup>14</sup>, and this may be due to the larger muscles<sup>23,24</sup> and broader shoulder as seen in this study. Nc serves as a screening measure for identifying over-weight and obesity<sup>14</sup>, and is also an effective tool for patient clinically suspected to have obstructive sleep apnea, raised insulin and free androgen index in obese pre-menopausal women<sup>25,26</sup>.

Waist circumference (Wc) in males was less compared to the

females. This is in line with another study on Nigerians resident in Ibadan<sup>20</sup>. Our result is in variance with works carried out in other countries<sup>20,27</sup>. They stated that Wc measurements were significantly higher in females than in males. The lower Wc in males may be due to less accumulation of adipose tissue around the midsection at this young age.

The height and weight were higher in males than in females. Males are usually taller and weigh more than females<sup>17,20</sup>. The differences in height and weight may be attributed to sex chromosomal differences<sup>28,29</sup>, larger muscles and other organs<sup>23,30</sup>.

Each of the parameters discussed has been and still in use both as independent index of health or in combination with other parameters<sup>14,15,17,31</sup>. In other instances, the use of the parameters independently as index of health may not give the best prediction of the state of health<sup>17,20</sup>, thus the use of their indices is usually recommended.

In this study, the indices with the most predictive power were Wc-NC:Wc, Wc-BAD:Wc and Nc:Wc-BAD:Wc. These three indices showed a greater predictive power in females than in males. This is an indication that these indices may be very good biomarkers in lieu of BAD, Nc and Wc alone, with indices being more predictive in females.

In conclusion, sexual dimorphism exist in young adult Nigerians with the males having larger bioacromial breadth, neck circumference, are taller and weigh more than the females. In contrast the male had lower waist circumference with the females having the most predictive indices of Wc-NC:Wc, Wc-BAD:Wc and Nc:Wc-BAD:W ratios compared to the males.

## ACKNOWLEDGMENTS

The study was carried out in different parts of town (Calabar Metropolis) and not in a particular institution and we followed the guidelines of Helsinki's Declaration. There was no external source of support.

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**Author Information**

**Anozeng O. Igiri, M.Sc.**

Department of Anatomy, Faculty of Basic Medical Sciences, University of Calabar

**Moses B. Ekong, M.Sc.**

Department of Anatomy, Faculty of Basic Medical Sciences, University of Calabar

**Paul A. Odey, B.Sc.**

Department of Anatomy, Faculty of Basic Medical Sciences, University of Calabar