Original Research Article

A Cross-Sectional Study to Analyze the Association between Anthropometric Measurements and Academic Performance among I Year Indian Medical Students

Rose Babu, Sunithapriya A. K

Assistant Professor, Department of Physiology, Jubilee Mission Medical College, Eastfort, Thrissur, Kerala.

Corresponding Author: Rose Babu

ABSTRACT

Objective: Relationship between overweight and academic performance in children and adolescents has been studied though it is controversial. It is known that medical profession demands immense effort and students are more prone to develop stress that can affect their body weight and hence might affect their studies. Hence this study aims to evaluate the association between anthropometry and academic performance of I year medical students.

Materials and methods: Anthropometric measurements like height, weight, waist and hip circumference of 100 I year medical students were taken. They were subdivided based on their BMI as underweight, normal and overweight subgroups. Academic performance was assessed based on their marks obtained for physiology theory exam which was done during their course of study.

Results: There is a significant negative association between anthropometric measurements and academic performance (Pearson correlation, $p<0.05$). There was no significant association between anthropometry and academic performance when adjusted for gender (logistic regression). Female students performed better than males, showing a significant association between gender and academic performance when controlled for BMI (logistic regression, $p<0.001$).

Conclusion: Our present study found that there is no association between academic performance and anthropometric measurements. Female students performed better when compared to male students. Studies with larger sample size, adjusting for all confounding factors are recommended to confirm the finding.

Keywords: Academic performance, medical students, anthropometry, gender

INTRODUCTION

Medical profession demands immense effort by the students mentally and physically. The students in medical field, face lots of stress during their studies because of their voluminous course, less opportunity to relax, [1] highly intensive schedule, huge amount of theoretical knowledge to be learned, responsibilities, lack of social activities. These factors may affect their body weight and body composition and make them more prone to acquire metabolic diseases like diabetes, hypertension etc in future.

Studies done in children and adolescents have proved that in addition to co morbidities like musculoskeletal diseases, hypothyroidism, cardiovascular diseases etc, obesity affect their state of mental well being. [2] It has been shown that in adolescents, distortion of body image can cause depression. [3] Quite a few studies

have examined the relationship between overweight and academic performance among students. Poor school performance is one of the most challenging psychological co morbidities of obesity/overweight. [2] Though certain controversies exist, few studies have emphasized that, obesity in children or adolescents may be accompanied with poor performance in studies, [4] in contrast to others which has proved no association between the above factors. [5,6] Hjorth et al explored association between the body weight and cognitive performance of children and found that overweight or obese children have poor cognitive performance than those with normal body weight. [7]

To our knowledge, there are no literatures available regarding the association between overweight/obesity and academic performance among Indian medical students. The objective of the current study was to evaluate the association between anthropometry and academic performance of I year medical students. Exploring the relationship between these two factors would help us to find new strategies that can be practiced, which would help the students to improve in their academics and become a better health professional.

MATERIALS AND METHODS

This cross sectional study was performed in Jubilee mission medical college, Thrissur, India. 100 medical students from I year were recruited for the study after obtaining their written informed consent. Anthropometric measurements like height, weight, waist and hip circumference were taken. Academic performance was assessed based on their marks obtained for physiology theory exam which was done during their course of study. Based on the percentage of marks they obtained, they were divided into subgroups as poor, average and above average performers. Ethical clearance was obtained from the Institutional Ethical Review Committee.

Anthropometric measurements

Weight was measured using a digital weighing scale to the nearest of 0.1 kg with minimum clothing. Measurement of height was taken using a wall mounted stadiometer to the nearest 0.1 cm. Head was placed in Frankfurt horizontal plane with heels together and toes apart. Head, shoulder blades, buttocks and heels were in contact with back board. BMI was calculated with the formula weight in kg/ (height in m)^2. Waist circumference was measured at the narrowest portion between the lower margin of last rib palpable and the highest point of iliac crest. Hip circumference was measured at the widest portion of the buttocks. A stretch resistant tape that provides a constant 100g tension with close skin contact and without underlying skin compression, was used to measure waist and hip circumference. Based on their BMI, The subjects were grouped into underweight (<18.5kg/m^2), normal weight ($18.5 - 22.9$kg/m^2) and overweight category (>23kg/m^2).

Statistical Analysis

The data was analyzed using SPSS version 22.0. The normality of data was checked using Q-Q plot and it was distributed normally. Pearson correlation was done to demonstrate the association between anthropometry and academic performance. To analyze the effect of anthropometry (BMI) and gender on academic performance, Chi square analysis was performed. To analyze the independent effect of BMI and gender on academic performance, Nominal logistic regression analysis was performed. The p value ≤ 0.05 were considered as significant.

RESULTS

In the current study, among 100 participants, 33 were males and 67 were females. They were under the age group of 18-20 years. Table 1 shows the characteristics of the subjects. Physiology theory marks obtained (out of 50) is also shown.

Table 1: Subject characteristics

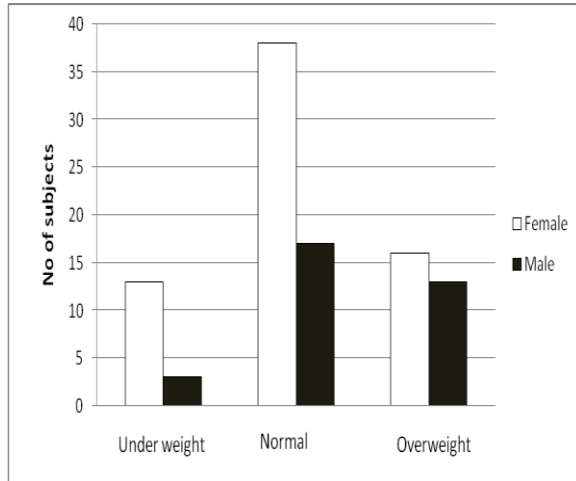| Parameter (n=100)	Mean ± SE
Height (cm)	164.39 ± 0.90
Weight(kg)	57.97 ± 1.1
BMI (kg/m^2)	21.37 ± 0.31
Waist (cm)	71.80 ± 0.82
Hip(cm)	93.81 ± 0.66
WHR	0.76 ± 0.01
Marks	30.49 ± 0.63
Marks %	60.98 ± 1.27

Data represented as Mean ± SE.

Figure 1: Distribution of students in under weight, normal weight and overweight groups

Figure 1 shows the distribution of female and male students in BMI subgroups. There were 16 subjects in underweight (13 females, 3 males), 55 (38 females, 17 males) in normal weight and 29 (16 females, 13 males) in overweight subgroups.

Table 2: Association between anthropometry and academic performance

	Weight	BMI	Waist	Hip
Marks	-0.248*	-0.203*	-0.224*	-0.209*

*Pearson correlation. Data represented as correlation coefficient. *p<0.05*

In table 2, the correlation between anthropometry and academic performance is shown. The anthropometric measurements like weight, hip and waist circumference including BMI was negatively associated with academic performance.

Table 3: Analysis of academic performance among different BMI subgroups

	Poor	Average	Above average	Total
Underweight	1	5	10	16
Normal weight	10	17	28	55
Overweight	10	9	10	29
Total	21	31	48	100

Chisquare analysis x^2 = 6.7, p = 0.14.

Table 3 shows that there is no significant difference in academic performance when comparing among various BMI subgroups.

Table 4: Comparison of academic performance among male and female students

	Poor	Average	Above average	Total
Female	10	16	41*	67
Male	11	15	7	33
Total	21	31	48	100

Chi-Square analysis x^2=15.485. p = <0.001

Table 4 shows the comparison of academic performance among gender. There is a significant difference in academic performance between male and female students (*p = <0.001*).

Table 5: Nominal regression analysis of academic performance for the I year medical students

Performance	BMI	β	SE	OR	95% CI	P value
Poor (<50%)	Underweight	1.987	1.169	0.137	0.014-1.36	0.089
	Normal	1.026	0.622	0.359	0.106-1.21	0.099
	Overweight	Reference	-	-	-	-
Average (>50%)	Underweight	0.289	0.761	0.749	0.168-3.33	0.704
	Normal weight	0.350	0.590	0.705	0.222-2.24	0.533
	Overweight	Reference	-	-	-	-

Nominal logistic regression analysis adjusted for gender.

Table 5 shows the effect of BMI on academic performance (independent effect) adjusted for confounding factor like gender. There is no significant effect for anthropometric measurements like BMI on academic performance.

Table 6: Nominal regression analysis of academic performance between gender in I year medical students

	Performance	β	SE	OR	95% CI	P value
Gender	Poor	1.819	0.623	0.162	0.048-0.550	0.001*
	Average	1.745	0.553	0.175	0.059-0.516	0.002*

*Nominal logistic regression analysis adjusted for BMI. *p<0.01.*

Table 6 shows the effect of gender on academic performance (independent effect) adjusted for confounding factor like BMI. The result shows that female students performed significantly higher than male students.

DISCUSSION

In our study, we explored the association between anthropometric measurements and academic performance among I year Indian medical students. We found that there is no significant association between anthropometric parameters like weight, BMI, waist and hip circumference and academic performance when controlled for gender (table 5).

A study done by Kim et al in South Korean adolescents has suggested that there is an association between overweight and poor academic performance. [8] Concerning cognitive tasks related to physiological memory and language, few studies have demonstrated that there is an inverse association between overweight and performance. [9] Gray et al showed that obesity has a negative impact on brain derived neurotropic factor, which is known to play a major role in maturation and development of neurons. [10] Deficiency of this factor is likely to cause memory deficits, attention deficits, impairment in learning etc. [11] Other possible mechanism regarding the above is that there is a positive correlation between BMI and depression. [12] This would have a negative impact on students' performance. Previous study conducted in North Korea has showed that the major cause of poor school performance is the psychological problems related to overweight. [13] However, in agreement to our findings, Louisa et al showed that there is no association between BMI and academic performance. [14] In our study, we have considered BMI for representing anthropometry since it is a well known fact that BMI is a surrogate marker of anthropometric measurements. Similar finding has also showed in Saudi Arabian females, where various confounding factors like age, ethnicity, psychosocial, socioeconomic factors were attributed to the above result. [15]

However, in the present study, we also found that, there is a significant correlation between academic performance and gender when controlled for anthropometric measurements (table 4, 6), demonstrating that the female students scored more compared to males. This depicts that the association which was noted in table 2, was due to the effect of gender rather than mere anthropometry of the subjects. There are minimal studies done based on gender differences in academic achievement in Indian medical students. Over the last many years the number of females getting into professional colleges has risen progressively especially in developing countries, and studies based on this have shown that gender is found to be one of the important factors affecting the academic performance. [16] A study conducted in Nigerian students demonstrated that female outperform males among low scorers, although the literacy rate is more among the boys than girls. [17] In contrast, Bahurudin and Luster (1998) found that gender is a predictor in mathematics achievement, and males bags higher than females students. [18] In another study, it is said that young women secured at comparable or higher levels in math as males, but for the high achieving females, their interest is the same or lower than males. [19]

Sinha et al suggested that when considering the higher achiever students the gender difference cannot be inculcated, though in overall performance females perform better than males. [20] In both subjective and objective modalities of achievement, gender difference is seen only among lowest and middle scorers. In our study, female outperform males among high scorers and the gender difference in performance is highly significant.

There are few limitations in our study. First, educational statuses of the parents of the students were not recorded; this factor might affect the student's

performance level. The data should be adjusted for many confounding factors like life style, diet, education system, and ethnicity that probably have some influence on the outcome. Therefore studies with larger sample size controlling other factors that can influence the performance are recommended to confirm the finding.

CONCLUSION

The present study found that there is no association between academic performance and anthropometric measurements. The association we found between academic performance and anthropometric measurements might be due to the gender factor. Female students performed better when compared to male students. Studies with larger sample size, adjusted for confounding factors that can influence the performance, are recommended to confirm the finding.

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