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Physical activity and its relation with body composition among undergraduate medical students in Delhi: a cross sectional study

Geeta Yadav^{1*}, Suman Bodat², Ishaan Siwach¹, Karan Sachdeva¹, Nitesh Chauhan³

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*Correspondence: Dr. Geeta Yadav,

E-mail: yadavgeeta07@gmail.com

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ABSTRACT

Background: Physical inactivity and overweight are leading risk factors for global mortality, responsible for 6% and 5% of deaths worldwide due to chronic non communicable diseases. It is well established that regular moderate or vigorous-intensity exercise lowers the risks and symptoms associated with the co-morbidities of obesity. The stress involved in meeting responsibilities of becoming a physician may adversely affect the exercise habits of students. So, the current study aimed to study physical activity and its relation with body composition among under-graduate medical students.

Methods: It was a cross-sectional study among 282 medical students. International Physical Activity Questionnaire (IPAQ) Short form was used to measure total physical activity (PA) and body composition parameters including Waist circumference, WHR, BMI, Body Fat% were assessed and analyzed using SPSS version 21.

Results: Out of 282 medical students 33%, 45.3%, &21.3% were involved in low, moderate and high physical activity. ANOVAs between different levels of physical activities according to IPAQ categories showed significant difference for Waist Hip Ratio (F:3.8; p=0.02) and Body Fat percentage (F=5.7; p=0.00). There was an inverse and statistically significant correlation between physical activity and Waist circumference, Body Fat% and Waist –Hip Ratio.

Conclusions: Medical Students involved in higher level of physical activity have significantly lower body Fat% level and WHR as compared to those belonging to lower and moderate activity group thus there is a need to actively promote physical activity among medical students.

Keywords: Body fat%, IPAQ, Medical students, Physical activity, Waist hip ratio

INTRODUCTION

Physical inactivity, overweight and obesity are leading global risks for mortality in the world along with high blood pressure, tobacco use and high blood glucose. These risk factors are responsible for increasing the risk of chronic diseases, such as heart disease, diabetes and various cancers.¹

Physical activity has been defined by WHO as "any bodily movement produced by skeletal muscles that require energy expenditure-including activities undertaken while working, playing, carrying out household chores, travelling, and engaging in recreational pursuits." It is important to not to confuse "physical activity" with "exercise". Exercise is "a subcategory of physical activity that is planned, structured, repetitive,

¹Department of Community Medicine, VMMC and SJH, New Delhi, India

²Department of Community Medicine, GMC Pali, Rajasthan, India

³Department of Community Medicine, K.D Medical College, Hospital and Research Centre, Mathura, Uttar Pradesh India

and aims to improve or maintain one or more components of physical fitness". A person can also benefit from physical activity that is done during leisure time, during transport, or during work.¹

As per WHO one in four adults and more than 80% of the adolescent population globally are not physically active as desired. There is 20-30% higher risk of mortality among people who are not active sufficiently as compared to those who are sufficiently active. Physical inactivity is estimated to cause around 21-25% of breast and colon cancer burden, 27% of diabetes and about 30% of ischemic heart disease burden.²

In SEAR countries, the prevalence of insufficient physical activity varied from 3% to 41% among males and from 6.6% to 64% among females. 5.1% of deaths are the attributable to physical inactivity.³

Overweight and obesity is a state when there is an abnormal or excessive fat accumulation in the body which poses a risk to an individual health. Around 2.8 million people are dying each year because of being overweight and obese. Obesity was once more prevalent among high-income countries but now a prevalent problem in low- and middle-income countries.¹

Unhealthy habits picked up at early stage of college life generally persist in adult life. During college students usually not able to adopt healthy practices due to studies, lack of time and other commitments.⁴ The first year of higher education is a crucial stage for increased risk of obesity and reduced level of physical activity among young adults since this transitional period brings about significant changes in eating habits and reduces the amount of time available for sports and leisure activities.⁵

Stress of studies, rigorous training, pressure of constant examinations, stay away from home and lack of access, time and will to engage in physical activity makes the medical students becoming overweight and obese. The objectives of the current study were to assess the level of Physical activity, BMI, Body fat percentage and Waist hip ratio and to find out relation between physical activity and Body Mass Index, Body fat percentage and Waist hip ratio among undergraduate medical students.

METHODS

A Cross sectional study was conducted among undergraduate medical students of Vardhman Mahavir Medical College & Safdarjung Hospital in New Delhi in the month of July 2018. All the undergraduates from all the semesters were approached for participation in the study and those who consented to be part of the study after explaining the purpose of the study were included in the study. The sample size was calculated using the formula 4PQ/I2, where p was taken 36 based on a study conducted by N Rustagi et al, q was 64, l (absolute error) was 7%=188 non responded error 10% à 188+19=207.6

Information regarding socio-demographic profile and associated factors like dietary habits, level of physical activity, sleeping habits, stress, junk food consumption was collected in a semi-structured, self-administered questionnaire and anthropometric measurements were also done as per standard techniques.

The data for assessing physical activity was recorded using short form International Physical Activity Questionnaire (IPAQ).⁷ It has seven open-ended questions surrounding individuals' last 7-day recall of physical activity. The following values were used for the analysis of IPAO data: walking =3.3 METs, Moderate PA=4.0 METs and Vigorous PA=8.0 METs total physical activity was calculated as MET-minutes/week by taking sum of walking, moderate and vigorous MET minutes/ week scores. A person was categorised as having moderate activity if he/she was involved in 3 or more days of vigorous-intensity activity of at least 20 minutes per day OR 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day OR 5 or more days of any combination of walking, moderateintensity or vigorous intensity activities achieving a minimum Total physical activity of at least 600 METminutes/week.

High physical activity category was taken as vigorous-intensity activity on at least 3 days achieving a minimum Total physical activity of at least 1500 MET-minutes/week OR 7 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum total physical activity of at least 3000 MET-minutes/week and those individuals who not meet criteria for high and moderated categories were considered to have a 'low' physical activity level.

Anthropometric measurements

Height, waist and hip circumference measured using non stretchable measuring tape and weight was measured using weighing machine. Body mass index was defined as a person's weight in kilograms divided by the square of his height in meters (kg/m²). BMI and Waist circumference were classified according to WHO Asia Pacific guidelines.⁸ Waist circumference was measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a stretch resistant tape.

Hip circumference was measured around the widest portion of the buttocks, with the tape parallel to the floor. For both measurements, the subject should stand with feet close together, arms at the side and body weight evenly distributed, and should wear little clothing. The subject should be relaxed, and the measurements should be taken at the end of a normal expiration. Each measurement was repeated twice. Waist Hip Ratio was classified according to WHO Guidelines. Body Fat was measured using Composition Monitor Model HBF-375 Karada Scan. Karada scan measures body resistance by using weak

current, flowing through both hands and feet. Bio-electric Impedance (BI)/ Biological resistance method is used. The body fat percentage was classified based on values proposed by Lohman(1986) and Nagamine(1972).

For males $\geq 25\%$, between 20%-24.99 %, 10-19.99 % and <10% was considered as very high, high, normal and low respectively while for females $\geq 35\%$, between 30-34.99%, 20-29.99% and <20% was considered as very high, high, normal and low respectively. The data was entered in Microsoft excel sheet and analysis was done using a licensed version of SPSS. ²¹ Descriptive analysis was done by calculating means and standard deviation. Differences in the anthropometric and body composition parameters between the three groups were tested through ANOVA. Tukeys post hoc test was used to identify specific differences between groups. Pearson correlation coefficients were computed for physical activity and anthropometric indices. A p value of 0.05 was taken to be statistically significant.

Ethical permission was obtained from the Institutional Ethics Committee, VMMC and SJH, New Delhi. Written voluntary informed consent was taken from all the participants after explaining the purpose of the study.

RESULTS

A total of 282 medical students were studied in the present study.

Table 1: General characteristics of the study population (n=282).

Variable	Number (%)		
Age (years)			
17-20	109 (48.7)		
21-24	173 (61.3)		
Mean age: 20.88±1.29	years		
Sex			
Male	177 (62.8)		
Female	105 (37.2)		
Family type			
Joint	51 (18.1)		
Nuclear	231 (81.9)		
Place of stay			
Day scholars	50 (17.7)		
Hostellers	232 (81.9)		
Diet			
Vegetarian	133 (47.2)		
Non vegetarian	149 (52.8)		
Median fruit intake/week	11times/week		

The mean age was 20.88±1.29 years and 173 (61.3%) students belonged to 21-24 years age group and there were more male students 177 (62.8%) as compared to females students 105 (37.2%) (Table 1).

Majority of the students were Hindus 256 (90.8%), belonged to nuclear family 213 (75.5%) and were hostellers 232 (81.9%). More students were non-vegetarians i.e 149 (52%), 87 (30.9%) students reported consuming less than 5 fruits per week with median fruit consumption per week was 11 times per week.

Prevalence of overweight and obesity(on the basis of BMI) was 55% among males as compared to 37% among females and mean BMI of males was also higher than females (23.7 (3.7) vs. 22.3 (2.9)) but females had higher Waist circumference as compared to males (37.2 vs. 17.5). Although more than half of the male students had high/higher body fat% as compared to females but mean body fat % was higher among females (28.5±5.0 vs 23.19±5.1) (Table 2).

Table 2: Gender wise anthropometric profile of the study participants (n=282).

	361 (455)	T 1 (405)				
Variables	Males (177)					
v ariables	N (%)	N (%)				
BMI (kg/m ²)						
Underweight (<18.5)	9 (5.1%)	6 (5.7)				
Normal (18.5-22.9)	70 (39.8)	60 (57.1)				
Overweight (23- 24.9)	38 (21.6)	19 (18.0)				
Obese (≥25)	59 (33.5)	20 (19.0)				
Waist circumference*						
Normal	127 (71.7)	66 (62.9)				
Increased	50 (28.3)	39 (37.1)				
Mean±SD	85.7±9.3	77.8±7.6				
Waist hip ratio**						
Normal	100 (56.5)	80(76.2)				
High	77 (43.5)	25(23.8)				
Mean±SD	0.89 ± 0.053	0.80 ± 0.058				
Body fat***						
Normal	59 (33.3)	60(57.2)				
High	51(28.8)	35(33.3)				
Very High	64 (36.1)	10(9.5)				
Mean±SD	23.19±5.1	28.5±5.0				

*Waist circumference of >90 cm for males and >80cm for females taken as increased; **WHR of >0.90cm for Males &>0.85cm for females taken as increased; ***Body fat for males, between 20%-24.99% as high and \geq 25% as very high; For females between 30-34.99% as high and \geq 35% as very high

214 (76%) students reported to be physically active but only 106 (38%) were involved in 150 minutes/week physical activity as per WHO recommendations.

Using short form IPAQ it was found that 128(45.3%) and 93 (33%) students were involved in moderate and low activity while only 61 (21.3%) were involved in high activity. There was no gender-wise difference in level of physical activity (Figure 1).

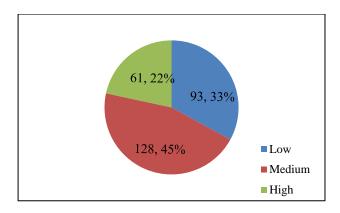


Figure 1: Distribution of study participants as per IPAQ physical activity categories (n=282).

ANOVAs between different levels of physical activities according to IPAQ categories showed significant difference for Waist Hip Ratio (F: 3.8; p=0.02) and Body Fat percentage (F=5.7; p=0.00). Tukey post-hoc test showed significant difference in WHR between low and high physical activity group (p=0.04).

Body fat% level was significantly lower among participants in high physical activity group as compared to those belonging to low and moderate activity group (p=0.00 and 0.01 respectively) (Table 3).

Table 3: Anthropometric profile of study participants according to level of physical activity (n=282).

Anthro- pometric profile	Low category Mean±SD	Moderate category Mean±SD	High category Mean±SD	p value
Height (cm)	1.69 ± 0.07	1.68 ± 0.07	1.69 ± 0.07	0.17
Weight (kg)	68.1±12.6	65.1±10.7	67.6±11.5	0.06
BMI(kg/m ²)	23.5±3.4	22.9±3.1	23.4±3.0	0.30
Waist (cm)	84.3±9.3	82.2±9.3	81.7±9.5	0.15
WHR	0.87±0.05	0.85 ± 0.06	0.84±0.09	$0.02^{\text{£}}$
Fat (%)	25.9 ± 5.4	25.6±6.1	23.0 ± 4.7	$0.00^{\text{£f}}$

Note: £ Tukey posthoc test significant for low category compared with moderate and high; ££: Tukey posthoc test significant for low compared with moderate and high

Table 4: Pearson correlations of physical activity and body composition.

Total METS hours /week	BMI	Waist	Body fat %	WHR
Pearson correlation	-0.02	-0.13	-0.16	-0.17
P value	0.69	0.026*	0.004*	0.004*

^{*}Significant correlation

There was a weak negative correlation between physical activity and Waist circumference, Body Fat% and Waist Hip Ratio. The correlation between physical activity and Waist circumference, body fat% and waist hip ratio although weak but was statistically significant (r= - 0.13,

p=0.02; r=0.16, p=0.00 and r=0.17, p=0.00). The correlation between physical activity and BMI was not found to be statistically significant. (r=-0.02, p=0.69) (Table 4).

DISCUSSION

Physical inactivity is a known preventable risk factor for non-communicable diseases like hypertension, diabetes mellitus etc. Regular physical activity leads to increased physical fitness, improved ability to cope with stress, and higher self-esteem.² Current study was carried out with the objective to assess the levels of physical activity among medical students and its relation with body composition parameters. The prevalence of self-reported physical activity was 76% but only 38% reported to be involved in 150 minutes/week physical activity as per WHO recommendations.

Using short form IPAQ having seven open-ended questions surrounding individuals' last 7-day recall of physical activity it was found that 45.3% were involved in moderate activity, 33% were involved in low activity while only 21.3% were involved in high activity which is similar to that reported by few other studies. Around 66.6% medical students were engaged in moderate/ high level of physical activity which is similar to that of 61% reported by Frank et al in their study in US medical students although the questionnaires were different. 12

Padampriya et al using long version of IPAQ found higher percentage of medical students engaged in high physical activity as compared to our study while few other studies have reported higher percentage of students engaged in low category as compared to our study. 13-15 Khera et al found more students (58.2%) in high physical activity group, 27.9% in moderate group and 13.8% in low activity group. The difference could be because they used GPAQ scale while we used IPAQ scale and also their study included only hostlers and also their participants included medical, nursing, engineering and general college students while ours included only medical students.¹³ Lower physical activity among during late adolescents or young adults when people are usually active can lead to development of sedentary behavior in middle age and can lead to non-communicable diseases like CHD, hypertension, diabetes mellitus etc. as has already been documented.

We found that body fat% level and WHR was significantly lower among participants in high physical activity group as compared to those belonging to lower and moderate activity group. Zanovec et al also found lower body Fat% among more active group but they did not take WHR in consideration. Various other studies using self-reported physical activity have reported lower Fat % among groups involved in higher physical activity. As our study was a cross sectional study using self-reported physical activity we cannot infer that lower physical activity led to higher body% or waist hip

ratio as for that prospective study using objective measurement of physical activity among the participants is needed.

A weak but statistically significant negative correlation was observed between physical activity and body fat%, Waist circumference, and waist hip ratio. As the physical activity increased the waist circumference, body fat% and Waist hip ratio decreased. Previous other studies have also reported significant and strong inverse relationship.^{17,20,21} We did not observe any significant correlation between physical activity and BMI. Goel et al, Preto et al also didn't found any association between physical activity and BMI in their study.^{22,23}

Limitation

The cross-sectional nature and using only questionnaire to assess physical activity was a limitation in our study

CONCLUSION

We conclude that individuals involved in higher level of physical activity have significantly lower body fat% level and WHR as compared to those belonging to lower and moderate activity group and there is a significant inverse relationship between physical activity and body fat% and Waist hip ratio. A prospective study using objective measurement of physical activity should be carried out to study cause and effect relationship between physical activity and body composition parameters for adiposity.

Recommendations

It is recommended that medical students should be involved in regular moderate to vigorous activity as per WHO recommendations to decrease their future risk of developing non communicable diseases.

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