Appraisal of 'Physical Activity' Patterns among Medical Students: A Cross- Sectional Study Using International Physical Activity Questionnaire -Short Form (IPAQ-SF) in Lucknow, India

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### Abstract:

Introduction: The health benefits of physical activity are well established. In India, it is estimated that overall, 39.2 crore individuals are physically inactive. The trends of physical inactivity among Indian adolescent and youth populations are also alarming which implies that a huge population is at risk for developing NCDs. **Objective:** To assess physical activity levels among MBBS students. **Method:** The study was conducted at a medical institute in Uttar Pradesh. Sample size of 342 was drawn using stratified random sampling. The data collection was done based on "IPAQ- short form" using self-administered questionnaire. Data analysis was done as prescribed by the IPAO-SF tool kit. Results: A total of 342 MBBS students participated in the study. Mean age of the participants was 20.86 years (Range 18-26 years). A total of 117(34.2%) medical students were found to be "insufficiently active" (Category-1),134 students (39.2%) were just minimally active (Category -2) and rest 91(26.6%) students were HEPA (Health Enhancing Physical Activity) active (Category-3). Median MET- minutes/week and Inter Quartile Range (IQR) for vigorous physical activity was 0(0-640), for moderate activity it was 60(0-320) and for walking it was 462(297-924). Overall total physical activity MET-minutes/week and IQR was 942(401-2066). The median and (IQR) values for sitting were 10(8-12) hours/day. **Conclusion:** The study reveals that a noteworthy proportion of the participants do not meet the recommended levels of physical activity, indicating a pressing public health concern. Findings necessitate the importance of behaviour change activities to promote physical activity in the study population.

Key Words: IPAQ-SF, MBBS Students, Physical Activity Levels

#### Introduction

The health benefits of physical activity are well established and include a lower risk of diseases like cardiovascular disease, hypertension, type-2 diabetes, and even some cancers. Regular engagement in physical activity brings positive effects on mental health, postpones the onset of dementia, and can help in the maintenance of a healthy weight.<sup>[1-5]</sup> In recognition of this strong association between physical activity and major noncommunicable diseases(NCDs), World Health Organization (WHO) aims to bring a 10% relative reduction in the prevalence of insufficient physical activity by 2025, as one of the nine global targets to improve the prevention and treatment of NCDs.<sup>[6]</sup>

Quick Response Code	Access this article online	How to cite this article :
	Website : www.healthlinejournal.org DOI : 10.51957/Healthline_ 527_2023	Dixit S, Ansari A, Singh M, Kariwala P, Singh A, Pathak A, Kandpal S. Appraisal of 'Physical Activity' Patterns among Medical Students: A Cross- Sectional Study Using International Physical Activity Questionnaire - Short Form (IPAQ-SF) in Lucknow, India. Healthline. 2023; 14 (2): 123-130

The health benefits of a physically active lifestyle during adolescence and early adulthood are also well documented. It includes improved cardiorespiratory and muscular fitness, bone and cardiometabolic health, along with positive effects on weight status.<sup>[7]</sup> Current evidence indicates that many of those health benefits carry forward in adulthood also.<sup>[4,7]</sup> There is significant amount of evidence suggesting a positive impact of physical activity on cognitive development too.<sup>[8]</sup> Approximately 39.2 crore individuals are physically inactive in India. This is a staggering figure and implies a huge population which is at higher risk for developing diabetes and other noncommunicable diseases.<sup>[9]</sup> This underscores the urgent need to improve overall physical activity levels and specific focus to increase recreational physical activity. This could go a long way in curtailing the risk of diabetes and other NCDs in India.

The trends of physical inactivity among Indian adolescents are also alarming as more than 76% of adolescents were found to be insufficiently physically active.<sup>[10]</sup>There is a dearth of information regarding the levels of physical activity among medical students in the state of Uttar Pradesh, as the literature search yielded limited studies on this specific topic. Considering the immense benefits of Physical Activity in decreasing the risk of non-communicable diseases, the present study is an attempt to understand the levels of physical activity among medical undergraduates in a tertiary health care institute of Uttar Pradesh using IPAQ-SF.

# Method:

This observational study was planned and conducted at a medical institute in Uttar Pradesh, India from April 2022 to October 2022. The sample size for the study was calculated using the formula for single proportion with finite population N=  $[DEFF*Np(1-p)]/ [(d/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]]^{[11]}$  Taking hypothesized overall prevalence of insufficient physical activity as 76.6% <sup>[10]</sup>, absolute error of 5%, design effect of 1.5, a finite population of

750 in four batches of MBBS students in the college, value of Z statistic for the level of significance 0.05 as 1.96 and assuming a 10 percent non-response rate, sample size was calculated to be 334. The design effect of 1.5 was assumed considering equal within-stratum variance. Stratified random sampling was utilized to cater the requisite sample size.

Study Design and Procedure: Students from different phase of medical training (first year to final year) were considered as separate strata for inclusion. Out of the four batches two batches (strata) were chosen randomly. Students from first year and final professional part-1got randomly selected for inclusion in the study. In the second stage the students in both the batches constituted the sampling frame and a number was assigned to all of them. 334 students were selected randomly from the sampling frame using random number generated using Microsoft excel software. Informed consent was sorted from the participants. The research team provided comprehensive information to the participants regarding the research study. The students who agreed to participate in the study were screened for any apparentlocomotor disability limiting physical activity or they were asked for any acute illness like fever, gastroenteritis etc or any injury, thus limiting theirphysical activityin last seven days. Based on exclusion criteria, a total of 5 such students were excluded from participation in the research study.

The data collection was done on "IPAQ – Short form" which serves as a common instrument that can be used to obtain internationally comparable data on health-related physical activity using selfadministered online Google form.<sup>[12]</sup> Link was sent to the selected students and they were asked to respond in next 48 hours. All the participants were asked to fill the forms honestly by choosing the best option describing their levels of physical activity against each of the seven questions in the IPAQ-SF proforma. If no response was received within next two days, the link was shared to remaining number of students, again chosen by random selection. A total of 353 forms were received, as few students who did not respond initially, filled the form after a gap of few days. Excluding the partially filled eleven forms, a total of 342 responses were included in the final analysis.

# Study Instruments:

**International Physical Activity Questionnaires - Short form (IPAQ-SF):** The International Physical Activity Questionnaires -Short form (IPAQ-SF) comprises a set of 7 questions.<sup>[12]</sup>This questionnaire has questions about walking, moderate-intensity activities, and vigorous intensity activities done in last one week. The frequency (measured in days per week) and duration (time per day) of physical activities were collected separately for each specific type of activity. Computation of the total score requires summation of the duration (in minutes) andfrequency (days) of walking, moderateintensity, and vigorous-intensity activity.<sup>[12]</sup>

Another measure of volume of physical activity was computed by weighting each type of activity by its energy requirements defined in METs (Metabolic equivalent of tasks) to yield a score in MET minutes. One metabolic equivalent (MET) is defined as the amount of oxygen consumed while sitting at rest and is equal to 3.5 ml O<sub>2</sub> per kg body weight per minute.<sup>[13]</sup> The MET concept represents a simple and practical method for expressing the energy cost of physical activities as a multiple of the resting metabolic rate. MET minutes were calculated using formulas as follows, Walking MET-minutes/week = 3.3 × walking minutes × walking days, Moderate METminutes/week =  $4.0 \times$  moderate-intensity activity minutes × moderate days, Vigorous METminutes/week =  $8.0 \times$  vigorous-intensity activity minutes × vigorous-intensity days. A combined total physical activity MET-min/week were calculated as the sum of Walking + Moderate + Vigorous METmin/week scores.<sup>[12]</sup> Total activities days were calculated by summing up the days spent in all different categories of physical activity separately.

Overall, three levels of physical activity were categorized as" Inactive, Minimally Active and HEPA active (Health Enhancing Physical Activity)". Inactive (Category-1) is the lowest level of physical activity. Those individuals who didnot meet criteria for Categories 2 or 3 (described ahead) were considered insufficiently active. Minimally Active (Category-2) was classified as just sufficiently active having any one of the following 3 criteria: a) 3 or more days of vigorous activity of at least 20 minutes per day OR b) 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day OR c) 5 or more days of any combination of walking, moderateintensity or vigorous intensity activities achieving a minimum of at least 600 MET-min/week. Individuals meeting at least one of the above criteria were defined as achieving the minimum recommended levels to be considered minimally active.

A separate category was labelled "HEPA" level,which is a more active category (Category-3).The two criteria used to classify a person as HEPA active were: a) vigorous-intensity activity on at least 3 days achieving a minimum of at least 1500 METminutes/week OR b) 7 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 3000 MET-minutes/week.

**Data Analysis:** Data cleaning and other data processing guidelines were followed as prescribed by IPAQ-SF toolkit, like first excluding outlier data, then secondly, recoding high values to four hours, and finally describing minimum amounts of activity to be included in analyses. Following these rules ensured that highly active people remained highly active, while decreasing the chances that fewer active individuals may be coded as highly active.<sup>[12]</sup>

Data entry was done in Microsoft office Excel version 2010, followed by data analysis using SPSS and plots were drawn using "R" statistical software. Data collected with IPAQ was reported both as a categorical and continuous measure and reported as median MET minutes as physical activity pattern follows non-normal distribution of energy expenditure. To test significance Chi square test and't'test were used. A "p" value was considered significant at <.05 level.

**Ethical Aspects:** Ethical approval was taken before commencing the research study. The research proposal was approved by institutional IEC committee.

### **Results:**

A total of 342 MBBS students participated in the study, comprising of 197 male and 145 female students. The mean age of the participants was 20.86±1.71 years. A total of 117(34.2%) students were found to be "insufficiently active" (Category-1), 134 students (39.2%) were just minimally active (Category -2) and rest 91(26.6%) of students were HEPA active (Category-3). The median MET-minutes/week and IQR for total physical activity for

Variables	Total (N=342)	Low active (n= 117)	Sufficiently active (n=225)	p value
	n (%)	n (%)	n (%)	
		[%]	[%]	
Age (in years)				
15-19	73(21.2)	36	37	$0.002^{*}$
		(49.3)	(50.7)	
		[30.8]	[16.4]	
20-29	269(78.8)	81	188	
		(30.1)	(69.9)	
		[69.2]	[83.6]	
Gender		•	· ·	
Males	197(57.6)	64	133	0.43*
		(32.5)	(67.5)	
		[54.7]	[59.1]	
Females	145(42.4)	53	92	
		(36.6)	(63.4)	
		[45.3]	[40.9]	
$BMI (kg/m^2)$		·	· · · ·	
<23.0	210[61.4]	77	133	0.23*
		(36.7)	(63.3)	
		[65.8]	[59.1]	
≥23.0	132[38.6]	40	92	
		(30.3)	(69.7)	
		[34.2]	[40.9]	
Professional Year				
First professional	166(48.5)	76	90	0.001*
-		(45.8)	(54.2)	
		[65.0]	[40.0]	
<b>Final professional part I</b>	176(51.5)	41	135	
		(23.3)	(76.7)	
		[35.0]	[60.0]	
		1 2 3	L 2	

Table1 : General Characteristics of Study Population according to Physical Activity (N=342)

( ) row percentage [ ] column percentage, # chi-square test

male students was 1188 (450-2506) and for female students it was 773(396-1476) (Figure1). Association is observed between age of the participants, and their year of professional education in MBBS with their physical activity levels. Gender and BMI values were not associated significantly with the physical activity levels in the study population. (Table 1)

The median MET- minutes/week and Inter Quartile Range (IQR) for vigorous physical activity was 0(0-640), moderate physical activity 60(0-320) and walking 462 (297-924). Overall total physical activity MET- minutes and IQR was 942(401-2066) (Figure 2, Table 2). The mean sitting hours were 10.36±3.08 (95% CI 10.03- 10.67) per day. The median and mode values for sitting were 10 hours/day (IQR 8-12) and 12 hours respectively (Range- 4-16 sitting hours/day). Quantum and pattern for different types of physical activity in mean MET minutes per week was also estimated. (Table 3)

### **Discussion**:

Non-communicable diseases have emerged as a significant global epidemic in many regions, primarily attributed to a substantial shift in lifestyles

Figure 1: Box plots depicting median MET- minutes per week (MMPW) of overall physical activity levels in male (N=197) and female (N=145) students



Table 2: Median Minutes of Various types of Physical Activities

Study Variable	Total	Vigorous	Moderate	Walking
		Activity	Activity	
	Median	Median	Median	Median
	(IQR)	(IQR)	(IQR)	(IQR)
Total activity days per weeks	9(7-13)	00(0-3)	1 (0-4)	7 (6-7)
Number of minutes spent per day	50 (25-90)	0 (0-30	(10(0-20)	30(15-40)
Total acitivity (MET-min/week)	942 (401-2066)	0(0-640)	60 (0-320)	462 (297-924)

Study Variable	Total	Vigorous	Moderate	Walking
		Activity	Activity	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Total activity days per weeks	9.6±4.6	1.7±2.2	2.1±2.3	5.9±1.9
Number of minutes spent per day	71.56±71.58	20.1±32.7	16.2±25.3	35.3±34.3
Total acitivity (MET-min/week)	1671.1±1934	657.1±1241	258.7±458.1	754.4±758.2

Table 3: Mean Minutes of various types of Physical Activities

# Figure 2: Box Plot depicting various types of physical activity in study population



characterized by diminished physical engagement as a common finding. The health benefits provided by physical activity are immense and well known too.<sup>[1-5]</sup> Yet, it is observed that globally and in India without any exception that, a large proportion of populations are either physically inactive or not active up to the recommended levels.

The present study found that 117(34.2%) of participants were insufficiently active (Category-1), 134 (39.2%) students were just minimally active (Category -2) and rest 91(26.6%) students were HEPA (Health Enhancing Physical Activity) active (Category-3). On clubbing the Category-II and Category-III together, 225 students (65.8%) can be considered as sufficiently active. In relation to inadequate levels of physical activitydiverse outcomes have been observed across various research studies, indicating variability in the findings across the country. Research study conducted among medical students in Bangalore revealed that 15.4% of the students demonstrated limited levels of physical activity.<sup>[14]</sup> It is worth mentioning that study conducted among Indian Students found 51% students having low physical activity levels.<sup>[15]</sup> Study done among medical students at Manipal found that 62% of medical students were exercising currently.<sup>[16]</sup>

As per the IPAQ guidelines,just Sufficient physical activity (Category-II) was observed in 39.2% of the participants in present research study. But students in this category are not enough physically active for total "Physical Activity" when all domains are considered. This is because IPAQ-SF measures total physical activity whereas the recommendations for physical activity are based on activity over and above usual daily activities (Usually leisure time or recreational). For this reason, any aberration in physical activity in this category of students (Category-II) may bring them to insufficiently active category(Category-I). When combining population for Category-I and category-II students, 73.4% of study might be considered at risk for physical inactivity related health issues.

Amongst the study population, median hours for sitting were 10 hours/day (IQR 8-12hours/day). Prolonged sitting has been equated with not just obesity, heart disease and diabetes but also with depression, cancer, and joint/muscle problems. It is so harmful that its repercussions have been equated to that of smoking. Other studies have also documented substantial sedentary behaviour in medical students. Study done among medical students in south India found average sitting hours as 7.06 hours per day.<sup>[14]</sup> We did not find gender wise significant difference in physical activity levels which contrasts with the study done earlier in medical students in Bangalore.<sup>[14]</sup>

# **Conclusion:**

The study findings indicate a noteworthy portion of the subjects failed to achieve the suggested thresholds of physical activity, while concurrently exhibiting prolonged periods of sedentary behaviour, primarily characterized by sitting. These outcomes underscore a critical public health issue that necessitates urgent attention. Consequently, the significance of implementing behaviour modification interventions aimed at enhancing physical activity levels among the targeted study cohort is emphasized.

# **Recommendations:**

To promote physical activity, it is advisable to address issues which commonly act as a barrier for

physical activity among youth like lack of resources to engage in physical activity, lack of skills and fear of injury in general. Health awareness in the form of motivational talks, lectures, IEC and addressing the above-mentioned issues can bring the desired changes to physical activity promotion. Motivation enhancement strategies along with creating enabling environment can be a wonderful strategy for bringing out the desired change in positive health behaviour.

### Limitations:

One of the limitations of study is that it only included students from two out of the four batches of the MBBS program at the institute. The inclusion of students from all four batches would have provided a more comprehensive representation of the study population. The findings of study may not accurately reflect the characteristics and diversity of the broader community of students as only the medical students from a single medical institute were included in the study. As a result, the validity of findings is limited only to the specific study population examined in this research. It is imperative to acknowledge that the reliance on only the selfreported physical activity data, obtained through the IPAQ-SF, may introduce a potential for bias in the findings of this study.

#### **Declaration**:

Funding: Nil

#### Conflict of Interest: Nil

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