**Original Article**

# The anthropometric indices of physical development in medical students at the University of Lagos, Nigeria

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## Abstract

**BACKGROUND AND AIM:** Limited data is available about the anthropometric indices of physical development of medical students of the University of Lagos Nigeria. This study aims to generate anthropometric data on selected body circumference variables of physical development among medical students in Urban Lagos.

**MATERIALS AND METHOD:** Simple Random Sampling was deployed to select 157 undergraduate volunteers aged 16-26 years from Medical and Dental students of the College of Medicine the University of Lagos. Anthropometric measurements of weight (kg), height (cm), chest circumference (cm), mid-upper arm and arm flexed circumference (cm), waist circumference (cm) and hip circumference (cm) were taken in accordance with the recommendation of International Society for the Advancement of Kinanthropometry (ISAK). Body composition indices such as body mass index (BMI) and height-weight ratio (HWR) were calculated. The data obtained was collated and analysed for Descriptive Statistics (Mean and Standard Deviation).

**RESULTS:** Results show that female medical students were taller and has accumulated more weight than their male counterpart. Both males and females had a slightly closer BMI. There is a slightly higher HWR for males than females. The Mid-Upper Arm circumference was higher in males than in females. The waist circumference revealed a higher girth in male medical students than female medical students.

**CONCLUSION:** This is consistent with the fact that the females have an earlier adolescent rapid growth spurt than males. This study has generated a database on some specific anthropometric indices of growth and physical development in male and female medical students in urban Lagos, and the results indicated that there were differences in the pattern of variation depending on the specific dimensions and indices being evaluated.

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## INTRODUCTION

The differences in growth and development vary with gender and ethnic origin. Gender-specific growth patterns, timing of adolescent growth spurt, overall size and age of skeletal maturity are well known. Still, differences between both genders are apparent from the time of fetal life (Alan *et al.,* 2001). At birth, the skeletal maturation of females is 4-6 weeks more advanced than that of males, and this trend continues throughout childhood and adolescence. The overall size and rate of development vary significantly depending on ethnicity. Black infants tend to be smaller at birth but experience an acceleration of linear growth that results in greater height than white children during the first few years of life. Skeletal maturity in black children especially girls also tends to be more advanced (Malina, 1970; Berkley *et al.,* 1994; Salisu *et al.,* 2018).

The growth pattern with age changes is generally similar in all children, but the size attained at a given age and timing of the adolescent growth spurt varies considerably from child to child (Alan *et al.,* 2001). Both genders follow the same course of growth. Gender differences before the adolescent spurt are consistent although minor, Boys, on average, tend to be slightly taller and heavier than girls. During the early part of the adolescent spurt, girls are temporarily taller and heavier because of their early growth spurt.

They soon lose the size advantage as the adolescent growth spurts of boys occur. Boys catch up with and eventually surpass girls in body size on average. Given the normal range of individual variation, overlap exists between both genders throughout growth and in young adulthood. (Ogbe and Ekuremi, 2016; Kobylińska *et al.,* 2022).

The adolescent period represents an important transition stage in the development of the adult morphologic character of all individuals. Inherited physical and behavioral traits that both determine

and influence performance to attain their full potential at the time this period also represents a critical stage in the establishment and manifestation of adult health risks (Malina *et al.*, 2004). The World Health Organization (WHO) defines the age of adolescence as between 10 and 1 8 years but certain authorities (Rolland-Cachera *et al.* 1991, Suwa *et al.*, 1992, Roche and Guo, 2001; Malina *et al.*, 2004), recommend that the age range 8-19 years in girls and 10-22 years in boys are more appropriate as the limit for normal variation in the onset and termination of adolescence. There is thus an overlap for the definition of a young adult taken as ages 18- 26 years in male and female. As young adults, most bodily systems are adult, both structurally and functionally. After the rapid growth spurt of adolescence, rate of growth in height begins to decelerate until the adult stature is attained (Carter, 2006; Sawyer *et al.*, 2018).

Both body growth and development patterns of an individual are affected by genetic background, hormonal, sex, nutritional, environmental, and lifestyle factors (Pipes and Trahm, 1993; Mbagwu *et al.*, 2015; Hurezeanu *et al.*, 2016; Oguejiofor and Nwankwo, 2023). Therefore, this study aims to investigate specific anthropometric indices of growth and physical development in male and female medical students in urban Lagos and study their pattern of variation.

## MATERIALS AND METHOD

This cross-sectional study involved 157 students volunteers aged 16-26 years selected with simple random sampling from 200-level medical and dental students of the College of Medicine of the University of Lagos.

Ethical approval was gotten from ethics committee of college of Medicine Idi-Araba with number: CMUL/HREC/06/24/1502. Informed consented form duly explained and signed by each participant.

The anthropometric variables measured included weight (kg), height (cm), mid-upper arm and arm flexed circumference (cm), chest circumference (cm), waist circumference (cm), and hip circumference (cm) according to the protocols recommended by the International Society for the Advancement of Kinanthropometry (ISAK, 2006). Body composition indices such as Body mass index (BMI), height-weight ratio (HWR), waist-hip ratio (WHR), and skelic index were calculated. BMI is calculated as weight (kg) divided by height (m) squared; HWR is calculated as height (in) divided by weight (lbs); WHR is calculated as waist circumference divided by hip circumference; and skelic index is calculated as ratio of leg length to trunk length in percentage.

The dataset was analyzed for Descriptive Statistics (Mean and Standard Deviation). The statistical packages used are Statistical Package for Social Science (SPSS) v25.

## RESULTS

From the responses to individualized questioning, the ethno-cultural distribution of the biological parentage of the study participants indicated same-ethnic group Nigerians (61%), mixed-ethnic Nigerians (36%) and mixed Nigerian trans-nationals represented approximately 3% of the study sample. The Nigerian ethnic nationalities represented included Yoruba, Ibo, Edo, Urhobo, Itsekiri, Ijaw, Ibibio, Efik, Annang, Igala, Hausa-Fulani, Nupe, Idoma and Tiv.

Table 1 highlights the descriptive statistics (mean and standard deviation) of the students' anthropometry data. The mean age and standard deviation is 20.85 (± 2.76), height 158.83 (± 10.72) and weight 56.46 (± 9.18). The BMI and the HWR are 22.76 (± 5.15) and 47.63 (± 4.22) respectively.

While Table 1 shows the parameters for the students' altogether, Table 2 show the descriptive statistics of the students according to gender (male and female). The mean age of male is 20.78 and female is 20.96, height is 158.67 and 159.13 for male and female, then weight is 56.37 and 56.64 for male and female respectively.

Table 1: Overall descriptive statistics of variables with mean and standard variations of students.

|  | Mean ± Std. Dev. |
| --- | --- |
| Age | 20.85 ± 2.76 |
| Height (cm) | 158.83 ± 10.72 |
| Weight (kg) | 56.46 ± 9.18 |
| MUAC | 26.47 ± 1.92 |
| ARM(F)C | 28.26 ± 1.93 |
| CHESTC | 84.31 ± 3.71 |
| WAISTC | 78.11 ± 5.98 |
| Hip C | 86.11 ± 5.98 |
| Skelic Index | 0.54 ± 0.04 |
| Body Mass Index (BMI) | 22.76 ± 5.15 |
| Height - Weight Ratio (HWR) | 47.63 ± 4.22 |
| Waist-Hip Ratio (WHR) | 0.91 ± 0.007 |

Table 2: Descriptive statistics of variables with mean and standard variations according to gender

|  | Male Mean ± Std. Dev. | Female Mean ± Std. Dev. |
| --- | --- | --- |
| Age | 20.78 ± 2.78 | 20.96 ± 2.73 |
| Height (cm) | 158.67 ± 10.95 | 159.13 ± 10.39 |
| Weight (kg) | 56.37 ± 9.46 | 56.64 ± 8.72 |
| MUAC | 26.56 ± 1.98 | 26.32 ± 1.81 |
| ARM(F)C | 28.22 ± 1.96 | 28.33 ± 1.88 |
| CHESTC | 83.97 ± 3.70 | 84.91 ± 3.68 |
| WAISTC | 78.83 ± 5.77 | 76.80 ± 6.19 |
| Hip C | 86.55 ± 5.97 | 85.30 ± 5.98 |
| Skelic Index | 0.55 ± 0.03 | 0.53 ± 0.04 |
| Body Mass Index (BMI) | 22.83 ± 5.54 | 22.63 ± 4.42 |
| Height-Weight Ratio (HWR) | 47.64 ± 4.51 | 47.61 ± 3.66 |
| Waist-Hip Ratio (WHR) | 0.907 ± 0.007 | 0.906 ± 0.007 |

## DISCUSSION

In Table 2, the descriptive statistics of the variables for the anthropometry of the students was shown for male and female, the table highlighted the mean and the standard deviation of the variables. The mean age of the male students was 20.78 while the mean age of the female students was 20.96. The female mean height was 159.13 higher than the mean height of male which is 158.67. Male mean weight is slightly lesser than female mean weight at 56.64. These indicated that female are poised to be physically matured than their male counterpart at that period of adolescence. This is also consistent with the differences in growth spurt between both genders.

The mid-upper arm circumference is an index of muscle mass and adequacy of calorific intake. It is also used to assess thinness. In this study, the mean mid-upper arm circumference for males and females show that muscle mass was higher in males than in females. This finding is consistent with the study done among students between 10 and 19 years of age by Bahaq and Shawky (2002), and Milena *et al.,* (2019). The mean mid-upper arm circumference for male at 26.56 is slightly higher than their female counterpart at 26.32.

The mean chest circumference for female students is relatively more than their male counterpart this was in support of the claim that the wider girth in females is associated with the earlier onset of growth spurt (Kuczmarski *et al.*, 2000; Widiyani *et al.,* 2011).

Waist circumference and waist circumference-derived indices such as waist-hip ratio and waist-height ratio have been used to measure the tendency for central obesity in both adults (Despres *et al.*, 1991, Hen *et al.,* 1995, Kahn and Valdez, 2003) and children (Maffeis *et al.,* 2001; Kelishadi *et al.*, 2007) and its relationship to cardiovascular disease. More so, the mean waist and hip circumference of the male students are slightly higher than their female counterpart.

In addition, the mean Body Mass Index (BMI) and Height-Weight Ratio of male students is more than female students, both falls in the category of normal weight according to BMI categories.

However, even though BMI is generally used as an anthropometric tool to assess the level of fatness or thinness in the measurement of health risk factors for underweight or obesity in the general population, modest changes in weight would not be adequately reflected in body weight changes (Karl *et al.*, 2001, Wang, 2002 Cole *et al.,* 2007; Milena *et al.,* 2019). Results of several inferential studies suggest that the interpretation of BMI in children and adolescents calls for consideration of the fat and lean mass components of body composition. The height-weight ratio (HWR) is used in the assessment of leanness. The waist-hip circumference ratio assess both central (waist girth) and peripheral (hip-gluteal girth) fat stores such that an increased ratio is suggestive of a high risk of ischemic heart disease, stroke,

and diabetes mellitus (Rohmatullayaly *et al.*, 2017; Bogin *et al.,* 2020; Kramer, *et al.*, 2021; Campbell, *et al.*, 2023) In this study, the ratio was observed to be higher in male medical students than female medical students. The observation are in line with the changes in fat distribution associated with the differences in the onset of growth spurt in both males and females.

**Conclusion:** This study has generated a database on some specific anthropometric indices of growth and physical development in male and female medical students in urban Lagos. In this study, the results indicated that there were differences in the pattern of variation depending on the specific dimensions and indices being evaluated. These variations may represent characteristics peculiar to the population sampled, which may not be extended to other similar population groups it may therefore, be necessary to carry out further investigations among similar populations to establish the pattern. This result, however, may form a reference base for comparison with a similar population of medical students.

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