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Original Research Article

A Study of anthropometric data variation in Ist & IInd term of Ist MBBS students of DBVP RMC

Rohini Antre[1], M C Tayde[2], A. N. Badwe[*3] and Tanvi Mandlik[4]

[1] PG Student (Medical Physiology), Department of Physiology
DBVP Rural Medical College, Pravara Institute of Medical Sciences, Loni, Tq: Rahata, Dist: Ahmednagar – 413 736 India
[2]Professor & Head, Professor, Department of Physiology, DBVP Rural Medical College,
Pravara Institute of Medical Sciences (DU), Loni, Tq: Rahata, Dist. Ahilyanagar – 413 736 India
[3]Professor, Department of Physiology, DBVP Rural Medical College, Pravara Institute of Medical Sciences (DU),
Loni, Tq: Rahata, Dist. Ahilyanagar – 413 736 India
[4]UG Student, College of Pharmaceutical Sciences, Pravara Institute of Medical Sciences (DU),
Loni BK, Tq: Rahata, Dist: Ahilyanagar – 413 736 India

Abstract

Objective: Medical students often undergo lifestyle changes due to academic pressure, altered dietary habits, and variations in physical activity levels. These factors can significantly influence their anthropometric profiles. By examining the trends in these measurements, this research intends to highlight potential correlations between academic routines and body composition changes. Understanding these variations can contribute to better health awareness among students and may aid in establishing preventive strategies for maintaining optimal physical well-being during their medical training. This study aims to analyze the fluctuations in key anthropometric parameters - height, weight, body mass index (BMI), waist-hip circumference ratio (WHR), relative fat mass percentage (RFM%), and waist height ratio (W/Ht) - across the two academic terms.
Material and Methods: This cross-sectional study was conducted to analyze anthropometric variations among first-year MBBS students of DBVP RMC across their first and second terms. A total of 200 students participated, including 102 males and 96 females. All measurements were taken in a controlled environment following standard anthropometric procedures. Participants were instructed to wear light clothing and remove footwear before the assessment. Measurements were taken twice, once in the first term and again in the second term, ensuring consistency and accuracy.
Results: This study demonstrates that anthropometric parameters in first-year MBBS students at DBVP RMC undergo measurable variations between the first and second academic terms, with distinct patterns observed in male and female students. Significant gender-based differences exist for key anthropometric indicators like BMI, WHR, and RFM%, W/Ht. The regression analysis highlights evolving relationships between these parameters, particularly the strengthening association between age and weight in males during the first year.
Conclusions: These findings have implications for understanding the physiological changes occurring in students during their initial transition to medical education. Further research with longitudinal follow-up, larger sample sizes, and the inclusion of lifestyle factors (diet, physical activity, stress levels) could provide a more comprehensive understanding of the determinants of these anthropometric variations and their potential long-term health implications. Monitoring these parameters could be valuable for promoting health and well-being among medical students.
Keywords: WHR (Waist Hip Ratio), BMI (Body Mass Index), RFM (Relative Fat Mass), Waist Height Ratio (W/HtR).

***Correspondence Info:**
Dr. A. N. Badwe
Professor,
DBVP Rural Medical College,
Pravara Institute of Medical Sciences, Loni,
Tq: Rahata, Dist: Ahilyanagar – 413 736

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1. Introduction

Anthropometric measurements serve as essential indicators of health, growth patterns, and nutritional status. Anthropometry is a series of systematized measuring techniques that quantitatively estimates the dimensions of human body and skeleton [1].

They play a crucial role in medical education, research, and clinical practice, offering insights into physiological variations among individuals. This study, aims to analyze the fluctuations in key anthropometric parameters-height, weight (W), body mass index (BMI), waist hip circumference ratio, (WHR), and relative fat mass percentage (RFM%) -across the two academic terms.

Medical students often undergo lifestyle changes due to academic pressure, altered dietary habits, and variations in physical activity levels. These factors can significantly influence their anthropometric profiles. By examining the trends in these measurements, this research intends to highlight potential correlations between academic routines and body composition changes. Understanding these variations can contribute to better health awareness among students and may aid in establishing preventive strategies for maintaining optimal physical well-being during their medical training.

The assessment of health indicators, such as body weight (W), Body Mass Index (BMI), and Waist-Hip Ratio (WHR), relative fat mass percentage (RFM%) plays a pivotal role in understanding the physiological and metabolic state of individuals. Among medical students, particularly those in their formative first year MBBS, these parameters not only reflect physical health but also provide insights into lifestyle patterns and nutritional adequacy during a challenging academic phase.

BMI is used to categorize individuals as underweight, normal weight, overweight, or obese. It is an indicator of overall health and risk for various chronic diseases. Stress, irregular eating habits, and sedentary lifestyles associated with medical college can affect BMI.

Waist Hip Ratio (WHR) is a measure of abdominal obesity, which is a stronger predictor of cardiovascular disease and other health risks than BMI alone. Similar to BMI, WHR can be affected by lifestyle factors prevalent in medical students. Abdominal obesity has been linked to increased risk of metabolic syndromes

This study aims to investigate the relationships between age,body weight (W), body mass index (BMI), and waist-hip ratio (WHR), relative fat mass percentage (RFM%) in first-year MBBS students at DBVP RMC. By establishing the interrelationship between these metrics, the research seeks to identify trends and potential health concerns, emphasizing the importance of proactive health monitoring among young medical professionals.

The study will employ systematic data collection methods to ensure accuracy and consistency in measurement, adhering to established anthropometric assessment guidelines. Statistical analysis will be conducted to determine significant trends and variations. The findings will provide valuable insights into how academic and lifestyle factors shape student's physical health and inform recommendations for healthier academic routines.

2. Material and Methods

2.1: Study Design and Sample Size

This cross-sectional study was conducted to analyze anthropometric variations among first-year MBBS students of DBVP RMC across their first and second terms. A total of 200 students participated, including 102 males and 96 females.

2.2: Anthropometric Parameters Assessed

The following parameters were measured and calculated:

Height (Ht, cm): Measured using a stadiometer with the participant standing barefoot, heels together, and looking straight ahead. Measurements were recorded to the nearest 0.1 cm.

Weight (W, kg): Measured using a calibrated digital weighing scale with the participant wearing light clothing and no shoes. Measurements were recorded to the nearest 0.1 kg.

Body Mass Index (BMI) (kg/m²): Calculated using the formula: BMI= (Height (m))/Weight (kg^2))

Waist Circumference (cm): Measured using a non-stretchable measuring tape placed horizontally midway between the lowest rib and the iliac crest at the end of a normal expiration. Measurements were recorded to the nearest 0.1 cm.

Hip Circumference (H,cm): Measured using a non-stretchable measuring tape placed horizontally around the widest part of the buttocks. Measurements were recorded to the nearest 0.1 cm.

Waist-Hip Ratio (WHR): Calculated using the formula:
WHR Waist Circumference (cm)/Hip Circumference (cm)

Relative Fat Mass Percentage (RFM% %): RFM is a simple anthropometric procedure, considered to be more convenient than body fat percentage and more accurate than the traditional body mass index (BMI) [12] and estimated by using the formula (validated for adults) [2,3]:

- **For Males**:
  RFM=64−(20×Waist Circumference (m)/Height (m))
- **For Females**:
  RFM=76−(20×Waist Circumference (m)/Height (m))

Waist Height Ratio (W/HtR): W/HtR is the ratio of waist circumference and the individual's height. It is easy to report, not being affected by usual factors such as age, sex, and ethnicity, and it negates the use of scales [13]. It is simple to report that a value of <0.5 or >0.5 defines obesity.

2.3: Data Collection Method

All measurements were taken in a controlled environment following standard anthropometric procedures. Participants were instructed to wear light clothing and remove footwear before the assessment. Measurements were taken twice, once in the first term and again in the second term, ensuring consistency and accuracy.

2.4: Statistical Analysis

Data were analyzed using appropriate statistical tools to determine mean values, standard deviations, and significance of variations between terms. A comparative analysis was performed to assess changes in anthropometric measurements over time and their correlation with lifestyle factors.

2.5 Statistical Methods

Data Organization and Preprocessing

The collected anthropometric data were organized into a structured data set for statistical analysis. Preliminary checks were conducted to identify any missing or outlier values. Descriptive statistics were computed to summarize the central tendency and dispersion of each parameter.

Descriptive statistics (mean, standard deviation) were calculated for each anthropometric parameter recorded at Ist term and IInd term 2, separately for male and female students. Paired t-tests were used to compare the mean values of each parameter within the same group (male and female) between Time 1 and Time 2 to assess for statistically significant changes over the study period. The level of significance was set at $p < 0.05$.

Pearson's correlation coefficient – Evaluated relationships between various anthropometric parameters.

3. Results

Table 1: Distribution of the subjects according to gender

Gender	N (%)
Male	**102 (51.51%)**
Female	**96 (48.48%)**
Total	**198**

Table 2: Variation in anthropometric parameters in male and female students in Ist and IInd term

Parameter	Male		Female	
Term	**Ist Term**	**IInd Term**	**Ist Term**	**IInd Term**
Age (Yrs)	19.294 ±1.172 **(P<0.05)	19.295 ±0.885 *(P<0.05)	19 ±0.746	19 ±0.746 *(P<0.05)
BMI (Kg/m$^{2)}$	23.666 ± 10.915 **(P<0.05)	23.658 ±3.179 *(P<0.05) **(P<0.05)	22 ± 3.264	22±3.179 *(P<0.05)
WHR	0.856 ± 0.064 **(P<0.05)	0.854 ±0.645 *(P<0.05) **(P<0.05)	1 ±3.352	1±0.051 *(P<0.05)
RFM (%)	20.940 ± 5.546 *(P<0.05)	21.179 ± 5.546 *(P<0.05) **(P<0.05)	41 ± 3.352	42 ±3.259
Waist/Height Ratio	0.472±0.062	0.475 ±0.064 *(P<0.05)	0.475±0.041	0.481±0.042 *(P<0.05)

(*paired t -test, ** unpaired t - test)

This study investigated variations in anthropometric data of first-year MBBS students (Table 1 & 2) at DBVP RMC between their first and second terms. Findings are reported as:

- Variation in Anthropometric Parameters in Male and Female Students in Ist and IInd Term
- The paired t-test results (indicated by *) suggest statistically significant changes within the same group (either male or female students) between the first and second terms for the following parameters (Table I):
- **Males and females,** age, BMI, and Waist/Height Ratio showed significant changes between the first and second terms.
- The unpaired t-test results (indicated by **) suggest statistically significant differences between male and female students for the following parameters in either the first or second term (or both):

- **Age:** Significant differences were observed between male and female students in both the first and second terms.
- **BMI:** Significant differences were observed between male and female students in both the first and second terms.
- **WHR:** Significant differences were observed between male and female students in both the first and second terms.
- **RFM%:** Significant differences were observed between male and female students in the second term.

Both male and female students recorded some changes in their body measurements (like BMI and waist ratios) between the first and second terms of their first MBBS year. There were also notable differences in age, BMI, WHR, and RFM% when comparing male and female students, both at the beginning and towards the end of their first year.

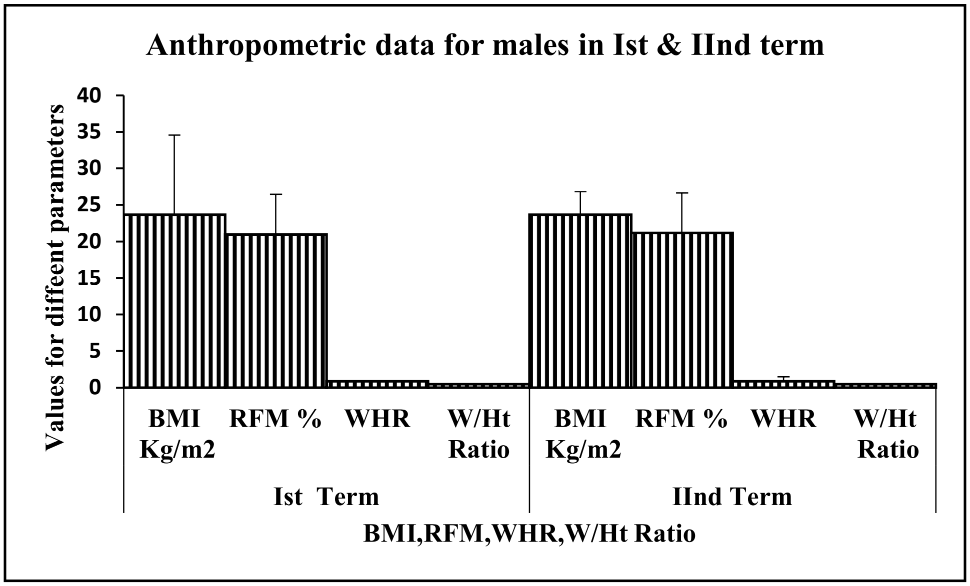

Figure 1: **Anthropometric data in males in I^st^ and II^nd^ term**

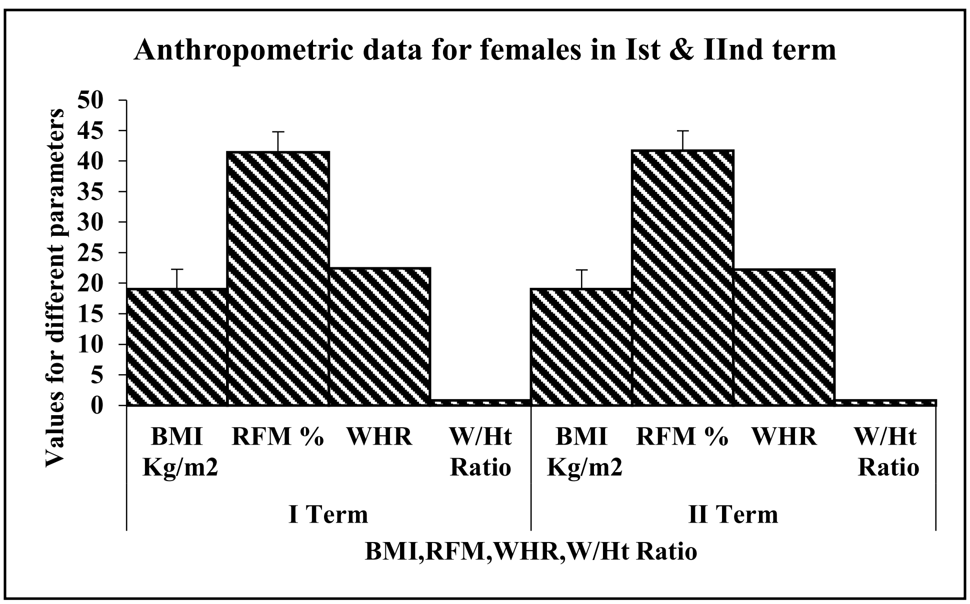

Figure 2: **Anthropometric data in females in I^st^ and II^nd^ term**

- **Regression Analysis** for Various Parameters in Males & Females

This section explores the relationship (correlation) between different anthropometric parameters within the male and female student groups in each term. The 'r' value indicates the strength and direction of the linear relationship (ranging from -1 to +1), and the 'P' value indicates if this relationship is statistically significant.

Table 3: Regression analysis for various parameters in males & females

SN	Gender	Parameter	I[st] Term	II[nd] Term
1	Male	Age & Height	r (100) =0.009, P<0.05	r (100) =0.459, P>0.05
		Age & Weight	r (100) =0.02, P<0.05	r (100) =0.895, P<0.05
		Age & BMI	r (100) =0.176, P>0.05	r (100) =0.713, P>0.05
		BMI &W/Hip	r (100) =0.003, P<0.05	r (100) =0.006, P<0.05
		BMI & W/Ht	r (100) =0.001, P<0.05	r (100) =0.001, P<0.05
		BMI & RFM%	r (100) =0.001, P<0.05	r (100) =0.894, P>0.05
2	Female	Age & Height	r (96) =0.965, P>0.05	r (96) =0.966, P>0.05
		Age & Weight	r (96) =0.669, P>0.05	r (96) =0.600, P>0.05
		Age & BMI	r (96) =0.6, P>0.05	r (96) =0.173, P>0.05
		BMI &W/Hip	r (96) =0.489, P>0.05	r (96) =0.406, P>0.05
		BMI & W/Ht	r (96) =0.490, P>0.05	r (96) =0.001, P<0.05
		BMI & RFM%	r (96) =0.001, P>0.05	r (96) =0.001, P<0.05

For Male Students:

First Term:

- There was a statistically significant but very weak positive correlation between age and height (r=0.009, P<0.05). This suggests that while statistically significant, the increase in age had a negligible impact on height in this group during the first term.
- There was a statistically significant but very weak positive correlation between age and Weight (r=0.02, P<0.05). Similar to height, the increase in age had a minimal impact on weight during the first term.
- There was a statistically significant but very weak positive correlation between BMI and W/Hip (r=0.003, P<0.05). This indicates a very weak tendency for BMI to be associated with Waist-to-Hip ratio.
- There was a statistically significant but very weak positive correlation between BMI and W/Ht (r=0.001, P<0.05). This indicates a very weak tendency for BMI to be associated with Waist-to-Height ratio.
- There was a statistically significant but very weak positive correlation between BMI and RFM% (r=0.001, P<0.05). This indicates a very weak tendency for BMI to be associated with Relative Fat Mass percentage.
- There was no statistically significant correlation between Age and BMI (r=0.176, P>0.05).

Second Term:

- There was no statistically significant correlation between Age and Height (r=0.459, P>0.05).
- There was a statistically significant strong positive correlation between Age and Weight (r=0.895, P<0.05). This suggests a strong tendency for weight to increase with age in male students during the second term.
- There was no statistically significant correlation between Age and BMI (r=0.713, P>0.05).
- There was a statistically significant but very weak positive correlation between BMI and W/Hip (r=0.006, P<0.05).
- There was a statistically significant but very weak positive correlation between BMI and W/Ht (r=0.001, P<0.05).
- There was no statistically significant correlation between BMI and RFM% (r=0.894, P>0.05).

For Female Students:

First Term:

- There was a very strong positive correlation between Age and Height (r=0.965, P>0.05), but it was not statistically significant.
- There was a strong positive correlation between Age and Weight (r=0.669, P>0.05), but it was not statistically significant.
- There was a moderate positive correlation between Age and BMI (r=0.6, P>0.05), but it was not statistically significant.
- There was a moderate positive correlation between BMI and W/Hip (r=0.489, P>0.05), but it was not statistically significant.
- There was a moderate positive correlation between BMI and W/Ht (r=0.490, P>0.05), but it was not statistically significant.
- There was a very weak positive correlation between BMI and RFM% (r=0.001, P>0.05), but it was not statistically significant.

Second Term:

- There was a very strong positive correlation between Age and Height (r=0.966, P>0.05), but it was not statistically significant.
- There was a strong positive correlation between Age and Weight (r=0.600, P>0.05), but it was not statistically significant.

- There was a weak positive correlation between Age and BMI (r=0.173, P>0.05), but it was not statistically significant.
- There was a moderate positive correlation between BMI and W/Hip (r=0.406, P>0.05), but it was not statistically significant.
- There was a statistically significant but very weak positive correlation between BMI and W/Ht (r=0.001, P<0.05).
- There was a statistically significant but very weak positive correlation between BMI and RFM% (r=0.001, P<0.05).

In second term it noted in:

- **Males:** In the first term, age had a statistically significant but practically negligible relationship with height and weight. By the second term, age showed a strong positive association with weight. The relationships between BMI and waist/hip ratio, waist/height ratio, and RFM% were statistically significant but very weak in both terms.
- **Females:** In both the first and second terms, the relationships between age and height, age and weight, and age and BMI were positive but not statistically significant. Similarly, the relationship between BMI and waist/hip ratio was positive but not significant in both terms. However, in the second term, there was a statistically significant but very weak positive correlation between BMI and both waist/height ratio and RFM%.

This interpretation provides a detailed overview of the study's findings. For a deeper understanding, it would be beneficial to consider the context of the study, the specific anthropometric parameters measured, and potential influencing factors.

4. Discussion

This study provides valuable insights into the anthropometric variations observed in first-year MBBS students (both male and female) between their first and second academic terms at DBVP RMC. The findings highlight both temporal changes within each gender group and significant differences between them.

The significant changes observed in age, BMI, and waist/height ratio in males, and age, BMI, waist/hip ratio, and waist/height ratio in females between the two terms suggest that even within a relatively short period, subtle shifts in body composition and dimensions occur in this young adult population. The increase in age is an inherent factor. Still, changes in BMI and waist ratios could be attributed to various factors associated with the transition to a demanding academic environment, including alterations in dietary habits, physical activity levels, and stress [4]. The specific direction and magnitude of these changes would require further analysis of the mean values provided in the table. It is noted from this study that there is a positive correlation between BMI, Waist circumference, Waist/Hip Ratio and are important indicators of obesity to predict obesity [8].

The consistent significant differences in age, BMI, and WHR between male and female students across both terms align with established knowledge of sexual dimorphism in anthropometric characteristics [5]. Typically, males tend to have a higher BMI and different fat distribution patterns reflected in WHR compared to females [7], however no increase in BMI in females is observed as reported by other study, due their physical growth [9]. The emergence of a significant difference in RFM% in the second term suggests that while baseline fat mass might be similar, the changes occurring during the first year of medical college might affect body composition differently in males and females.

The regression analysis revealed interesting patterns of association between different anthropometric parameters. The statistically significant but weak positive correlations observed in males during the first term between age and height, age and weight, and BMI with waist and fat measures suggest minimal linear relationships at that stage. However, the development of a strong positive correlation between age and weight in males by the second term warrants attention. This could indicate a more pronounced weight gain associated with increasing age within this specific timeframe for male students. The lack of significant correlations in females for most parameters suggests a more complex interplay of factors influencing their anthropometric changes during this period, or potentially a need for a larger sample size to detect significant linear relationships.

The findings related to waist-to-height ratio are particularly relevant in the context of central adiposity, a known risk factor for metabolic diseases [6,7]. The significant changes observed in both genders for this parameter, along with the differences between genders, underscore the importance of monitoring this indicator in young adults. This study demonstrated, during the first year of the MBBS course, both male and female students undergo unfavourable changes in nutrition and body weight composition, which significantly differ between sexes, with males showing more significant changes [10,11].

This study demonstrates that anthropometric parameters in first-year MBBS students at DBVP RMC undergo measurable variations between the first and second academic terms, with distinct patterns observed in male and female students. Significant gender-based differences exist for key anthropometric indicators like BMI, WHR, and RFM%. The regression analysis highlights evolving relationships between these parameters, particularly the strengthening association between age and weight in males during the first year.

These findings have implications for understanding the physiological changes occurring in students during their initial transition to medical education. Further research with longitudinal follow-up, larger sample sizes, and the inclusion of lifestyle factors (diet, physical activity, stress levels) could provide a more comprehensive understanding of the determinants of these anthropometric variations and their potential long-term health implications. Monitoring these parameters could be valuable for promoting health and well-being among medical students.

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