ORIGINAL ARTICLE

Physical Activity, Sedentary Behavior and Correlates Among Students of Tehran University of Medical Sciences

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Abstract- Exercise and physical activity have well known physical and mental benefits, especially during students' life .This study was conducted to evaluate physical activity among students of Tehran University of Medical Sciences (TUMS). We have randomly recruited students of TUMS in the 2017-2018 academic year to report their routine physical activity through filling out the Persian version of the Global Physical Activity Questionnaire as well as demographic characteristics among 12 different schools. Accordingly, we classified the physical activity of participants into three groups (high, moderate, and low). From a total of 425 students, data from 417 were analyzed. The age range of students was from 18 to 48, with a mean (SD) of 25.8 (5.43) years. 53.5% and 46.5% of participants were male and female, respectively. Students were classified into 3 categories of high (41%), medium (38%), and low (21%) physical activity. In the present study, 87.3% and 12.7% of students were active and inactive, respectively. There was a significant difference in the overall activity level between genders and work-related activity between students of clinical and non-clinical settings. No significant differences were found between physical activity level and other demographic data. Our results showed that the majority of students had a physical activity of more than 600 MET-min/week. No significant relationship was found between physical activity and age, school, GPA, and BMI. Compared to the national activity report, students of TUMS were at the proper level of physical activity. However, further research is needed to confirm these results.

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Keywords: Exercise; Iran; Sedentary behavior; Students

Introduction

World health organization (WHO) defines physical activity as any skeletal or body movement that consumes energy. Doing work, sport, housework, and even challenges in recreational activities are kinds of physical activity (1). Thousands of articles have mentioned the benefits of exercise and physical fitness, and it is almost a fact that physical activity has significant health benefits in all age groups (2,3). Physical activity can make a positive impact on not only physical aspects but also other aspects of health, including psychological and social (4). Recent studies have shown that physical inactivity is directly related to various disorders and non-communicable diseases like diabetes, hypertension, osteoporosis, obesity, and some types of cancer. Social factors like gender, age, socioeconomic situation, marital status, and job position have also effected physical inactivity (5).

According to a big worldwide survey, about 31 percent of adults (15-year-old or older) are inactive physically with different proportions, range between Southeast Asia, the Americas, and the Eastern Mediterranean. Inactivity is more common in the elderly and also in women, and it is more prevalent in high-income countries (6). Some factors, such as lack of time or motivation, distance from the site of exercise, and social support, have been associated with physical inactivity (5).

The level of physical activity drops sharply between adolescence and adulthood, so it is imperative to pay attention to the mobility of young people, especially university students, who are the future leaders and decision-makers of the country (7).

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Since student life is one of the most important periods of life and is effective in forming behavioral habits, so many studies focus on student populations (8,9). Students usually follow the same course as they did in university after graduation. Six years after graduation, 85% of active individuals continued to exercise, and 80% of inactive persons continued the same pattern. During the study, the university is the last place where individuals can implement their physical activity behavior and continue to change their lifestyle. In other words, physical activity among university students is a catalyst for permanent physical activity in adulthood (10).

In particular, medical students will experience a lengthy education period of almost seven years and a lot of physical and psychological stress during this course. Accordingly, regular physical activity and its health benefits may have more importance in this population (11). Medical students, as future physicians, are presumed to be the potential role model for their patients and should be knowledgeable regarding physical activity and do it habitually. The fact is that the more physicians are familiar with the exercise, the more they prescribe it looks like a pill they have seen the effect many times (12). Furthermore, If physicians keep going in healthy habits, patients can trust them more (13).

Based on the investigation in the medical university of Silesia in Poland, medical students have the lowest physical activity (about 26% of them show a low level of activity) in comparison to other students, including nursing, midwifery, cosmetology and pharmacy students (14). Another web-based survey in the United States showed that physicians and medical students have higher physical activity and lower body mass index compared to the normal population. Besides, 73.2% of residents and 67.9% of fellow physicians participate in physical activities, which is less than undergraduate students (84%) and attending (84.8%), and this was directly correlated to working hours per week (15).

Another study conducted on 409 medical students in Saudi Arabia showed that only 47.2% of students reported being physically active. Interestingly, The medical students who had physically active habits were high academic achievers (16). Despite the noted importance, a few studies have been done focusing on the amount of physical activity and its related factors among Iranian medical students. Therefore, we aimed to investigate the amount and patterns of physical activity in students of Tehran University of Medical Sciences, the oldest and first ranked medical university of Iran.

Materials and Methods

In a cross-sectional study, we have studied the amount and pattern of physical activity among students of Tehran University of Medical Sciences (TUMS) through filling out two questionnaires, including a researcher-made questionnaire including demographic data and GPAQ physical activity questionnaire tool.

Totally, almost 13,000 students study in this university from undergraduate to fellowship level in 12 different schools. Accordingly, 425 students were randomly selected for this survey based on the calculated sample size and considering the clusters compatible with the distribution of students in different schools and research centers from October 2017 to August 2018.

The distribution of study participants closely correlated with the total number of students in each school according to the updated and integrated educational database of the university.

Students participated in the study solely at their own discretion, having given their verbal consent following an explanation of the research outline. Each respondent received such an explanation individually.

Inclusion and exclusion criteria

Students of Tehran University of Medical Sciences who were at least 18-year-old and were studying in the 2018-2019 academic year were recruited. Subjects with any acute or chronic underlying disease such as cardiovascular, respiratory, or muscular disease, which may affect physical activity, were excluded from this study.

Data collection tools

Data collection was done using a questionnaire. The anonymous questionnaire used in this study was composed of 2 parts. The first part was used to record demographic and educational information of gender, age, grade point average, residence status (dormitory or non-dormitory), body mass index (calculated from self-reports of height and weight), and activity in a particular sports discipline. The second part was the Persian form of standard Global Physical Activity Questionnaire (GPAQ). For international students, the original and English version of the questionnaire was used.

The Global Physical Activity Questionnaire (GPAQ) has been utilized in WHO STEPS methods to evaluate physical activity and sedentary behavior (17,18). We used the second version of GPAQ, which broadly measures the physical activity of the population. GPAQ version 2.0 consists of 16 questions about different aspects of physical activity in a typical week. It classifies physical activity into work, transport, and recreation (the various aspects of physical activity), through face to face interviews with all eligible participants based on the STEPS protocol. The validity and reliability of GPAQ have been studied in many countries with reliability coefficients demonstrating moderate to substantial strength (18,19).

The Persian version of GPAQ has been used in many national multi-central physical activity surveys (20-22). Data collection processes were validated in the STEPS 2016 conducted in Iran (23).

The GPAQ inquires about the frequency (days) and time (min/h) spent doing moderate- and vigorous-intensity activities at work (including unpaid household works) and recreation, as well as moderate-intensity commuting activity (time spend walking or cycling to and from places).

The minimum time of 10 minutes of physical activity was required to include it in the analysis. The moderate- and vigorous-intensity of each activity were assessed based on the amount of effort required to accelerate both respiratory and heart rate.

The time spent on sedentary behaviors (e.g., sitting, watching TV) were also determined.

The data derived from the GPAQ were cleaned, categorized, and analyzed according to the WHO STEP wise approach to chronic disease risk factor surveillance analyses guide (WHO 2005).

The level of physical activity referred to in the questionnaire is presented in the corresponding metabolic equivalent (1 MET= a resting energy expenditure assuming oxygen consumption of 3.5 mL-min/kg weight) "Energy expenditure" was defined as specific physical activity metabolic rates relative to the resting metabolic rate. In computing GPAQ data on energy expenditure, physical activity was split into vigorous and moderate types according to the questionnaire instructions, with their predetermined workload values of 4 MET for moderate activity and 8 MET for vigorous activity per minute. Physical activity was measured by activity in minutes per week, and according to the questionnaire, it reported in units of MET-minute per week.

Energy expenditure was estimated based on the intensity (METs), duration (min), and frequency of each activity. Total physical activity (TPA) was calculated as the sum of all MET-min/week, performed at work, commuting, or recreation (WHO 2005).

Students were assigned to 3 different categories of physical activity level (low, moderate, and high), assessed using the following formula: MET level * minutes of activity/day * days per week. The reported values for physical activity were based on the participants' self-report on the questionnaire and were not directly measured by the researchers.

Data analysis

Data cleaning was done according to WHO STEPS surveillance manual, GPAQ Instrument, and Analysis Guide version 2 (24).

The students' information was categorized and analyzed in two ways:

A) Based on the GPAQ analysis framework

Physical activity was classified as one of the 3 categories of the high, medium, and low based on the GPAQ analysis framework (25):

1) High: a person reaching any of the following criteria are classified in this category:

• Vigorous-intensity activity on at least 3 days a week achieving a minimum of at least 1500 MET min/ week, or

• Seven or more days of any combination of walking, moderate or vigorous intensity activities are achieving a minimum of at least 3000 MET-min/week.

2) Moderate: a person not meeting the criteria for the "high" category, but meeting any of the following criteria is classified in this category:

• Three or more days of vigorous-intensity activity of at least 20 minutes per day, or

• Five or more days of moderate-intensity activity (including walking) of at least 30 minutes per day, or

• Five or more days of any combination of walking, moderate- or vigorous intensity activities achieving a minimum of at least 600 MET-min/week.

3) Low: a person who does not meet any of the above-mentioned criteria falls in this category.

B) Achieving physical activity goals based on WHO guidelines

The recommended amount of physical activity to prevent chronic illness according to the World Health Organization Guideline is at least 150 minutes of moderate-intensity or 75 minutes of vigorous activity or 600 MET - min/ week for all people of 18-64-year-old.

Statistical analysis

Descriptive statistics are presented as frequency, relative frequency, mean, median, minimum, and maximum values and standard deviation. To assess normal distribution of data, Kolmogorov–Smirnov test (K–S test) and to compare MET-min/week among different groups interquartile range (IQR) and median test were used. Comparisons between different groups of physical activity were made using nonparametric tests of Mann-Whitney and Kruskal-Wallis tests. Data were analyzed using SPSS ver-21 software (Chicago, IL, USA), and values were considered statistically significant at $P<0.05$.

Results

This study was conducted with the participation of 425 students. After data cleaning, data from 417 students were analyzed.

Table 1. Distribution of participants in different schools

School	No. of participants	Relative frequency
Medicine (Clinical sciences)	141	33.8%
Medicine (Basic sciences)	32	7.7%
Public Health	42	10.1%
Pharmacy	41	9.8%
Dentistry	37	8.9%
International College	35	8.4%
Nursing & Midwifery	30	7.2%
Allied Medical Sciences	23	5.5%
Rehabilitation	9	2.2%
Advanced technologies in medicine	9	2.2%
Virtual Medicine	6	1.4%
Nutritional Sciences & Dietetics	5	1.2%
Iranian traditional medicine	4	1%
Research Centers	3	0.7%
Total	417	100%

Due to the abnormal distribution of data (Kolmogorov-Smirnov $P<0.05$ for physical activity, Age, BMI, sports experience), we used the median and IQR instead of the mean and standard deviation in reporting the results.

Overall, 223 male and 194 female students participate in our study (53.5% and 46.5%, respectively). The mean age (standard deviation) was 25.8 (5.43) in the range of 18-48. The average physical activity of students in high school was 1.98 hours per day (SD=1.57), and the average time of students exercise at the present time was 3.91 hours per week (SD=2.65).

Table 2 shows the pattern of physical activity and its distribution through the daily life of participants.

Table 2. Distribution of physical activity among participants

Variable (min/week)			Frequency (%)	Median (Min/W)	Mean (Min/W)	Standard Deviation
Physical Activity At Work	**Vigorous**	Yes	51 (12.2%)	210	252.35	202.73
		No	366 (87.8%)			
	Moderate	Yes	224 (53.7%)	360	489.73	443.43
		No	193 (46.3%)			
Transport Activity	**At least 10 minutes in each time**	Yes	329 (78.9%)	180	256.7	222.51
		No	88 (21.1%)			
Recreational Activities	**Vigorous**	Yes	191 (45.8%)	150	185.49	135.6
		No	226 (54.2%)			
	Moderate	Yes	200 (48%)	120	179.65	182.06
		No	217 (52%)			
Sedentary behavior (In minutes per day)				360	393.99	199.09

Overall, mean (SD) [confidence interval], median (IQR) of total physical activity (MET-min/week) for all students were reported in Table 3.

According to the analysis based on the GPAQ framework, 169 (41%), 160 (38%), and 88 (21%) of students were classified into 3 categories of high, medium, and low physical activity, respectively.

Table 3. Descriptive characteristics of physical activity (MET-min/week) in different fields

Variable (MET-min/week)	Mean	Standard Deviation	Confidence interval 95%	Median	IQR
Total Physical Activity	6690.3	3840.5	6107.1-7273.5]	2460	3840
Physical Activity At Work	2434.7	2139.5	2109.8-2759.6	2160	3120
Transport Activity	1260.4	1111.5	1091.6-1429.1	960	1230
Recreational Activities	1778.7	1595.9	1536.3-2021.1	1440	2160

Table 4. Physical activity level, MET-min/week and association of variables with activity level

Variable		Physical Activity, N (%)			Total	MET Median(IQR)	*P*
		High	Moderate	Low			
Sex	**Male**	103 (46.2%)	79 (35.4%)	41 (18.4%)	223	2940(3720)	0.038*
	Female	66 (34%)	81 (41.8%)	47 (24.2%)	194	2350(2970)	
Age	**<=20**	28 (41.8%)	28 (41.8%)	11 (16.4%)	127	2400(3330)	0.792
	21-25	61 (37.2%)	63 (38.4%)	40 (24.4%)	135	2390(3410)	
	26-30	51 (45.1%)	43 (38.1%)	19 (16.8%)	82	2960(3895)	
	>30	29 (39.7%)	26 (35.6%)	18 (24.7%)	73	2400(4140)	
BMI	**<=18.5**	7 (36.8%)	9 (47.4%)	3 (15.8%)	19	2040(3135)	0.869
	18.5-24.9	111 (40.1%)	106 (38.3%)	60 (21.7%)	277	2640(3600)	
	25-29.9	43 (42.2%)	37 (36.3%)	22 (21.6%)	102	2160(3500)	
	30-34.9	7 (46.7%)	6 (40%)	2 (13.3%)	15	2280(4320)	
	>=35	1 (25%)	2 (50%)	1 (25%)	4	1040(-)	
Grade point Average (GPA) (Top average being 20)	**<=14**	2 (25%)	3 (37.5%)	3 (37.5%)	8	2400(2100)	0.701
	14.01-16	37 (51.4%)	24 (33.3%)	11 (15.3%)	72	2620(3930)	
	16.01-18	75 (46.9%)	56 (35%)	29 (18.1%)	160	2520(3360)	
	18.01-20	37 (46.3%)	29 (36.3%)	14 (17.5%)	80	1940(4095)	
School	**Medicine (Clinical sciences)**	61(43.3%)	47(33.3%)	33(23.4%)	141	2760 (3720)	0.076
	Medicine (Basic sciences)	16(50%)	11(34.4%)	5(15.6%)	32	3360 (3795)	
	Public Health	16(38.1%)	19(45.2%)	7(16.7%)	42	2400 (3680)	
	Pharmacy	17(41.5%)	17(41.5%)	7(17.1%)	41	2120 (2640)	
	Dentistry	21(56.8%)	10(27%)	6(16.2%)	37	3600(4940)	
	International College	8(22.9%)	16(45.7%)	11(31.4%)	35	1630(2160)	
	Nursing & Midwifery	8(26.7%)	13(43.3%)	9(30%)	30	2390(4860)	
	Allied Medical Sciences	9(39.1%)	10(43.5%)	4(17.4%)	23	2160(4020)	
	Rehabilitation	4(44.4%)	4(44.4%)	1(11.1%)	9	2880(6330)	
	Advanced technologies in medicine	4(44.4%)	4(44.4%)	1(11.1%)	9	980(6160)	
	Virtual Medicine	3(50%)	1(16.7%)	2(33.3%)	6	3960(-)	
	Nutritional Sciences & Dietetics	0	5(100%)	0	5	2400(1870)	
	Iranian traditional medicine	1(25%)	2(50%)	1(25%)	4	3020(-)	
Activity in a Specific Sport Discipline	**Yes**	127 (46.5%)	103 (37.7%)	43 (15.8%)	273	2880(4060)	<0.001*
	No	42 (29.2%)	57 (39.6%)	45 (31.3%)	144	2100(3160)	

As the table shows, there is a significant difference in activity level between males and females as well as between students active in a specific sport discipline and those who are not. No significant differences were found between physical activity level and other variables, such as age, BMI, school, and GPA.

According to the WHO recommendation, 364 (87.3%) and 53 (12.7%) of students were divided into two groups of active and inactive according to the achievement of 600 MET- min/week.

The pattern difference of physical activity between students of clinical settings (hospital) and other undergraduate or non-medical students were compared (Table 5).

Table 5. Comparison of the 3 fields of physical activity between clinical and non-clinical students

Variable (MET-min/week)		Number	Median (Min/W)	Mean (Min/W)	Standard Deviation	*P*
Physical Activity At Work	**Non-clinical**	370	360	1239.7	1800.4	0.01
	Clinical	47	1200	1767.2	1942.8	
Transport Activity	**Non-clinical**	370	600	839.2	937.5	0.347
	Clinical	47	480	688.1	736.7	
Recreational Activities	**Non-clinical**	370	480	1040.5	1339	0.309
	Clinical	47	720	928.1	1042.2	

As the table shows, there is a significant difference between two groups in work-related physical activity and students, involved in hospital shifts have more activity at work.

Discussion

This study, including 417 students overall, showed that 87.3% of the subjects met the goal of physical activity (600 MET-min/week) according to the WHO physical activity guideline. This study indicated that physical activity in men is higher than women (mean 2940 and 2350), and the difference is statistically significant. Overall, a higher level of physical activity in men appears to be justifiable due to facilities and cultural constraints in the university setting. Another study found that physical inactivity was 3 times greater in women compared to men in the Iranian general population (22).

We also found that the age group of 26-30 years had the highest physical activity compared to the other age groups. However, the lowest physical activity level is seen in a group that is up to five years younger than the former group. Referring to the statistics, it can be argued that this group's interesting difference from other age groups is due to the overwhelming activity of medical assistants working in hospitals, and most of them have high or moderate levels of work. Postgraduate students, on the other hand, have also played a role in increasing this group's activity. However, there was no statistical significance among age groups in physical activity. In the Iranian general population, the age group 55-64 years had lower physical activity compared to younger individuals (22).

Although the physical activity between schools was not significantly different, the level of physical activity at work was significantly higher in clinical students compared to non-clinical ones (among schools with a sample size of more than 30). Besides, it can be discussed that some students consider the time lower than 10 minutes as an activity even though we aware of them not to do so before answering.

Considering all types of physical activities among students, we found that the proportion of work activity is higher than in recreation and transport activities. High levels of physical activity in medical students may be due to the long hours they spend in the hospital and long shifts. However, the lowest hours of work among schools with a sample size of more than 30 belong to the International school. One study conducted on Malaysia Sabah University showed that the physical inactivity in medical students and non-medical students was 49% and 35%, respectively, which was statistically significant. Another study showed that physical inactivity was significantly higher in medical students in Egyptian and Saudi medical students compared to the other students (26). One study on US medical students showed that more than half of the medical students adhered to CDC physical activity recommendations during the 4 years of medical training (13).

In this study, we found no statistical significance between GPA (grade point average) of students and physical activity level, whereas, in a study conducted in Saudi, they found a strong positive relationship between GPA and physical activity level (16).

The mean of student sedentary behaviors was about 394 minutes per day. The other studies showed that the mean of student sedentary behaviors was 458 in Nigeria, 670 minutes per day in Canada (27), 639 minutes per day in Iowa University students, and 546 minutes per day in young American adults (28).

Considering the higher physical activity level in students of Tehran University of Medical Sciences compared to the other studies, their hours of inactivity are also shorter, and the two findings are reasonably consistent. Given the inadvertent errors of some students in reporting the hours of rest as the hours of inactivity, it is expected that the average time of inactivity is less than 393.9 minutes a day for each person.

According to the WHO recommended levels of physical activity for adults, that is 600 MET-min/week, 87.3% of students reached the goal of physical activity level, and 12.7% of students had less than 600 MET-min/week physical activity. However, according to the National Iranian Physical Activity Document, in the age group of 15-65 years, in 2011, the prevalence of lower physical activity in Iran was over 40%, and this percentage among Iranian women reached 56%.(22) Physical activity level in medical students of Tehran University of Medical Sciences was higher in comparison with other medical students in Saudi Arabia, Egyptian(26) (43.3% vs. 15.4% and 10.8% respectively) and its comparison with Thailand(29), India (30) and Malaysia (31) (49.5%, 41.3%, and 51%, respectively). Besides other medical students in the country, i.e., Kerman(32) and Hormozgan (33) (10.9% and 26.5%, respectively) are lower active.

The major difference of physical activity level between Tehran University of Medical Sciences and the other universities in the country, as we mentioned previously, could be attributed to their higher level of knowledge to the benefits of a healthy lifestyle and better access to proper sports facilities of this capital city and university. In addition, the percentage of inactivity in female students is lower than the females in the general population in the national report on the National Physical Activity Program (24.2% vs. 56.7%) (22).

The more physical activity of female students compared to the general population may reflect the difference in awareness between these two groups.

Students who were active in a specific sport discipline was more active in this study, and about 46 % of them were categorized in high physical activity group (near 3 times more than their counterparts); Considering this issue looks as if we provide facilities and infrastructures to train our children to be somewhat active in a specific sport discipline, they may be more active in future.

The biggest limitation of the study was the high probability of selection bias. Because some inactive people may refuse to participate, and in contrast, more active students were eager to participate. Another problem with the study was the incomprehensibility of the research questions for a number of participants; Most of the misunderstanding was identified in the last question about sedentary behavior, and even with sufficient explanations, participants were unable to estimate the concept of leisure time for example correctly.

Although we emphasize that we do not consider activity lower than 10 minutes as physical activity, some did so as a kind of work activity in their time estimation. Even if they understood the question, they might have forgotten the amount of activity, which leads to a kind of recall bias. Another restriction was access to some samples, especially those who were involved and so busy in hospitals such as specialty or subspecialty assistants and fellows.

The amount of physical activity among students of Tehran University of Medical Sciences is much higher than in similar cases at home country and abroad. There was no significant relationship between physical activity of students in different schools, age groups, grade point average, and BMI. Further research seems to be needed to confirm this finding and its causes. On the other hand, the level of female students' performance at university is higher than that of other universities, and there is less gender inequality, although this finding was not significant. Finally, considering that 49.5 percent of Iranians were physically active, according to the National Iranian Activity Report, students at Tehran University of Medical Sciences are at a good level in terms of physical activity.

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