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Original Article

Adverse Effects of Prolonged Sitting Behaviour on the General Health and Posture of Medical Students

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ABSTRACT

Objective: To determine the prevalence of musculoskeletal symptoms among Medical students and to correlate the musculoskeletal adverse effects with prolonged sitting and sitting posture.

Study Design: Analytical cross-sectional study.

Place and Duration of Study: Study was conducted online among Medical Students studying in various medical institutions across Pakistan, from Nov 2021 to Apr 2022.

Methodology: Study included 144 Medical and Dental students, recruited through convenience sampling. Any participant currently suffering or recently recovered from a debilitating illness, physical disability, presently undergoing treatment for any chronic muscular or skeletal pain was not included in the study. A close-ended virtual questionnaire containing the Nordic Musculoskeletal Questionnaire (NMQ) was used.

Results: Majority of respondents 100(69.4%) sat continuously for more than 2 hours while 44(30.6%) sat for less than 2 hours in a single seating. Results of the NMQ showed that most people had pain and discomfort in shoulder, upper back, lower back and hip. Pain in the lower back was the most common complaint 93(65%). Prolonged sitting (>2hours) was significantly associated with Lower back pain (p=0.004) and hip pain (p=0.019)

Conclusion: Prolonged sitting behaviour was associated with frequent complaints of lower back discomfort. Poor posture was demonstrated to cause pain in the shoulder and upper back regions. Active workstations, intermittent walks during breaks and usage of negative desks, as well as avoidance of forward leaning posture are suggested to improve working conditions.

Keywords: Musculoskeletal ailments, Sedentary lifestyle, Sitting posture.

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INTRODUCTION

The physical, economic and social environments of developed and developing countries continue to change rapidly. Many of these changes, particularly in technologies for personal transportation, communication, workplace productivity and domestic entertainment have been associated with much reduced human energy-expenditure requirements.[1] In 1950s, the first epidemiological study using occupational activity to define sedentary and active behaviour was conducted by Morris and colleagues. In this study, bus conductors who climbed approximately 600 stairs per day at work had half the number of heart attacks in comparison to bus drivers who spent 90% of their work time sitting.[2] Modern workplaces have shifted the nature of work from active to sedentary and promote lengthy sitting behaviour. One cause of this change is the transition from paper-based work to computerized and paperless work.[3] There is a rapidly accumulating evidence on relationship of prolonged sedentary time with cardio-metabolic risk biomarkers and health outcomes.[4] Bad posture while studying i.e leaning forward without proper back support puts weight of the top half of our body directly on the lumbar spine instead of uniformly distributing it through the hips and legs as in the standing position. Hence this adds pressure while being seated for extended periods of time can cause a lot of musculoskeletal problems if proper posture is not maintained. More recently, evidence has arisen indicating that postural fixity (either sitting or standing) is undesirable from a health standpoint.[2] Too much sitting is now understood to be a health risk. Increased discomfort from prolonged sitting has been attributed to increased muscle fatigue, decreased intervertebral disc nutrition, and reduced blood flow in muscles. However, dynamic movements utilize muscles of opposing groups, reducing fatigue and pain.[5] To date, no studies have investigated the effect of different sitting postures on perceived body discomfort.[6] Back pain and neck pain have been recognized as the leading global cause of disability in most countries.[7] Pain is generally viewed as a long-term effect of an imbalance between work-

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related physical factors and physical capacity, whereas per-ceived discomfort indicates a short-term defect.[8] Previous studies showed that 17.7-63.0% and 23-34% of office workers experienced neck pain and back pain during the last 12 months, respectively. Deconditioning is a form of exercise intolerance in which emp-loyees' abilities to perform physical tasks are impaired beyond normal expectations.[9] Sitting pro-motes deconditioning, which negatively affects emp-loyees' abilities to meet the demands of increasingly physical workloads. Prolonged sitting combined with an awkward posture, such as a forward-leaning head and increased thoracic kyphosis, increases the demands of the spinal muscles and joints, which might contribute to the increased risks of developing spinal pain in sedentary workers. It results in an enormous economic burden for both individuals and societies due to healthcare costs, decreased productivity, work absenteeism, lost wages, and work compensation.

There are currently no guidelines or recommendations in place in Pakistan to tackle the menace of detrimental sedentary and sitting behaviours. Therefore, this study aimed to survey the prevalence of poor posture and prolonged sitting behaviour along with their associated musculoskeletal adverse effects among Pakistani medical students.

METHODOLOGY

An analytical cross sectional study was conducted among Medical and Dental students studying in various Public and Private sector Medical and Dental colleges all over Pakistan. Study was carried over a period of 6 months from November 2021 to April 2022. By using epi info version 7, a sample size of 144 was calculated. Approval of Institutional Ethical Review Committee was taken before initiating the study. Participants were enrolled through non probability convenience sampling.

Inclusion Criteria: Students of either gender, of all ages, studying MBBS or BDS in numerous institutes across Pakistan were included in the study.

Exclusion Criteria: Any student currently suffering or recently recovered from a debilitating illness, physical disability or handicap, presently undergoing treatment or taking medication for any chronic muscular or skeletal pain was excluded from the study.

The study was conducted online in coherence with the prevailing COVID crisis in Pakistan. Informed voluntary consent was taken from the participants before enrolling them in the study. Google forms were used to create the questionnaire which were then widely disseminated among the eligible medical and dental students via emails. A validated, structured questionnaire was used which consisted of two parts. The first part gauged the demographic characteristics and general wellbeing of the respondents, while the second part contained the Nordic Musculoskeletal Questionnaire (NMQ) to evaluate symptoms pertaining to specific body regions as well as gauging their severity. The occurrence of the reported symptoms was limited to the past 12 months. Operational definitions were used to categorize good and bad posture to facilitate ease of analysis. Good posture was defined as sitting on chair with back resting against the chair or sitting on the bed with book placed in lap and back resting against the bed. While bad posture was defined as sitting on chair and leaning on desk or sitting on bed with book placed on bed and leaning forward.

Statistical analyses were performed using the Statistical Package for the Social Sciences Software (SPSS) version 25. Categorical variables were expressed as frequency and percentage while continuous variables were expressed as mean and standard deviation. Chi-square test was applied and p-value <0.05 was taken as statistically significant.

RESULTS

Out of 144 participants, 102(70.8%) were females while 42(29.2%) were males. Age of the participants ranged from 17–25 years. BMI of 105(72.9%) participants was in normal weight range whereas 22(15.3%) students were overweight. Prolonged sitting (>2hours) was reported by 100(69.4%) of the students. Moreover, 106(73.6%) of students reported studying with a bad posture. Among the students, 113(78.4%) had an average daily exercise time of less than 1 hour. Socio-demographic details of participants are given in Table-I. Results of Nordic Musculoskeletal question-naire revealed that lower back pain (64.6%), shoulder pain (59.7%) and upper back pain (59%) were the most prevalent complaints as shown in Figure-1. The prevalence of body ache in various regions and its association with prolonged sitting hours in shown in Table-II. Association of prolonged sitting with regional body aches was found to be most significant in lower back (p-value=0.002), head (p-value=0.032) and hip (p value=0.012). Moreover, bad posture was also found to be significantly associated with body aches especially in the regions of shoulders (p-value=0.003), upper back (p-value=0.012) and hip (p-value=0.023) as shown in Table-III. Owing to the age group of our study subjects

i.e. 18-25 years, the only problems arising due to this prolonged sitting behaviour were musculoskeletal in nature and no obesity or cardiovascular disorders were reported in any of the participants, with majority having their BMI in the normal range.

Table-I: Sociodemographic details of Respondents (n=144)

Variable	n(%)
Age	
17-19	12(8.3)
20-22	106(73.6)
23-25	18(12.5)
>25	8(5.6)
Gender	
Male	42(29.2)
Female	102(70.8)
BMI	
<18.5	17(11.8)
18.5-24.9	105(72.9)
>25	22(15.3)
Daily Exercise	
<1hr	113(78.4)
1-2hrs	22(15.3)
>2hrs	9(6.3)
Continuous Sitting	
<2hrs	44(30.6)
>2hrs	100(69.4)
Posture of Studying	
Good	38(26.4)
Bad	106(73.6)

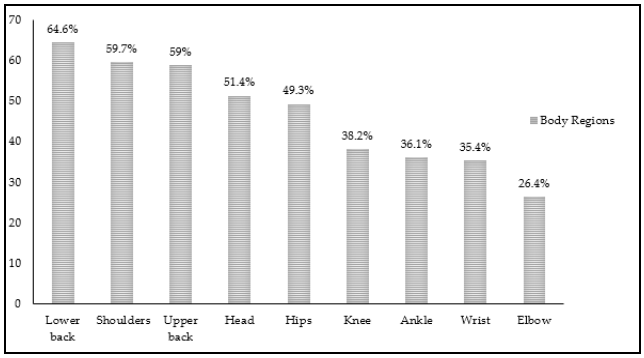

Figure-1: Frequency of Musculoskeletal pain according to various body regions

DISCUSSION

According to the results of our study, majority of the study participants (69.4%) reported that they sat continuously for more than 2 hours in a single seating without any change of position in between. The Nordic Musculoskeletal questionnaire used in our study revealed that the most frequent complaints among the musculoskeletal symptoms were found to be in shoulder region (71%), upper back (59.0%) and lower back (64.6%), with the most significant being lower back pain (*p*-value 0.002), headache (*p* value 0.032) and hip pain (*p*-value 0.012). This study showed that bad posture was found to have a significant association with issues mainly in the upper body regions i.e. shoulder, neck and upper back leading to complaints of stiff neck, tight shoulders and continuous back pain. Prolonged sitting, on the other hand, was seen to have a significant association with pain mainly in the lower body regions including lower back and hip pain. Headache was also seen to be associated with prolonged sitting.

Table-II: Association of Prolonged Sitting with Regional Body aches (n=144)

Body Region	Pain present, n(%)		*p*-value
	Yes	No	
Shoulder	64	36	0.082
Upper back	63	37	0.101
Lower back	73	63	0.002
Hip	66	44	0.012
Head	70	30	0.032
Elbow	75	25	0.354
Wrist	37	63	0.343
Knee	38	62	0.543
Ankle	33	67	0.163

Table-III: Association of Bad Posture with Regional Body aches (n=144)

Body Region	Pain present, n(%)		*p*-value
	Yes	No	
Shoulder	71	35	0.003
Upper back	69	37	0.012
Lower back	72	33	0.102
Hip	58	48	0.023
Head	66	40	0.349
Elbow	30	76	0.259
Wrist	38	68	0.510
Knee	42	64	0.349
Ankle	41	65	0.192

Similar studies conducted on occupational sedentary lifestyle among office workers have shown significant associations of prolonged sitting hours with lower back pain and neck/shoulder pain, backed by experimental evidence indicating that with decrease in workplace sitting time there was reduction in lower back pain, neck/shoulder pain and general musculoskeletal problems.[10] Generally, the prevalence of musculoskeletal disorders has been reported to range from

40–80% among office workers.[11] This high rate of musculoskeletal disorders in different body regions of office workers can be associated with the fixed postures and prolonged sitting hours. Studies have demonstrated that the average adult spends 50–60% of their day in sedentary hobbies.[12]

Studies have linked continuous sitting behaviour and lack of daily exercise with chronic disorders like cardiovascular dieases,[13,14] and diabetes Mellitus. However, keeping in view our study subjects who are medical students within the age range of 18-25 years and majority having an average normal BMI, we did not include the associated cardiovascular and metabolic disorders which are mainly developed in later stages of life.

In the United States, Australia and Europe, measures such as sit-stand workstations have been used to reduce sitting time by up to 143 minutes in a workday.[15] However, some factors, including organizational structure, physical environment, interpersonal communication, and intrapersonal factors (such as attitude) may also be involved in reducing the sitting time.[16,17] According to a study, the use of height-adjustable workstations caused office workers to sit less and with use of these workstations symptoms of musculoskeletal disorders in the upper limbs were reduced. Moreover, their efficiency, attitude, and moral sense improved.[18]

LIMITATIONS OF STUDY

Due to COVID-19 restrictions, our study was conducted online through google forms and utilized self-reported data, limiting the validity of the data to some extent. Moreover, since the study was targeted towards medical students only so the results could not be generalized to whole population.

RECOMMENDATIONS

Based on the findings of our study, active breaks in between long sitting hours are recommended to prevent any sort of musculoskeletal issues. Maintaining a proper posture while sitting i.e., with back supported and neck in a straight alignment with lower back, can help relieve the adverse effects of long sitting hours. Moreover, at least 1 hour of daily physical activity is recommended for prevention of musculoskeletal adverse effects related to prolonged sitting.

CONCLUSION

Prolonged sitting has adverse effects on posture of medical students. Our study revealed that continuous sitting without active rest bouts was seen to have musculoskeletal adverse effects which were more pronounced in shoulders, lower back and upper back. Poor posture was also demonstrated to cause pain in the shoulder and upper back regions. BMI did not seem to have a positive association with adverse musculoskeletal effects as most of the participants taking part in the research had a normal BMI. Decreased average daily physical activity (less than 1 hour) was seen to be a contributing factor towards the negative effects on posture and general wellbeing of medical students. Complaints of body ache in the regions of elbow, ankle, wrist and knee were found to be relatively infrequent did not show significant association with long hours of continuous sitting and bad sitting posture.

Conflicts of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

SFM: Conceptualization and design of study statistical analysis Technical Support Reviewing of manuscript & final apporval of the version to be published.

NK:Conceptualization and design of study statistical analysis Editing of manuscript & final apporval of the version to be published.

AS: Data collection data Entry data Analysis & final apporval of the version to be published.

QI: Questionnaire design data collection data entery data analysis & final apporval of the version to be published.

FJR: Data collection introduction Methodology & final apporval of the version to be published.

MS: Data collection Discussion & final apporval of the version to be published.

AA: Data Collection Results Conlusion & final apporval of the version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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