European Journal of Physical Education and Sport Science
ISSN: 2501 - 1235
ISSN-L: 2501 - 1235
Available on-line at: www.oapub.org/edu

doi: 10.5281/zenodo.886613 Volume 3 | Issue 10 | 2017

PREVALENCE, PATTERNS AND ASSOCIATED FACTORS OF PHYSICAL ACTIVITY IN INDIAN UNIVERSITY STUDENTS

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Abstract:

Background: As physical activity is beneficial for overall health, regular surveillance is essential among the populace. In India, there is a paucity of data regarding physical activity. The present study was aimed to explore the prevalence, patterns and associated factors of physical activity in university students.

Methods: A total of 255 students were interviewed using IPAQ long form. Demographic data including age, height, weight, stay and place of residence was self-reported by subjects. PA levels were presented as median and percentages. Chi-square test was employed to estimate the association between the categorical variables.

Results: In the overall sample, 11.37% were inactive, 73.73% were moderately active and 14.9% were found to be highly active. Walking was identified as a major contributor in females while vigorous activity contributed maximally in males. The Leisure-time domain was observed as major contributor and work domain was the least contributor to the total PA levels. Significant associations were seen between physical activity and independent factors such as gender, Stay and BMI.

Conclusions: Majority of university students had moderate levels of physical activity. What is new? This study explores a new fact that being a hostler is significantly associated with low levels of physical activity among university students.

Keywords: walking, moderate, vigorous, domain, IPAQ

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1. Introduction

An extensive research database regarding health benefits of physical activity has been on track since the half of 20th century.[1] Physical inactivity has been declared as one of the biggest public health intimidation of this epoch.[2] Physical inactivity is the major cause of obesity which is the main culprit behind various health concerns. About 387 million people worldwide have been identified as diabetic by the International Diabetes Federation as of 2014 and this number is expected to rise to one billion by the year 2035. It is projected that major contributors to this increase in diabetic patients shall be developing countries like India and China with a figure of 163.5 million which is the 3/4th of the aggregate figure.[3] Associations have been identified between different cancers and physical inactivity. A total 39 out of 46 studies on colon cancer and for 24 out of 36 studies on breast cancer reported consistency of evidence for risk drop with increased physical activity.[4] Evidence-based research signified that physical activity lessens fatness in overweight children, enhance musculoskeletal and cardiovascular health and fitness, positively affects focus and memory and so on brain functioning.[5] Earlier, only vigorous activities were considered beneficial but recent studies emphasized that health gains can also be achieved by performing an intermittent daily activity of moderate intensity.[6]

1.1 Situation in India

Growing technology is significantly affecting the lifestyle of people. India is a developing nation, facing striking lifestyle changes including movement behavior specifically the University students. Physical activeness is cutting down rapidly and people are spending more sedentary lifestyle. Accordingly, there is a greater need for extensive research to realize the complete portrait of physical activity prevalence in India. India's 2016 Report card on physical activity for children and youth highlighted few selected indicators and assigned grade C for overall activity, grade D for both transportation and sedentary behavior and grade D for government policies and investments. It was reported that most Indians do not achieve the WHO's recommendation of minimum physical activity levels and sedentary behavior prevails at larger scale.[7,8] In a study conducted by ICMR-INDIAB, it was reported that a massive population of about 392 million Indians is inactive which could result in aforementioned morbidities.[9] A systematic review done in South Asian countries has reported a wide variation (18.5-88.4%) in physical inactivity prevalence and highlighted the lack of data on physical activity profiles of Indians.[10] Thus, it is vital to promote more active lifestyle among the university students. To our knowledge, no similar study

on Indian university students has been undertaken. This study will act as a baseline for the further monitoring of physical activity levels among the Indian population.

2. Materials and methods

2.1 Selection of subjects and variables

For this purpose, two hundred fifty-five (N=255) university students age ranged from 18-30 year participated in the study from the various departments of the Guru Nanak Dev University, Amritsar, Punjab, India. Out of the total sample, n=129 (50.59%) participants were males and n=126 (49.41%) were females. The recruitment of subjects was based on multistage cum convenience sampling. All the subjects were informed about the objective and procedure of the study and verbal consent for voluntary participation was taken from all of them.

In addition to the interview, self-reported demographic data was taken as independent variables including age, body height, body weight, place of residence (Rural vs. Urban) and stay (Day scholar vs. Hostler). BMI was calculated by dividing the body weight by height in meter squared. The dependent variables of the study were total physical activity level (PAL), intensity-specific scores and domain-specific scores.

2.2 Study instrument and data processing

The instrument used for surveying of the PA level was the International Physical Activity Questionnaire (IPAQ) long form (2002).[11] This version of IPAQ contained 27 questions in detail about walking, moderate intensity and vigorous intensity physical activity which elicit the responses in four domains viz. work domain, transportation domain, domestic & garden domain and Recreation, Sport, and Leisure-time domain. Energy cost was measured in METs (Metabolic equivalents of task). Compendium of physical activity was consulted to estimate the energy expenditure of specific activities.[12] The following criterion was applied to classify the levels of physical activity:

- Inactive - < 600 MET-min/week
- Moderately Active - 600 MET-min/week to 3000 MET-min/week
- Highly Active - > 3000 MET-min/week

BMI was classified in accordance with the new cut off values for Asian people recommended by International Obesity Task Force (IOTF)[13]:

- Underweight - BMI < 18.5 Kg/m2
- Normal – BMI 18.5 Kg/m^2 to 22.9 Kg/m^2
- Pre-obese – BMI 23.0 Kg/m^2 to 24.9 Kg/m^2
- Obesity class I – BMI 25 Kg/m^2 to 29.9 Kg/m^2

- Obesity class II - BMI ≥ 30.0 Kg/m^2

2.3 Statistical analyses

Descriptive statistics of mean and standard deviation were executed on all variables. Normality of the data was tested by applying Kolmogorov-Smirnov test. Since the data were non-parametric, PA levels were presented as median values, first, second and third inter-quartile range and percentages.[14] Contributions of each domain to the total PA level were presented as percentages. Associations between demographic variables (gender, age, place of residence, stay and BMI) and Physical activity levels were assessed by applying Pearson's Chi square test. IBM SPSS statistics 21.0 software was utilized for all the data analyses.

3. Results

Table 1: Descriptive statistics of demographic characteristics of students

	Male						Female					
Characteristics	**Rural (n=59)**		**Urban (n=70)**		**Total (n=129)**		**Rural (n=58)**		**Urban (n=68)**		**Total (n=126)**	
	Mean	**S.D**	**Mean**	**S.D**	**Mean**	**S.D**	**Mean**	**S.D**	**Mean**	**S.D**	**Mean**	**S.D**
Age	24.51	2.27	24.26	2.54	24.36	2.44	23.21	2.09	23.2	2.06	23.24	2.04
Height (cms)	176.66	5.41	175.3	6.57	175.92	6.08	163.52	6.22	161.31	6.01	162.33	6.19
Weight (kg)	73.29	6.96	73.43	9.06	73.35	8.14	55.10	6.94	56.16	8.21	55.68	7.64
BMI	23.44	1.39	23.88	2.56	23.68	2.1	20.57	1.83	21.53	2.55	21.08	2.28

Descriptive data of demographics were classified into three sections viz. male' and female which were further classified into rural, urban and total males/females. As shown in table 1, in males, age ranged from 19-29 years. Mean and SD of age for rural, urban and total males was 24.51±2.27, 24.26±2.54 and 24.36±2.44 respectively. Mean and SD of height for rural, urban and total males was 176.66±5.41, 175.3±6.57 and 175.92±6.08 cms respectively. Mean and SD of weight for rural, urban, total males was 73.29±6.96, 73.43±9.06 and 73.35±8.14 kgs respectively. Mean and SD of BMI for rural, urban and total males was 23.44±1.39, 23.88±2.56 23.68±2.1 respectively.

Table 2: Descriptive statistics of physical activity levels among university students

Group	MET (min-max)	Median	IQR	Inactive (%)	Moderately active (%)	Highly active (%)	Achieving 600 MET-min/week (%)
Overall	0-5740	1560	1440	11.37	73.73	14.9	88.63
Males	213-5740	1850	1762	8.53	69.76	21.71	91.47
Females	0 – 5214	1364	1106	14.29	77.77	7.94	85.71
Rural	93-5740	1746	1473	7.69	76.07	16.24	92.31
Urban	0-5274	1355	1217.25	14.49	71.74	13.77	85.51

MET= Metabolic equivalent of task

IQR = Inter-quartile range (1st and 3rd quartiles)

In females section, Mean and SD of age for rural, urban and total females was 23.21± 2.09, 23.2±2.06 23.24±2.04 years respectively. Mean and SD of height for rural, urban and total females was 163.52±6.22, 161.31±6.01 and 162.33±6.19 cms respectively. Mean and SD of weight for rural, urban and total females was 55.10±6.94, 56.16±8.21 and 55.68±7.64 kgs respectively. Mean and SD of BMI for rural, urban and total females was 20.57±1.83, 21.53±2.55 and 21.08±2.28 respectively.

Table 2 demonstrates the median value and inter-quartile range of MET-min/week and PA levels among total university students and both genders. MET value in overall sample ranged 0-5740 with median value 1560 and IQR 1440. It was depicted that 11.37% of students were inactive, 73.73% students were moderately active and 14.9% students were engaged in high level of physical activity. It was observed that 88.63 % participants achieved the recommended 600 Met-min/week [7]. In Male group, MET value ranged 213-5740 with median value 1850 and IQR 1762. Among the total male population, 8.53% participants were inactive, 69.76% moderately active whereas 21.71% were highly active. After analyzing, 91.47 % male participants were found to be achieving 600 Met-min/week. In female group, MET value ranged 0-5214 with median 1364 and IQR 1106. Comparatively higher percentage reported low activity by 14.29%, moderate activity by 77.77% and relatively low numbers of females were highly active by 7.94%. It was found that 85.71 % female participants achieved 600 Met-min/week.

In rural group, MET value ranged 93-5740 with median 1746 and IQR 1473. Regarding PA level, 7.69 % were low active, 76.07% moderately active and 16.24 % were highly active. It was found that 92.91% rural participants achieved 600 Met-min/week. In urban group, MET value ranged 0-5274 with median 1355 and IQR 1217.25. Regarding PA level, 14.49 % were low active, 71.74 moderately active and 13.77% were highly active. It was found that 85.51 % urban participants achieved 600 Met-min/week.

Table 3: Intensity-specific scores of physical activity among university students

Group	Variable (Intensity-specific)	MET (min-max)	Median Value	IQR	Contribution (%)
Male	Walking	213 – 2772	496	561	28.35
	Moderate-intensity activity	0 - 5740	480	600	25.8
	Vigorous-intensity activity	0 – 3660	800	1330.5	45.85
Female	Walking	0 – 5214	594	743	48.6
	Moderate-intensity activity	0 – 4650	360	560	30.33
	Vigorous-intensity activity	0 – 2880	0	480	21.07
Overall	Walking	0 – 5214	578	645	37.12
	Moderate-intensity activity	0 – 5740	360	570	27.73
	Vigorous-intensity activity	0 – 3660	360	1040	35.15

MET = Metabolic equivalent of task
IQR = Inter quartile range (1st and 3rd quartiles)

Table 3 demonstrates the intensity-specific scores of males, females and total participants including walking, moderate and vigorous types of activities and their percent contribution in total MET scores. In male group, analyses shows that walking, moderate and vigorous intensity activities contributed by 28.34%, 25.8% and 45.84 % respectively. In female group, the contribution of walking, moderate and vigorous intensity activity was 48%, 30.33% and 21.07% respectively. In overall group, walking accounted for by 37.11%, moderate intensity 27.73% and vigorous intensity by 35.15% to the total physical activity levels.

Table 4: Contributions of various domains to the total physical activity levels

Domain	Male (%)	Female (%)	Rural (%)	Urban (%)	Total (%)
Work	9.39	7.82	11.19	5.50	8.76
Transportation	18.17	22.09	18.12	21.97	19.76
Domestic & garden	14.10	16.74	14.19	16.48	15.17
Leisure-time	58.32	53.33	56.50	56.03	56.30

Table 4 shows the contributions of four domains viz. work, transportation, domestic and leisure time in the total physical activity levels. On the whole, leisure & sports domain contributed the maximum among both groups and it was higher among the males with 58.32 % than the females with 53.33 % input to the total. Contrarily, Work

domain contributed the slightest among both groups with least among urban population contributing only 5.5 % of the total activity. Among the total participants, work domain contributed merely 8.76 % of the total activity signifying the effects of automation and urbanization. Transportation domain accounted for 19.76% to the total while it was 18.17 % among males and 22.09% among females. Similarly, 21.97 % activity was performed in transport domain among urban students while it was 18.12% among rural students. Contribution from domestic domain was less than transport domain but more than work domain. In males, 14.10 % of activity was reported from domestic domain whereas it was slightly more among females with 16.74 % contribution. Likewise, it was 14.19 % among rural and 16.48% among urban students.

Table 5: Associations between demographic variables and physical activity level

Variable (Number of subjects)		**Physical activity level**			
		Low	**Moderate**	**High**	**p-value**
		Count (%)	**Count (%)**	**Count (%)**	
Gender	Male (129)	11 (8.5)	90 (69.8)	28 (21.7)	
	Female (126)	18 (14.3)	98 (77.8)	10 (7.9)	.005*
Age	Immature adults[a] (162)	23 (14.2)	119 (73.5)	20 (12.3)	
	Mature adults[b] (93)	6 (6.5)	69 (74.2)	18 (19.4)	.08
Residence	Rural (117)	9 (7.7)	89 (76.1)	19 (16.2)	
	Urban (138)	20 (14.5)	99 (71.7)	19 (13.8)	.224
Stay	Day scholar (127)	6 (4.7)	102 (80.3)	19 (15)	
	Hostler (128)	23 (18)	86 (67.2)	19 (14.8)	.003*
BMI	Underweight (8)	1(12.5)	6 (75)	1 (12.5)	
	Normal (144)	10 (11.8)	117 (81.3)	10 (6.9)	
	Pre-obese (75)	4 (5.3)	50 (66.7)	21(28)	.001*
	Obese I (23)	7 (30.4)	11 (47.8)	5 (21.7)	
	Obese II (5)	0 (0)	4 (80)	1(20)	

[a] Immature adults mean aged < 25 years

[b] Mature adults mean aged ≥ 25 years

* indicates $p<.05$

Table 5 depicts the associations between selected demographic variables and physical activity levels. Significant associations were found between physical activity levels and gender, stay and BMI ($p<0.05$). However, age (immature vs. mature adults) and place of residence (rural vs. urban) were not significantly associated with the physical activity levels.

4. Discussion

The present study was aimed to provide a description of the current scenario of physical activity levels of Indian university students. Findings revealed that total participants were active by 14.9% highly active, 73.73% moderately active and the 11.37% of the total participants were found inactive, hence, not achieving the minimum recommendation of 600 MET-min/week. Results were not in agreement with a similar study administered on Indian population using GPAQ which estimated that about half of the Indian population was inactive[9] and additionally, the Saudi population where inactivity prevalence (96.1%) was higher at a greater rate.[15] However, with regard to the inactivity, this study is screening almost similar trends with Australia (17.2%), Canada (13.7%), Lithuania (15.0%), USA (15.9%), and New Zealand (12.2%).[16]

Results from the present study reveal that majority of the population was moderately active (73.73%) whereas data from other countries across the globe viz. Australia (58.8%), Canada (59.6%), Czech Republic (62.9%) USA (62.0%) Lithuania (52.1%) New Zealand (63.1%) China (57.7%) and Columbia (52.7%) had shown that majority of population was highly active as reported in a study conducted on general population of 20 countries including India (37.9%).[16] A very less population (14.9%) was occupied in high levels of physical activity when weighted against a similar study conducted on Egyptian students which reported a comparatively better percentage of highly active students (36.7%).[17] Median MET value was 1560 which indicates that more than half of the participants achieved the minimum value of recommended physical activity of at least 600 MET-min/weeks.[11] In males, 8.53% were inactive, 69.76% moderately active and 21.71% were highly active. The median value of 1850 METs provides evidence that majority of males achieved the minimum recommended PA levels. In the female category, 14.29% were inactive, 77.77% moderately active and 7.94% participants were highly active in their daily life and median MET value was 1364. These findings are inconsistent with the findings from a systematic review done on South Asians which reported inactivity prevalence ranged from 12.7%-66.2% in males and 17.0%-79.6% in females.[10] Findings are also dissimilar to a study that reported the majority of Polish males and females as highly active.[18]

While analyzing the intensity-specific scores, it was found that vigorous activity contributed the highest by 45.84%, moderate by 25.80% and walking by 28.34% in the male category. In female's intensity-specific scores, findings are inconsistent to males to whom walking contributed the highest by 48.67%, moderate by 30.28% and the least contribution was reported in vigorous-intensity activities by 21.03%.These results have shown similar trends with a study done on Swedish population where males were more

engaged in vigorous activity and females in walking.[19] It might be due to the reason that males are more likely to visit playfield and gyms while females prefer to perform light physical activities like walking and less intense activities or cultural aspects may also be a reason. Among the total participants, walking contributes the maximum followed by moderate and vigorous intensity activities.

The present study identified leisure-time physical activity as the major contributor and work-related PA as least contributor to the total physical activity levels in all sections. These findings are similar to the findings drawn from Croatian university students.[20] However, a study on Egyptian university students reported that domestic domain was the least contributor.[17] The reason for greater engagement in leisure-time activities could be that most students reside in university hostels or nearby areas of campus; therefore, the scope for engaging in work or domestic activities was very less. Furthermore, transportation was found to be the second major contributor in total PA as students commute within the campus by walking. Moreover, it is evident from Table 5 that gender and BMI were significant associative factors with physical activity. These results are in line with the previous studies.[21,22] Additionally, categorical variable stay (day scholar vs. hostler) was also found to be significantly associated with physical activity levels. To the author's knowledge, no study has been done to establish the relationship between physical activity levels and place of stay of students. However, two previous studies had identified that hostlers were more prone to less nutrition intake and anemia than the day scholars.[23, 24]

5. Conclusions

This study concluded that majority of Indian university students were engaged in moderate levels of physical activity. Out of the total sample, 11.37 % students did not achieve minimum recommended value of 600 MET-min/week. Males were more engaged in vigorous-intensity activities whereas females were more occupied in walking. In overall sample, leisure-time domain was identified as the most contributing domain to the total physical activity levels. Independent factors such as gender, stay and BMI were significantly associated with physical activity levels.

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