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Musculoskeletal pain among medical students and its association with perceived stress level: A cross-sectional study

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Abstract:

BACKGROUND: Musculoskeletal pain (MSP) is common among medical students across the world. The present study was done to estimate the prevalence of MSP among medical students in the state of Sikkim, India, and to assess perceived stress levels among medical students and its association with MSP.

MATERIALS AND METHOD: A cross-sectional study was carried out at a private medical college in the state of Sikkim, India. Fifty students each from the third, fifth, seventh, and ninth semesters were included in the study. Students were asked to complete a questionnaire that included data regarding lifestyle habits and activities, the modified Nordic scale for MSP, perceived stress score (PSS-10), and Oswestry disability index (ODI) questionnaire.

RESULTS: The majority (73%) of the participants reported one or more episodes of MSP in the past 12 months and 50% of them had pain in the past 7 days. No significant association was found between MSP and lifestyle habits, mean time spent on physical activities and sedentary behavior. The perceived stress level was significantly higher among those with MSP in the past 12 months (19.7 ± 5.6) (*P*-0.021), as well as in those who had MSP in the past 7 days (20.8 ± 5.5) (*P*-0.001). Severe pain was significantly associated with a higher perceived stress score (23 ± 5) (*P*-0.003). Students who had MSP in the past 12 months as well as in past 7 days had a higher quality of life score (9.8 ± 10.6, *P*-0.039 and 13 ± 10.9, *P*-0.000, respectively).

CONCLUSION: The majority of our medical students have experienced musculoskeletal pain in the past 12 months, which is significantly associated with perceived stress and quality of life.

Keywords:

Medical education, musculoskeletal pain, perceived stress, quality of life

Introduction

"Musculoskeletal pain" (MSP) is considered a major cause of chronic pain, and could lead to reduced educational attainment, and absenteeism from university lessons.[1] Various risk factors identified for the development of MSP range from body morphology to lifestyle activities to psychological aspects.[2-5]Among them, occupation could be considered one of the major contributors to the development of MSP.[6] Healthcare workers, particularly surgeons and interventionists, commonly suffer from musculoskeletal problems.[7] Studies have implicated that low back pain (LBP) among healthcare workers begins before they start working,[8] which brings our attention to the years of their training. Available literature suggests that there is a high prevalence of MSP among medical

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students.[9-13] Undergraduate training for medicos is different in each country. Hence, these results cannot be generalized as a whole. To the best of our knowledge, only two studies have been done related to MSP among medical students in India, and have shown a high prevalence of LBP,[11] and neck pain.[12]

In view of the suspected high prevalence of musculoskeletal problems among medical students, the present study was done to estimate the prevalence of MSP among MBBS students of a private medical college in the state of Sikkim, India. The study aimed to correlate various previously identified risk factors with MSP and to assess perceived stress levels among medical students and its association with MSP.

Material and Methods

Study design and setting

This cross-sectional study was carried out at a private medical college in the state of Sikkim, India, with an annual intake of 100 students for the course of MBBS. The study aimed at estimating the prevalence of MSP among medical students in Sikkim state and identifying risk factors associated with MSP. We also assessed the perceived stress score (PSS) and quality of life (QoL) among medical students and their association with MSP.

Study participants and sampling

The study was carried out in the months of September and October of 2019, keeping in mind the academic calendar, as well as weather conditions of the region. Out of 400 medical students, who were part of the old National Medical Council curriculum for MBBS, a total of 200 students were enrolled in the study. Fifty students each from the third, fifth, seventh, and ninth semesters (referred here on as first-, second-, third-, and fourth-year batches, respectively) with odd roll numbers were included in the study from every batch. Those who gave a history of diagnosed organic cause for MSP such as connective tissue disorder, history of trauma, infective pathology, or presently suffering from any illness were excluded from the study. In such a case, the subsequent roll-numbered student was asked to fill out the questionnaire.

Data collection tool and technique

After obtaining informed written consent, students were asked to complete a pretested, self-administered questionnaire. The questionnaire was prepared in the English language and consisted of 3 sections. Section 1 of the questionnaire was used to obtain basic demographic details of participants and their health behavior activities. The body mass index (BMI) was calculated based on self-reported weight and height and graded as: underweight (<18.5 kg/m^2), normal (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), and obese (>30.0 kg/m^2).[14] Lifestyle habits such as coffee/tea intake, tobacco, and alcohol consumption were recorded as never, occasionally (a few days of the week), and regularly (most days of the week). Time spent on physical activities and sedentary activities was recorded as approximate minutes (in multiples of 15) spent in a week.

WHO recommends 150 to 300 min of moderate-intensity physical activities per week, in the form of exercise, sports (indoor/outdoor), yoga, and brisk walking, for young adults.[15] Accordingly, we recorded the approximate amount of time (minutes per week) spent on these activities and summed them together. The total time was considered as "Summed Physical Activity" (SPA) time per week.

Similarly, sedentary behavior is defined as " any waking behavior characterized by an energy expenditure of ≤1.5 metabolic equivalents (MET) while in the sitting or reclining posture."[16,17] Accordingly, the time spent on sedentary activities such as watching television, using a computer, playing video games, and studying was recorded as minutes per week and was summed up to obtain "summed sedentary behavior" (SSB) time per week.

In Section 2, a modified Nordic scale questionnaire was used to record information regarding MSP.[18] Participants had to answer about the presence of pain in the upper or lower extremities and spine area, in the past 12 months and in past 7 days. Pain intensity was evaluated by a "10-point visual analog scale" (VAS). Mean VAS values were calculated to form an overall pain score. Visual analog scale scores were categorized as "no pain" for scores equal to 0, while scores between 1–4, 5–7, and 8–10 represented as "mild," "moderate," and "severe" pain, respectively.

Perceived stress was analyzed using the perceived stress scale (PSS-10),[19] originally developed by Cohen S.[20] The PSS-10 questionnaire has 10 questions and assesses psychological stress levels as perceived by the participants over the past 4 weeks. Total scores on the PSS range from 0 to 40 and were interpreted as "low stress" (0 to13), "moderate stress" (14 to 26) and "high stress" (27 to 40).[21]

To assess the quality of life (QoL), the Oswestry disability index (ODI) questionnaire was used. Oswestry disability index (ODI) is considered as the gold standard to assess limitations in life caused by low back pain.[22] Total scores were interpreted as a minimal disability (0–20), moderate disability (21–40), severe disability (41–60), and crippled (61–80). Patients with scores above 81 were

considered as either bed-bound or exaggerating their symptoms.[23]

Statistical analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 20 (IBM Corp, Armonk, NY, USA). For categorical variables, frequency and percentage were calculated with a 95% confidence interval (CI). Mean and standard deviation (SD) were calculated for continuous data. The Chi-square test was used to compare categorical data (likelihood ratio and Fisher's test were used where applicable). Means were compared using "independent t test" and "One-way ANOVA test" for normally distributed data, and nonparametric independent tests such as "Mann–Whitney U test" and "Kruskal–Wallis test" were used for non-normally distributed data. For all analyses, a *P* value of <0.05 was considered statistically significant.

Ethical clearance

Ethical clearance was obtained by the institutional ethics committee (SMIMS IEC Registration No: IEC/522/19-58).

Results

Out of the 200 distributed questionnaires, 199 were completely filled. The mean (± SD) age of the participating students was 21.16 ± 3 years. Of the 199 participants, 109 (55%) were females and 90 (45%) were males. The mean (± SD) BMI of participants was 22.1 ± 3 kg/m2. [Table 1].

Comparison between MBBS batches

On comparing students of different batches of MBBS, [Table 2] it was seen that the BMI of third-year students (23.5 ± 3) was marginally better as compared to other batches; however, it was not significant (*P*-0.061). Interestingly, it was noted that first-year students spent more time on physical activities (117 ± 72 min/week), whereas final-year students significantly spent the least (67 ± 67 min/week) (*P*-0.006). The time spent on "summed sedentary behavior" by students as a whole was 1275 ± 726 min/week, which did not differ significantly among different batches (*P*-0.346). There was no significant difference among batches, with respect to lifestyle habits such as caffeine intake, smoking habits, or alcohol intake.

Musculoskeletal pain among participants and factors associated

The majority of participants (*n* = 171, 86%) responded as having one or more episodes of MSP in the past 12 months and 85 (50%) of them had pain in the past 7 days. Among those who reported MSP, 57% were females, with no significant difference between genders (*P*-0.232). There was no statistical difference in the occurrence of MSP among the different batches of MBBS (*P*-0.443). The majority (70%) of the symptomatic students complained of pain in multiple areas. No significant association

Table 1: Characteristics of study participants

Variables	Total observed=*n* (percentage)	Musculoskeletal pain in past 12 months		Statistical significance, *P*
		Present	Absent	
Gender				
Male	90 (45%)	73 (81%)	17 (19%)	0.232†
Female	109 (55%)	98 (90%)	11 (10%)	
MBBS batch				
First	49 (24.6%)	42 (86%)	7 (14%)	0.443†
Second	50 (25%)	45 (90%)	5 (10%)	
Third	51 (25.6%)	40 (78%)	11 (22%)	
Fourth	49 (24.6%)	42 (86%)	7 (14%)	
Mean BMI (kg/m^2)	22.1±3	22.7±3.4	23±2.7	0.64#
Lifestyle habits				
Caffeine intake (coffee/Tea)				
Never	11 (5%)	8 (73%)	3 (27%)	0.562†
Occasional	105 (53%)	90 (86%)	15 (14%)	
Regular	83 (42%)	71 (85%)	12 (15%)	
Tobacco intake (smoking/chewing)				
Never	136 (68%)	119 (88%)	17 (12%)	0.325†
Occasional	46 (23%)	37 (80%)	9 (20%)	
Regular	17 (9%)	13 (76%)	4 (24%)	
Alcohol intake				
Never	91 (46%)	78 (86%)	13 (14%)	0.954†
Occasional	101 (51%)	85 (84%)	15 (16%)	
Regular	7 (3%)	6 (86%)	1 (14%)	

†-"Chi-square test" was used for analysis, #-"independent *t*-test" was used for analysis. *P*<0.05 was considered as significant

was found between MSP and lifestyle habits [Table 1], physical activities or sedentary behavior [Table 3].

Table 2: Comparison between different batches of students

	Batch	Mean±SD	Statistical significance
BMI (kg/m^2)	First	22.7±3	0.061†
	Second	23±3	
	Third	23.5±3	
	Fourth	± 3	
Summed physical activity time (minutes/week)	First	117±72	0.006**†
	Second	80±76	
	Third	95±73	
	Fourth	67±67	
	Fourth	505±291	
Summed sedentary behavior time (minutes/week)	First	1377±823	0.346†
	Second	1338±871	
	Third	1185±572	
	Fourth	1163±550	
PSS score	First	19±5	0.352$^{\#}$
	Second	20±5	
	Third	18±5	
	Fourth	20±6	
QoL score	First	8.8±9.4	0.089†
	Second	9.4±11	
	Third	6.8±6.9	
	Fourth	11.9±12.2	

BMI - body mass index, PSS - perceived stress scale, QoL - quality of life. †Nonparametric "Kruskal-Wallis test" was used for analysis, $^{\#}$One way ANOVA test used for analysis. **P<0.01

The perceived stress level of students was assessed using the PSS-10 score [Table 4]. The mean stress score of participants was 19.3 ± 5.6. Perceived stress scores were significantly higher among female students (20.2 ± 5.7) as compared to male students (18.3 ± 5.3) (P-0.018). The perceived stress level was significantly higher among those who had MSP in the past 12 months (19.7 ± 5.6) (P-0.021), as well as those who had MSP in the past 7 days (20.8 ± 5.5) (P-0.001). Severe pain was significantly associated with a higher PSS score (23 ± 5) (P-0.003). Although there was no significant change in stress scores among students of different batches, it was noted that the mean PSS score across batches was in the range of moderate stress level, with second-year and final-year students having higher PSS scores [Table 2].

To assess quality of life (QoL), the Oswestry disability index (ODI) was used, with a higher grade suggesting progressively restricted mobility. The mean QoL score was significantly higher among those who had MSP in the past 12 months [9.8 ± 10.6 (P-0.039)] and in those who had pain in the past 7 days [13 ± 10.9 (P-0.000)]. Similarly, students with severe pain had a considerably poorer QoL (31.4 ± 13.5, P-0.000) [Table 4]. Although final-year students had relatively higher QoL scores, there was no significant difference in the quality of life among students of different batches [Table 2].

Table 3: Correlation between MSP and daily activities

Activities	Total time spent (minutes/week) (mean±SD)	Musculoskeletal pain in past 12 months		Statistical significance$^{\#}$
		Present	Absent	
Summed physical activity	88±74	92±76	77±68	0.331
Studying on a desk and chair	310±277	304±278	330±276	0.629
Studying on a couch	187±231	185±225	175±236	0.575
Watching TV	36±70	35±77	38±63	0.754
Desktop computer usage	76±136	75±127	90±183	0.935
Laptop usage	181±214	178±213	185±203	0.504
Mobile phone usage	519±308	524±307	470±319	0.409
Summed sedentary activities	1275±726	1268±710	1250±779	0.804

$^{\#}$Nonparametric test "Mann-Whitney U test" was used for analysis

Table 4: Correlation between musculoskeletal pain and perceived stress scale score and quality of life score

Musculoskeletal pain (MSP)	PSS score (mean±SD)	Statistical significance	QoL score (mean±SD)	Statistical significance
MSP in past 12 months				
Present	19.7±5.6	0.021*†	9.8±10.6	0.039*$^{\#}$
Absent	17±5.2		5.5±6.5	
MSP in past 1 week				
Present	20.8±5.5	0.001**†	13±10.9	0.000***$^{\#}$
Absent	18.2±5.4		6.3±8.6	
Severity of pain				
Mild	18.5±5.6	0.003**†	5.4±7.2	0.000***^
Moderate	18.5±5.6		12.3±0.3	
Severe	23±5		31.4±13.5	

PSS - perceived stress scale, QoL - quality of life. †"independent t-test" was used for analysis. $^{\#}$Nonparametric test "Mann-Whitney U test" was used for analysis. ^nonparametric "Kruskal-Wallis test" was used for analysis *P<0.05, **P0.01, ***P<0.001

Discussion

Our study showed that 73% of the students had experienced one or more episodes of MSP in the past 12 months, and almost 50% of them had acute pain.

Various studies have been done to assess the burden of musculoskeletal problems among medical students in countries across the world.[9-13,24-29] Unfortunately, till now only a couple of studies have been done in this regard in India. One of them reported that 48% of the study group at one of the medical colleges in New Delhi had low back pain (LBP) in a span of 12 months,[11] and the other reported that 58% of the study group had neck pain.[12] Although these studies were assessing symptoms related to a particular area (i.e., low back pain and pain in the neck, respectively), these are the only studies available to compare our present study. As our study considered symptoms in all the musculoskeletal areas, it showed a higher (73%) prevalence of MSP in the past 12 months, which is similar to studies conducted on medical students in Saudi Arabia (85%),[16] China (67%),[25] and Malaysia (65%).[29]

A sedentary lifestyle, in common perception, has always been linked to several health problems. However, the link between sedentary behavior and MSP remains uncertain. Systematic reviews and meta-analysis reports on this topic are contradictory. In their meta-analysis, Baradaran Mahdavi *et al*.[30] concluded that "sedentary behavior" is associated with a moderate increase in the risk of LBP, whereas Alzahrani H *et al*.,[31] in their meta-analyses, indicated no relation between sedentary behavior of different durations as a risk factor for LBP. Similarly, in our study, we did not find a significant association between "summed sedentary behavior" time and MSP, much like other studies on MSP in medical students.[26,28,32]

WHO recommends 150 to 300 min per week of moderate physical activities for adults.[15] It was noted that on average our students spent 88 ± 74 min on SPA in a week, which is less than the WHO recommended time. IC Benlidayi *et al*.,[26] in their study comparing MSP between medical and dental students, recorded 2.1 ± 3.3 hours per week of exercise in medical students. Compared to this, our students are spending lesser time in such activities. Although we did not find any significant correlation between SPA time and the presence of MSP, this is a matter of concern. The correlation between "regular exercise" and musculoskeletal-related problems is contradictory. Amelot *et al*.,[13] in their study, suggest that at least 30 min walking per day reduces the occurrence of LBP. Similarly, Behera *et al*.,[12] in their study, showed a lower prevalence of neck pain among those who did regular exercise, whereas few other studies did not find a significant association between exercise and MSP.[11,24,26,28] The lack of a proper description of "regular exercise" and its quantification in these studies might be the reason for discrepancies in the correlation between MSP and physical activities.

Musculoskeletal pain and its relation with perceived stress and quality of life

Perceived stress score among our students was in the range of moderate stress level (19.3 ± 5.6). Studies done in the southern part of India to assess psychological stress levels among medical students using the same scale as ours have recorded a higher mean PSS score of 25.64 ± 5.44 and 27.53 ± 7.01.[33,34] Grossly, it appears that our students are relatively less stressed than students of other regions in India. But the fact that in general, medical students are having higher stress levels cannot be ignored. Previous studies have pointed out the vastness of the academic curriculum, fear of failure or poor performance in the examination, lack of recreation, loneliness, and family problems as major contributors to increased stress levels among medical students.[33-35]

Although there was no significant change in mean PSS score between different batches of students, in our study, it was seen that the second-year students and final-year students scored higher on the stress scale, which is similar to other studies done in India.[33,34,36] It was also noted that PSS score was significantly higher among female students as compared to males, similar to other studies.[32,35]

There was a strong association between MSP and perceived stress levels among students in our study, similar to other studies.[11,25,28,37] Studies have attributed this positive correlation between MSP and perceived stress to an increase in muscle tension by psychological stress, especially in central body areas such as the neck and shoulder, thus increasing the risk of musculoskeletal disorders.[38,39] However, Hendi *et al*.,[40] in their study on MSP and its correlation with stress among medical students, found no significant correlation between the two.

Pain in any form and region can have implications on QoL. Although previous studies have not assessed the QoL using the same scale as our study, Amelot *et al*.[13] noted that LBP had a very significant repercussion on the daily personal schoolwork, the quality of sleep, and personal life of students. Similarly, we found that QoL scores were significantly high (poor QoL) among those who had MSP. It was also strongly correlated with the intensity of pain and pain in the past 7 days.

Strengths of the study

The newly formed National Medical Council, India, implemented competency-based undergraduate

curriculum from the year 2019. Hence, to the best of our knowledge, this would be the only study available to compare the development of MSP among medical students of old and new curricula and to compare the relation between MSP and perceived stress, as no such studies are available in India at present.

The study used the time spent on activities and considered summed physical activities and summed sedentary behavior time, instead of using an ordinal scale, which would be ambiguous, as no definitive criteria are available for "occasional," "regular." The study used gold standard scales in measuring perceived stress levels and quality of life. The above-mentioned changes in our methodology indeed have been mentioned as limitations in other studies done on the same subject.[15,16,17,31]

Limitations and recommendation

The risk of response bias and recall bias are major limitations of our study, as we mainly recorded events of the past year. The study is from the only medical college present in the state, which may limit the generalization of results elsewhere in the country. The study did not record the number of episodes of MSP among participants. The cross-sectional design of the study prevents us from establishing a cause–effect relationship. Prospective studies using better study design are to be encouraged in the future to circumvent this problem.

Conclusion

The majority of our medical students have experienced musculoskeletal pain in the past 12 months, which is significantly associated with perceived stress and quality of life. Although no significant association was found between a sedentary lifestyle, physical activities, and musculoskeletal pain, better lifestyle habits are to be encouraged among students. Multicentric prospective studies are needed in India to tackle this issue in the future.

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Conflicts of interest

There are no conflicts of interest.

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