

Association between Sedentary Behaviour and Depression, Stress and Anxiety among Medical School Students in Chennai, India

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ABSTRACT

Introduction: Physical inactivity has been found to be a major contributing factor for occurrence of non-communicable diseases like cardio vascular diseases, type 2 diabetes, dyslipidemia and also certain mental illnesses. With the higher prevalence of sedentary behaviour among medical students in India, the researches on sedentary behaviour related to mental illness (depression, anxiety, self-esteem, psychological stress, and quality of life) have become the focus considering the medical students role in future physicians and public health intervention programme. The prevalence and association of sedentary behaviour and certain mental illnesses has been explored in this study.

Aim: To find the prevalence of physical inactivity among medical school students and its association with anxiety, stress and depression.

Materials and Methods: A cross-sectional study was conducted among medical students of Tagore Medical College, Chennai, Tamilnadu. Total 507 medical school students who were >18 years of age from all academic years (First

year MBBS to Fourth year MBBS) students were included. A pretested, structured study tool was used which comprised of five sections-Socio-demographic profile, International physical activity questionnaire, Perceived Stress Scale, Generalised Anxiety Disorder-7 and Beck Depression Inventory. Data was analysed with SPSS-IBM software version 21. Prevalence of physical inactivity was measured in proportions. Chi-square test and Mann Whitney test was applied. A p-value of <0.05 was considered significant.

Results: Among the study participants, 73% and 53.5% had moderate and severe intense activity, respectively. Out of 507 study participants, 21.5% were sedentary. Significant association was found between depression and sedentary behaviour. (p-value-0.049). There was a significant mean difference in depression scores among participants with sedentary and non-sedentary behaviour. (p-value-0.046).

Conclusion: The study was able to find significant association between sedentary behaviour and depression. Promotion of physical activity could help in improvement of negative emotional effects.

Keywords: Negative emotional effects, Physical inactivity, Positive emotional effects, Promoting physical activity, Risk factors

INTRODUCTION

Physical inactivity has been found to be a major contributing factor for occurrence of non-communicable diseases [1]. It has been found that younger age group have sedentary behaviour due to technological advances and there has been reduction in the participation in active pursuits [2,3]. Sedentary behaviour has been defined as activities which utilises energy expenditure of ≤ 1.5 Metabolic Equivalent (MET) [4]. Scientific evidences show that sedentary behaviours are not only associated with increased risk of cardio-metabolic disease, but also attributes to all causes of mortality and various physiological and psychological problems [5-7]. Studies have found an association between sedentary behaviour and negative emotions including depression [8,9]. Review articles suggest major evidences on anxiety associated with sedentary behaviour [10]. Sedentary behaviour like screen based entertainment lead to anxiety through biological pathway, increase in the arousal of central nervous system, disrupted sleeping behaviours, poor metabolic health [11]. Animal studies proved that exercise has positive impact on pathophysiology pathways of anxiety [12]. Interventions targeted supervised physical activity has better anxiety outcomes [13]. It overcomes anxiety by lipolysis during moderate to intense physical activity which alters the tryptophan mechanism which is a neurotransmitter associated with mood [14]. Physical activity also offers benefits comparable to established treatment in anxiety order [15]. Moderate to intense physical activity is a valuable mental health promotion in reducing

the risk of anxiety and depression [16,17]. A review conducted among South Asian studies reported that leisure related inactivity was >75% in South Asia. Higher prevalence of sedentary behaviour among medical students has been reported in India [18]. The prevalence of sedentary behaviour among medical school students and its association with anxiety, depression and stress remains little explored and the present study was an attempt to explore the physical activity pattern among medical school students. The aim of the study was to find the prevalence of physical inactivity among medical school students and its association with anxiety, stress and depression.

MATERIALS AND METHODS

The study was a cross-sectional study conducted in a tertiary care teaching hospital, located in Southern Chennai Tamil Nadu, India. The study population comprised of medical students of Tagore Medical College in Chennai, Tamil Nadu. Medical school students who were >18 years of age from all academic years (first year MBBS to fourth year MBBS) who gave consent to participate were included in the study. The students who could not be contacted even after three visits were excluded. The total number of students in medical school at the time of study was 547. Complete enumeration of all the students was done. Total 507 students were included in the present study. The study period is from April 2016 to March 2017. After obtaining written informed consent, the content of the questionnaire was explained to the study participants and self

administered for data collection. Institutional Ethical Committee approval was obtained before starting of the study (IEC NO: 40/ March 2016). Confidentiality of study participants was maintained in all the phases of the study.

The study tool was pretested, validated and structured questionnaire. Few modifications had been done to adapt the questionnaire to local condition. The scales used for assessing negative emotions are used for screening purpose. The study tool comprised of five sections: 1) Socio-demographic profile and anthropometry of the study participants; 2) The International Physical Activity Questionnaire (IPAQ) [19], self-administered short version was designed for use among young and middle aged adults for assessing physical activity. The questionnaire inquires four activity types during the last week: "vigorous activity" periods for atleast 10 minutes; "moderate activity" periods for at least 10 minutes, "walking" periods for atleast 10 minutes and times spent "sitting" on weekdays. Those who do not undertake any of the above activities were considered to be sedentary. Frequency of activity is measured in days and duration in hours and minutes. 3) The Perceived Stress Scale (PSS) [20] consists of items designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The PSS was designed for use in community samples with at least a junior high school education. Score more than seven was considered as cut-off point; 4) Generalised Anxiety Disorder 7 (GAD-7) [21] is a sensitive self-administrated test to assess generalised anxiety disorder, normally used in outpatient and primary care settings that has seven items, that measure severity of various signs of GAD. Those with a score of more than 10 were considered to be anxious; 5) The Beck Depression Inventory (BDI) [22] self-administered instrument used to screen the presence and degree of depression. It evaluates 21 symptoms of depression which covers emotions, behavioural changes, and somatic symptoms. Each answer on a scale given a value of 0-3. Those with score of above 10 were considered to be depressed [23].

Study participants were referred to Department of psychiatry for further evaluation of those who had positive scores of any of the negative emotional effects (anxiety, stress and depression).

STATISTICAL ANALYSIS

Data was analysed with Statistical Package for Social Sciences (SPSS-IBM) software version 21. For qualitative variables proportions, for quantitative variables mean, median, range and standard deviation were calculated. Prevalence of physical inactivity was measured in proportions. Mean and Standard deviation of the scores were calculated. Chi-square test was applied to find the association between physical activity and anxiety, stress and depression scale scores were done. Mann-Whitney test was applied to find out differences in mean. A p-value of <0.05 was considered significant.

RESULTS

The study was conducted among 507 medical school students. A 71.6% of the medical students stay in hostels within the medical school campus. A 67.3% had their permanent residence in urban area. An 81% belong to upper socio-economic class according to modified BG Prasad scale-2016 updated [Table/Fig-1] [24].

The mean (SD) body weight (in kg) among males and females were 66 (± 10.7) and 55 (± 9.6) respectively. The mean (SD) height (in cm) among males and females were 171 (± 7.4) and 158 (± 6.8) respectively. BMI among males and females were 22 (± 3.5) and 21 (± 3.6) respectively.

Physical Activity

Among the study participants, 73% and 53.5% undertook moderate and severe intense activity respectively. Out of 507 study participants, 21.5% were sedentary [Table/Fig-2].

S. No.	Profile	n (%)
1.	Gender	
	Male	217 (42.8)
	Female	290 (57.2)
2.	Academic year	
	I MBBS	111 (21.9)
	II MBBS	143 (28.2)
	III MBBS	139 (27.4)
	IV MBBS	114 (22.5)
3.	Current residence	
	Hosteller	363 (71.6)
	Day Scholar	144 (28.4)
4.	Permanent residence	
	Rural	166 (32.7)
	Urban	341 (67.3)
5.	Occupation of Father	
	Professional	86 (17.0)
	Semiprofessional	246 (48.5)
	Clerk/Shop owner	10 (2.0)
	Skilled worker	76 (15.0)
	Semiskilled worker	67 (13.2)
	Unskilled worker	4 (0.8)
6.	Occupation of Mother	
	Professional	33 (6.5)
	Semiprofessional	127 (25.0)
	Clerk/Shop owner	4 (0.8)
	Skilled worker	9 (1.8)
	Semiskilled worker	16 (3.2)
	Unskilled worker	2 (0.4)
7.	Education of Father	
	Primary	22 (4.3)
	Middle	47 (9.3)
	Higher secondary	61 (12.0)
	Graduate	200 (39.4)
	Postgraduate	160 (31.6)
	Illiterate	17 (3.4)
8.	Education of Mother	
	Primary	42 (8.3)
	Middle	63 (12.4)
	Higher secondary	71 (14.0)
	Graduate	151 (29.8)
	Postgraduate	137 (27.0)
	Illiterate	43 (8.5)
9.	Socioeconomic Class	
	Upper	411 (81.0)
	Upper Middle	70 (13.8)
	Middle	12 (2.4)
	Lower Middle	13 (2.6)
	Lower	1 (0.2)

[Table/Fig-1]: Socio demographic profile (n=507).

Negative Emotional Effects

Around 15% of study participants were normal with respect to anxiety scale. A total of 83 (16.4%) were anxious taking a cut-off of 10 score in the scale. Only 15.2% of study participants were not stressed. 49.5% were not depressed and 11.4% had severe depression as per the depression scale [Table/Fig-3].

S. No.	Physical activity	n (%)
1.	Moderate intense activity	
	Yes	370 (73.0)
	No	137 (27.0)
	Frequency of such activity	
	Daily	155 (30.5)
	4-6 days per week	40 (7.9)
	2-3 days per week	108 (21.3)
	One day per week	67 (13.2)
	None of the above	137 (27.0)
	Time duration of activity per day	
	One hour per day	95 (18.7)
	30 minutes per day	96 (18.9)
	20 minutes per day	86 (17.0)
	<20 minutes per day	93 (18.3)
	Not applicable	137 (27.0)
2.	Severe intense activity	
	Yes	271 (53.5)
	No	236 (46.5)
	Frequency of such activity	
	Daily	94 (18.5)
	4-6 days per week	55 (10.8)
	2-3 days per week	62 (12.2)
	One day per week	60 (11.8)
	None of the above	236 (46.5)
	Time duration of activity per day	
	One hour per day	124 (24.5)
	30 minutes per day	59 (11.6)
	20 minutes per day	44 (8.7)
	<20 minutes per day	44 (8.7)
	None of the above	236 (46.5)
3.	Sedentary activity	
	Yes	109 (21.5)
	No	398 (78.5)

[Table/Fig-2]: Distribution of study participants according to their physical activity using International physical activity questionnaire (IPAQ) (n=507) [21].

The physical activity was assessed using International physical activity questionnaire (IPAQ) [21].

S. No.	Scores	n (%)
1.	Anxiety scale	
	Normal (0-5)	258 (50.9)
	Mild (6-10)	166 (32.7)
	Moderate (11-15)	58 (11.4)
	Severe (15-21)	25 (4.9)
2.	Stress scale	
	Normal (0-6)	15 (3)
	Low (7-13)	62 (12.2)
	Moderate (14-26)	383 (75.5)
	Severe (27-40)	47 (9.3)
3.	Depression scale	
	Normal (0-13)	251 (49.5)
	Mild (13-19)	107 (21.1)
	Moderate (20-28)	91 (17.9)
	Severe (29-63)	58 (11.4)

[Table/Fig-3]: Distribution of study participants according to self-reported anxiety, stress and depression scores. (n=507)

The self-reported anxiety, stress, depression is assessed using-The Perceived Stress Scale (PSS), Generalized Anxiety Disorder 7 scale (GAD-7), The Beck Depression Inventory (BDI) [21-23].

Sedentary Behaviour and Negative Emotional Effects

The proportion of depression was higher among those who were sedentary. This was found to be statistically significant (p-value-0.049). However, no significant differences were obtained with anxiety and perceived stress emotions [Table/Fig-4]. There was a significant mean difference in depression scores (p-value -0.046) [Table/Fig-5].

S. No.	Emotion	Sedentary behaviour		p-value
		Yes n (%)	No n (%)	
1.	Anxiety scale			0.623
	Normal (0-5)	55 (21.3)	203 (78.7)	
	Mild (6-10)	34 (20.5)	132 (79.5)	
	Moderate (11-15)	12 (20.7)	46 (79.3)	
	Severe (15-21)	8 (32)	17 (68)	
2.	Stress scale			0.181
	Normal (0-6)	6 (40)	9 (60)	
	Low (7-13)	9 (14.5)	53 (85.5)	
	Moderate (14-26)	84 (21.9)	299 (78.1)	
	Severe (27-40)	10 (21.3)	37 (78.7)	
3.	Depression scale			0.049
	Normal (0-13)	12 (4.7)	239 (95.3)	
	Mild (13-19)	8 (7.5)	99 (92.5)	
	Moderate (20-28)	57 (62.6)	34 (37.4)	
	Severe (29-63)	32 (55.1)	26 (44.9)	

[Table/Fig-4]: Association between sedentary behaviour and negative emotional effects.

Chi-square test applied, p-value ≤0.05 is significant

S. No.	Negative emotions	Sedentary behaviour	Mean rank	Sum of ranks	Mann-Whitney U	Z-value	p-value
1.	Anxiety	Yes	246.31	26847			
		No	256.11	101930	20852.5	-0.621	0.535
2.	Stress	Yes	251.87	27453			
		No	254.58	101324	21458.5	-0.172	0.863
3.	Depression	Yes	257.93	100167			
		No	251.68	27598	57766.0	-23.94	*0.046

[Table/Fig-5]: Sedentary behaviour and mean negative emotional effects score.

*Mann-Whitney test, p-value ≤0.05 is significant

DISCUSSION

The present study explored the relationship between sedentary behaviour and negative emotional effects (stress, anxiety and depression) and tries to find out whether physical activity could serve as the non-pharmacological remedy for reducing the symptoms of stress, anxiety, and depression. Approximately, one-fifth of the students had sedentary behaviour. Higher prevalence of negative emotions in our study could be justified as these scales are screening scales and inclusion of those who had mild symptoms to diseased category.

In the present study, it was found that around 20% were sedentary and sedentary behaviour was higher among females (58.7%) when compared to males (41.3%). Also, it was found that only half of the participants undertook vigorous activity. In a previous study done by Banerjee A et al., reported that only around 40% underwent vigorous activity [18]. Similar results with higher physical activity among males have been reported in a study done by Rajappan R et al., [25]. It is assumed that knowledge about healthy lifestyle and dietary food habits must be more in medical school students than other college or university students. However, one fifth of students were sedentary and more than 15% of sedentary students were females. This could be attributed to the attitude towards health promotion and physical activity and its relation with disease prevention.

The study found a modest association between sedentary behaviour and depression. This finding was similar to a study done by Asare M et al., which found a significant negative correlation between physical activity and depression ($r=-0.78$, $p<0.001$) [26]. However, a study done by Hume C et al., found no association between different types of physical activity and depression [27]. One of the important hypothesis is 'endorphin hypothesis in which beta-endorphin is an opioid secreted by pituitary gland during activity which produces feeling of sense of well-being and euphoria by reducing cortisol level in the body [28]. Serotonin hypothesis suggest that serotonin secretion and function is modulated by moderate exercise in brain areas like midbrain, striatum, hypothalamus and hippocampus. This modulation in serotonin system during acute physical exercise is considered as keystone in decreasing psycho-emotional system like depression and anxiety [29-31].

In the present study, there was no significant association between sedentary behaviour and stress levels. However, in previous studies, association was found between sedentary behaviour and stress levels [32,33]. Nguyen-Michel ST et al., reported no association between stress levels and physical activity [34]. As stress is a multi-faceted construct and is influenced by many factors, physical activity could be one of the factors which influences stress levels.

The study was one among few of its kind to evaluate physical activity with all mental health conditions such as depression, anxiety and stress. In previous studies, a negative relationship has been found between anxiety and exercise [35]. The relation between anxiety and physical activity is explained by endorphin hypothesis.

LIMITATION

One of the limitations of the study is that the study assessed physical activity in previous one week period, which could not be representative of overall physical activity of rest of the days of the year.

CONCLUSION

The study was able to find an association between sedentary behaviour and depression. However, significant association between sedentary behaviour and anxiety and stress levels could not be ascertained with the present study. Though aetiology of anxiety and stress are multi-factorial, physical inactivity could be one among the factors attributing to these negative emotional effects. Promotion of physical activity could help in reducing the negative emotional effects among medical students.

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