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Physical fitness and its association with anthropometric parameters in medical students

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ABSTRACT

Background: Although determined partly by genetics, physical fitness can be affected by a series of factors, such as sedentary behaviors, physical activity, and obesity. In general, medical students have considerable information about healthy lifestyle and dietary habits compared to other professional courses. Unfortunately, knowledge does not always translate into practice in terms of maintaining good health. **Aims and Objectives:** The study aims to assess the physical fitness and evaluate its association with body mass index (BMI) in medical students. **Materials and Methods:** This cross sectional was conducted in the Department of Physiology among the 1st-year students of Government Medical College, Srinagar, from December 2022 to February 2023. A total of 116 students in the age group of 18–22 years participated in the study. Descriptive data for age (years), gender height (m), and weight (Kg) were obtained and BMI was calculated. Physical fitness index (PFI) was measured using the modified Harvard step test. **Results:** The prevalence of overweight/obesity according to BMI was 41.3% (34.4% were overweight and 6.0% were obese). Among the participants, 81.7% of participants had a PFI of average to excellent while as 18.3% of participants had a PFI of low to poor. The study found a weak negative association (r-value = −0.07) between BMI and physical fitness, which was statistically not significant. **Conclusion:** The present study found a weak association between physical fitness and BMI which was statistically not significant. Although majority of students had good to excellent PFI, the prevalence of overweight and obesity was found to be quite high in them.

Key words: Physical fitness; Overweight; Obesity; Body mass index

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INTRODUCTION

Physical fitness can be defined as "the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy, to enjoy leisure time pursuits, and to meet unforeseen emergencies".[1] Physical activity and its maintenance have important public health implications as it has been found to be negatively associated with multiple conditions such as obesity,[2] diabetes,[3] coronary artery disease,[4] and depression.[5] Active healthy living benefits both individuals and society in multiple ways, such as by increasing productivity, improving morale, decreasing absenteeism, and reducing health-care costs. It also improves psychological well-being, physical capacity, self-esteem, and coping with stress.[6]

Although determined partly by genetics, physical fitness can be affected by a series of factors, such as sedentary behaviors, physical activity, and obesity.[7] The problem of obesity which is rapidly growing in both developed and developing countries, has led to decrease in the physical exercise capability and reduction in health-related fitness, particularly cardiorespiratory fitness and speed of movement.[8,9]

College life which forms a transitional period from adolescence to adulthood is a critical period for the

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development of healthy lifestyles and the formation of healthy behaviors.[10] In general, medical students have considerable information about healthy lifestyle and dietary habits compared to other professional courses. Unfortunately, knowledge does not always translates into practice in terms of maintaining good health.[11] As a result in recent years, there has not only been significant decline in physical activity among students[12] but the prevalence of obesity has also increased putting them at risk for various chronic diseases.[13-15] Although studies have investigated the relationship between anthropometric parameters such as body mass index (BMI) and physical fitness, few studies examined it in medical college student population. Thus, the present study aims to assess the physical fitness and evaluate its association with anthropometric parameters in medical students.

Aims and objectives

The study aims to assess the physical fitness and evaluate its association with BMI in medical students.

MATERIALS AND METHODS

This cross sectional was conducted in the Department of Physiology among the 1st-year students of Government Medical College, Srinagar from December 2022 to February 2023. A total of 116 students in the age group of 18–22 years participated in the study. Permission for conducting the study was taken from Institutional Review Board. The students were informed about the objectives of the study and consent was obtained from them.

Inclusion criteria

All 1st-year medical students willing to participate were included in the study.

Exclusion criteria

Students having history of any cardiac disorders, those taking any cardio active drug, or attending a recent weight loss program were excluded from the study. Three students who were former athletes were also excluded from the study.

A detailed history was taken from each and physical examination was performed. The findings were recorded in the pro forma along with other particulars such as age, gender, and residence. The participants were examined for various anthropometric parameters such as height and weight.

Weight was measured using digital scale to the nearest 0.1 kg with only light clothing, and for height, subjects were made to take off their shoes, stand upright with their head in the Frankfort plane with the heel, buttock, and occiput against the wall. Height was recorded to the nearest 0.5 cm. BMI was calculated as weight (in kgs) divided by the square of height (in m). Body surface area (BSA) was calculated by Mosteller Method: BSA (m^2) = (height (cm) × weight (kg)/3600)^{½}.

Modified Harvard Step Test (in which the height of the step is lower) was employed to asses physical fitness for ease of performance from an Indian context.[16] It tests the cardiovascular system and reflects the general capacity of body to cope with increased physical work load and ability to recover from it. Resting pulse rate was recorded first by counting the radial artery pulse for 1 min in sitting position after 5 min of rest. Participant was asked to step at a rate of 30 steps/min for 5 min or until exhaustion. Total duration of the exercise was measured as the time in seconds up to which each subject was able to perform the test. At 1 (PR1), 3 (PR2), and 5 (PR3) min after exercise, pulse rate was recorded. Physical fitness index (PFI) was calculated using the formula:

$$\text{PFI} = \frac{\text{Total duration of exercise in seconds}}{2\,(\text{PR1} + \text{PR2} + \text{PR3})} \times 100$$

Statistical analysis

Data were collected and grouped using MS excel. Statistical analysis was performed using a statistical software program SPSS. Descriptive data represented by the percentage. Continuous variables were expressed as mean and standard deviation (mean, SD). Association between variables was seen using Chi-square test and correlation was found using pearson's coefficient. Level of significance was set at $P<0.05$.

RESULTS

The present study was performed among 116 first-year medical students out of which 56.8% students were males and 43.1% students were females. The prevalence of overweight/obesity according to BMI was 41.3% (34.4% were overweight and 6.0% were obese). None of the candidates fell in the underweight category; hence, it was not included. The basic characteristics of participants are listed in Table 1.

The mean age of the participants was 19.24 years and mean BMI was 24.26 kg/m^2.

Mean PFI was 70.02. All the mean values were slightly higher in males. No significant gender differences were found (Table 2). Table 3 shows the association between categories of BMI and PFI. No significant difference was found between PFI of normal and overweight/obese participants.

Table 1: Basic characteristics of the participants.

S. No.	Variable	Sub-group	Number of participants
1	Age	18–20	106 (91.3%)
		20 and above	10 (8.6%)
2	Gender	Male	66 (56.8%)
		Female	50 (43.1%)
3	BMI	Normal	68 (58.6%)
		Overweight/obese	48 (41.3%)

Table 2: Mean values and standard deviation of variables

S. No.	Variable	Male	Female	Mean±SD
1	Age (years)	19.18±0.90	19.30±0.86	19.24±1.46
2	Weight (kg)	61.37±9.89	58.66±9.07	60.39±9.74
3	Height (cms)	1.60±0.04	1.55±0.05	1.57±0.087
4	BMI (kg/m^2)	23.5±4.09	21.66±3.12	22.26±3.69
5	BSA (m^2)	1.52±0.12	1.48±0.17	1.523±0.15
6	PFI	71.75±15.49	69.80±19.16	70.02±31.27

BMI: Body mass index, SD: Standard deviation, PFI: Physical fitness index, BSA: Body surface area

Table 3: Physical fitness tests and various categories of BMI

PFI	BMI (mean±SD)		P-value
	Normal	Overweight/obese	
	71.89±26.57	68.16±32.19	0.391

Independent t-test; P<0.05 was considered as statistically significant. BMI: Body mass index, BSA: Body surface area

Out of the students who participated in the study, 81.7% had a PFI of average to excellent while as 18.3% had a PFI of low to poor (Table 4).

Table 5 shows the association between PFI using Modified Harvard's step test and anthropometric parameters (weight, height, BMI, and BSA). Pearson's corelation showed a weak negative association (r-value=−0.07) between BMI and physical fitness, which was statistically not significant.

DISCUSSION

Physical fitness and obesity are important issues from the perspective of public health.[17] As BMI is the main determinant of obesity, it is assumed that overweight and obese individuals tend to have lower fitness levels compared to normal weight individuals. However, the present study found a weak negative association (r-value=−0.07) between BMI and physical fitness, which was statistically not significant. Our study is in concordance with a study conducted in Gujarat (using a similar test) on medical students, who were a weak

Table 4: Classification of physical fitness according to Harvard index

S. No.	Fitness index rating	Male	Female	Number of participants
1	Excellent (>96)	18	15	33 (28.4%)
2	Good (83–96)	26	19	45 (38.7%)
3	Average (68–82)	13	4	17 (14.6%)
4	Low average (54–67)	7	11	18 (15.5%)
5	Poor (<54)	2	1	3 (2.5%)

Table 5: Association between PPI and anthropometric parameters

S. No.	Variable	PPI	
		R	P
1	Weight	−0.045	0.63
2	Height	0.019	0.842
3	BMI	−0.07	0.453
4	BSA	−0.029	0.759

P<0.05 was considered as statistically significant. BMI: Body mass index, BSA: Body surface area, PPI: Pulse pressure index

that positive correlation (r-value=0.06) between BMI and cardiorespiratory endurance was found which was statistically not significant.[18] Some other studies have also shown that fitness capacity decreases progressively as the BMI increases.[19,20]

Most of the participants (81.7%) had PFI of average to excellent while as 18.3% participants had a PFI of low to poor. The lower mean values of PFI in the female students compared with male students can thus be attributable to their lower body weight and height. These findings are comparable to the findings of a study conducted in another medical college in the same region.[21] In the present study, the prevalence of overweight and obesity was 41.3% (34.4% were overweight and 6.0% were obese) with a slightly higher prevalence in males. There are numerous studies showing an increase in the prevalence of obesity among medical students.[14,15] Studies conducted in south India also demonstrated similar prevalence of obesity with slightly higher male prevalence.[22] This can be explained by the fact that males were more susceptible to unhealthy lifestyles, such as overeating and drinking while females pay more attention to their body size and image, with a desire to be slim they participate more in weight maintaining activities.[23]

The results of the present study suggest that there is the need to identify and monitor cardiovascular risk factors like obesity among the young students. Medical students face a lot of psychological distress, especially during freshmen year of training and this continual stress has been associated with various mental and physical problems including stress-related eating which makes these students

more prone to obesity/overweight, sedentary lifestyle, and decreased physical activity which have been demonstrated by various studies.[24-28] It is extremely important to introduce early changes in style of living with proper interventions to better the health-related variables (exercise, eating, stress, etc.). Screening of college students should be done at entry level and they should be encouraged to participate in fitness programs (sports, regular exercise, and yoga) in addition to discouraging fast food consumption and smart phone addiction. This will not only help in decreasing the health problems associated with reduced physical activity but will also reduce the gap between knowledge and practice.[28] Adoption of a healthy lifestyle by a medical students will facilitate the formation of healthy physicians who most likely would give effective preventive counseling to their patients.[29]

Limitations of the study

The limitations were the cross-sectional nature of the study design and the small sample size. The level of physical activity was also not assessed in the study.

CONCLUSION

The present study found a weak association between physical fitness and BMI which was statistically not significant. Although majority of students had good to excellent PFI, the prevalence of overweight and obesity was found to be quite high in them. These findings further stress the importance of putting knowledge into practice by adopting an overall healthy lifestyle to combat this huge problem of obesity which will otherwise assume epidemic proportions.

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