

Musculoskeletal disorders and associated risk factors in coaching students: A cross-sectional study

John Ashutosh Santoshi¹, Siddharth Jain²,
Harshanand Janardhanrao Popalwar³, Abhijit P. Pakhare⁴

Departments of ¹Orthopaedics and ⁴Community and Family Medicine, All India Institute of Medical Sciences, Bhopal, ²Department of Orthopaedics, Government Medical College, Vidisha, Madhya Pradesh, ³Department of Physical Medicine and Rehabilitation, Safdarjung Hospital, VM Medical College, New Delhi, India

ABSTRACT

Background: Coaching institutes attract students aspiring for admission to professional courses and jobs. Physical stress during coaching includes poor study posture and sitting on chairs improperly in overcrowded classes for prolonged periods. Many students attending the coaching institutes report to outpatient clinics of multiple specialties with musculoskeletal disorders (MSD). **Materials and Methods:** We carried out a cross-sectional study of 500 coaching students. We ascertained the 12-month MSD (period prevalence) and last 7-day MSD (point prevalence) using the Nordic Musculoskeletal Questionnaire. The duration of attending classes, hours of daily study, and duration of sitting continuously at a stretch were also enquired. **Results:** A total of 488 responses were retrieved. Males and females accounted for 63.9% and 36.1%, respectively. The respondents' mean age was 18.6 ± 1.06 years; mean body mass index was 21.4; mean duration of attending classes was 15.6 ± 7.66 months; mean hours of daily study were 4.78 ± 1.71 hours; mean duration of sitting continuously at a stretch was 2.2 hours. The overall prevalence of MSD was 87.1%. The mean frequency of MSD per participant was 2.6. Most participants reported pain in the neck region and lower back (43%), followed by ankle/foot (36%), followed by upper back (32%), followed by shoulder (28%); knee, elbow, and wrist/hand were lesser than 20%, while hip/thigh pain was the least common symptom (8%). **Conclusion:** This study serves to sensitize the medical community to this largely under-reported problem in young individuals who are in the phase of life preparing for their future career while inadvertently risking their long-term health in the process.

Keywords: Coaching, musculoskeletal disorders, nordic musculoskeletal questionnaire, students

Introduction

Coaching institutes have sprung up all over the country, in all cities, and even in small towns. These attract students from high school onwards aspiring for admission to professional courses to post-graduates aspiring for jobs in private and public sectors. These coaching institutes offer coaching for students appearing in competitive exams like entrance exams for medical, engineering, law, chartered accountancy, post-graduate medical courses, public service commission, banking, etc.

Address for correspondence: Dr. John Ashutosh Santoshi, Department of Orthopaedics, All India Institute of Medical Sciences, Bhopal - 462 020, Madhya Pradesh, India.
E-mail: jasantoshi@gmail.com

Physical stress imposed on the body during coaching includes poor study posture and sitting on chairs improperly in overcrowded classes. This produces muscle strain, joint imbalance, and soft-tissue stresses. The muscles must hold the body in a single position for a long time, leading to prolonged immobility with a subsequent reduction in blood flow that results in muscle tension and susceptibility to musculoskeletal injury. Over time, this becomes habitual, leading to more chronic, recurring pain and episodes of pain. Adverse academic environmental factors such as poor lighting, extreme temperature, and noise can also increase the risk of injury and subsequent development of musculoskeletal disorders (MSD).^[1]

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Many students from these coaching institutes report to outpatient clinics of multiple specialties like general practice, family medicine, orthopedics, general medicine, physical medicine, etc., with musculoskeletal complaints, which commonly include pain and stiffness in various regions of the body like neck, shoulder, lower back, wrist, etc. There is a lack of research on this topic,^[2] and no statistics are available on prevalence rates of MSD among such students. Therefore, this study aimed to investigate the prevalence of MSD among students attending these coaching classes and to determine the contributory risk factors for MSD. Such data are required to suggest ergonomic furniture, lifestyle modifications, and behavioral changes in this susceptible group.

Materials and Methods

After obtaining the approval of the institutional human ethics committee, we carried out a cross-sectional study among students of selected coaching institutes. A total of six coaching institutes imparting coaching for medical, engineering, and law entrance exams were selected. A total of 500 coaching students were approached; this number was decided on logistics feasibility and based on the fact that it will be appropriate sample size for the prevalence of 30% and above with relative error of 20% of prevalence and design effect (as it is a coaching institute-based sampling) of 2. Within an institute, we selected a batch randomly and then all students of that batch were selected. The participants were provided with a detailed explanation of the content and purpose of the study. The inclusion criteria included all consenting students aged 17–27 years. We excluded all students with a history of any injury to body parts or any surgical procedures, history of receiving treatment for psychological disorders before enrollment for coaching, any physical disability causing pain, and students with sickle cell anemia and thalassemia.

The Nordic Musculoskeletal Questionnaire (NMQ)^[3] was used for the study. The NMQ includes an image of the human body, viewed from the back, which is divided into nine anatomical regions that are usually affected by MSD. It is a binary response questionnaire, with “yes” and “no,” indicating the presence and absence of MSD, respectively. Participants were asked to indicate whether they had any trouble (ache, pain, discomfort, or numbness) in any of the body parts mentioned in the questionnaire (neck, shoulder, elbow, wrist and hand, upper back, lower back, hip/thigh, knee, ankle, and foot) in the past 12 months; for those who reported in the affirmative were further questioned, if at any time, during the past 12 months, he/she had been prevented from doing normal work/attending classes because of the trouble (period prevalence), and if he/she had trouble at any time during the last 7 days (point prevalence). Weight, height, and BMI measurements were obtained for each participant. The duration of attending classes, hours of daily study, and the duration of sitting continuously at a stretch were also enquired.

The participants were given around 30 min to complete the questionnaires. The questionnaires were scrutinized for

completeness at the time of collection, and, if any information was found missing, participants were asked again for that information to be completed. All participants were advised to attend the orthopedic outpatient clinic at our institute for any MSD-related complaint and treatment.

Definition of variables

Musculoskeletal pain is pain perceived within a region of the body and believed to arise from the muscles, ligaments, bones, or joints in that region. Excluded from the definition is a pain because of serious local causes, such as tumors, fractures, or infections, and systemic and neurological causes.^[4]

Statistical analysis

We used Epi-Info 7 software for statistical analysis. Frequency and percentage were used for categorical variables, whereas numerical variables were summarized using mean and standard deviation or median and interquartile range depending upon distribution. We analyzed the difference in the distribution of various factors among students “with any MSD” and “without any MSD” as well as for “MSD of specific body part” versus “no MSD in that body part.” For this, we used the Chi-square test and *t*-test or Mann–Whitney test as appropriate. Statistical significance was considered for *P* value <0.05.

Results

Out of the 500 questionnaires administered, 488 were retrieved and were found to be evaluable with a response rate of 97.6%. Males (*n* = 312) and females (*n* = 176) accounted for 63.9% and 36.1%, respectively. The respondents' age ranged from 17 to 22 years with the mean age being 18.6 ± 1.06 years. The mean age of males (18.5 ± 1.04) and females (18.73 ± 1.1) were statistically comparable. The mean BMI was 21.4 (16.8–34.4, median 21) (males 21.68 ± 2.54 , females 20.98 ± 2.89). The mean duration of attending classes was 15.6 ± 7.66 months (male 16.06 ± 6.68 , female 14.8 ± 9.11). The mean hours of daily study were 4.78 ± 1.71 hours (males 4.56 ± 1.73 females 5.19 ± 1.59). The mean duration of sitting continuously at a stretch was 2.2 hours (1–4, median 2 hours). The overall prevalence of MSD was 87.1%. The mean frequency of MSD per participant was 2.6 (median 2, range 0–9).

Body region-wise distribution of the overall prevalence of MSD (ache, pain, discomfort, numbness) is shown in Table 1. According to the body regions, maximum number of participants reported pain in the neck region and lower back (43%), followed by ankle/foot (36%), followed by upper back (32%), followed by shoulder (28%); knee, elbow, and wrist/hand were lesser than 20%, while hip/thigh pain was the least common symptom (8%). The frequency of 12-month period prevalence [Figure 1] and 7-day point prevalence of MSD is shown in Table 2.

The duration of attending classes was more in students with neck pain and knee pain, and it was found to be statistically significant.

The hours of daily study were higher among students with ankle and foot pain, and it was also statistically significant. The duration of sitting continuously at a stretch had statistically significant difference among those with and without neck and shoulder pain. Considering MSD in any body part, statistically significant difference was noted for the duration of attending classes and hours of study; increase in the duration of attending classes and hours of daily study led to increase in MSD.

Table 3 shows the frequency of MSD in relation to the duration of coaching. The effect of duration of coaching was analyzed as two broad groups: up to 12 months and >12 months. Participants with up to 12 months of coaching reported shoulder

pain most commonly (43%) followed by neck pain (39.9%) in the last 12 months, which prevented them from doing normal work/attending classes, whereas, it was shoulder pain (28.5%) followed by upper back pain (27.4%) for participants with >12 months of coaching. The point prevalence (last 7 days) of MSD was highest for lower back pain for both groups: up to 12 months – 32.6% and >12 months – 19.6%.

Table 1: Body region-wise distribution of the overall prevalence of MSD

| Prevalence of MSD | Response | Frequency (n) | Percentage (%) |
|------------------------------|----------|---------------|----------------|
| NMQ response: neck | No | 278 | 57.0 |
| | Yes | 210 | 43.0 |
| NMQ response: shoulder | No | 352 | 72.1 |
| | Yes | 136 | 27.9 |
| NMQ response: elbow | No | 403 | 82.6 |
| | Yes | 85 | 17.4 |
| NMQ response: wrist and hand | No | 405 | 83.0 |
| | Yes | 83 | 17.0 |
| NMQ response: upper back | No | 334 | 68.4 |
| | Yes | 154 | 31.6 |
| NMQ response: lower back | No | 279 | 57.2 |
| | Yes | 209 | 42.8 |
| NMQ response: hip/thigh | No | 448 | 91.8 |
| | Yes | 40 | 8.2 |
| NMQ response: knee | No | 401 | 82.2 |
| | Yes | 87 | 17.8 |
| NMQ response: ankle and foot | No | 312 | 63.9 |
| | Yes | 176 | 36.1 |

MSD: Musculoskeletal disorder; NMQ: Nordic Musculoskeletal Questionnaire

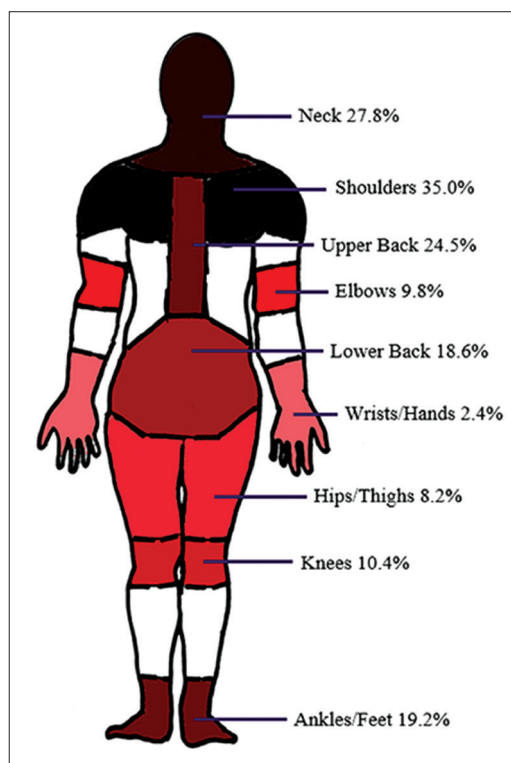


Figure 1: Image of the human body, viewed from the back, which is divided into nine anatomical regions that are usually affected by MSD as per the Nordic Musculoskeletal Questionnaire^[3] showing 12-month period prevalence of MSD. MSD: Musculoskeletal disorder

Table 2: Frequency of 12-month period prevalence and 7-day point prevalence of MSD

| | Neck | Shoulder | Elbow | Wrist and hand | Upper back | Lower back | Hip/thigh | Knee | Ankle and foot |
|----------------------------|-------------|-------------|-----------|----------------|-------------|-------------|-----------|------------|----------------|
| 12-month period prevalence | 136 (27.8%) | 171 (35.0%) | 48 (9.8%) | 12 (2.4%) | 120 (24.5%) | 91 (18.6%) | 40 (8.2%) | 51 (10.4%) | 94 (19.2%) |
| 7-day point prevalence | 77 (15.7%) | 100 (20.4%) | 36 (7.3%) | 12 (2.4%) | 84 (17.2%) | 124 (25.4%) | 17 (3.4%) | 51 (10.4%) | 56 (11.4%) |

MSD: Musculoskeletal disorder

Table 3: Frequency of MSD in relation to the duration of coaching

| | Past 12 months | | P | Last 7 days | | P |
|----------------|----------------|------------|--------|-------------|------------|--------|
| | ≤12 months | >12 months | | ≤12 months | >12 months | |
| Neck | 87 (39.9%) | 49 (18.1%) | 0.727 | 33 (15.1%) | 44 (16.3%) | 0.0001 |
| Shoulder | 94 (43%) | 77 (28.5%) | 0.0001 | 56 (25.7%) | 44 (16.3%) | 0.001 |
| Elbow | 8 (3.7%) | 40 (14.8%) | 0.832 | 5 (2.3%) | 31 (11.5%) | 0.0001 |
| Wrist and hand | 5 (2.4%) | 7 (2.7%) | 0.832 | 5 (2.3%) | 7 (2.6%) | 0.875 |
| Upper back | 46 (21.1%) | 74 (27.4%) | 0.550 | 40 (18.3%) | 44 (16.3%) | 0.203 |
| Lower back | 43 (19.7%) | 48 (17.8%) | 0.001 | 71 (32.6%) | 53 (19.6%) | 0.583 |
| Hip/thigh | 27 (12.4%) | 13 (4.8%) | 0.485 | 9 (4.1%) | 8 (3.0%) | 0.002 |
| Knee | 32 (14.7%) | 19 (7.0%) | 0.006 | 32 (14.7%) | 19 (7.0%) | 0.006 |
| Ankle and foot | 25 (12.1%) | 69 (25.8%) | 0.001 | 36 (17.3%) | 20 (7.5%) | 0.0001 |

MSD: Musculoskeletal disorder

Discussion

This study explored the prevalence of MSD and symptom severity among a cross-section of students attending coaching classes. Attending coaching classes involves long hours of sitting at one place and the mental stress of completing the vast syllabi. During this time of preparation for the competitive exams, most students have altered and irregular eating habits, sit in improper body posture for long hours, neglect regular physical exercise, have the stress of staying away from home or studying alone for long hours, etc. All this makes the students prone for musculoskeletal pains. While many students seek medical help, most neglect their symptoms or procrastinate until the exams get over.

There is strong evidence to suggest an association between MSD and physical factors.^[2,5] The pathology of MSD has always been associated with physical risk factors, such as performing high repetition tasks, exposure to vibrations, improper posture while working, and static work posture, which increase the physical loading on the joints and soft tissues, leading to injuries. However, the severity of the injuries depends on various factors, such as the frequency, duration, and intensity of the physical exposure. Various authors have reported the prevalence of MSD among college students to range between 32.9% and 89.3% in different parts of the world;^[6-10] the overall prevalence of MSD in our study was 87.1% which is comparable with other studies.

All MSD symptoms were more in males except pain in the ankle and foot which was more in females. Most studies have reported a higher incidence of most MSDs in females. Although unclear, a reason for the gender difference has been suggested that females may pay more attention to their health and well-being, or that they may have a lower pain threshold or are less resistant to constant musculoskeletal tension.^[11]

In this study, body region-wise MSD prevalence showed that most participants reported pain in the neck region and lower back. This is comparable with other reports.^[6-9,12] These regions are considered to be injury prone as they are more mobile within the lumbar and cervical curves and can be affected more easily.^[12]

Individuals with an increased BMI are known to have more musculoskeletal pain than do people with a lower BMI. BMI has been shown to be an independent risk factor for the development of MSD, and it can also increase the 12-month prevalence of MSD.^[13] According to the consensus statement for Asian Indians,^[14] 5 participants were underweight (BMI <18 kg/m²), 209 had normal BMI (18.0–22.9 kg/m²), 81 were overweight (BMI 23.0–24.9 kg/m²), and 17 were obese (BMI >25 kg/m²). There was a positive correlation between BMI and MSD in all body parts (neck, shoulders, elbow, wrists and hands, lower back, hips, knees, ankles, and foot), except for the upper back, for which a negative correlation was observed. However, none of the correlations were statistically significant.

Ergonomics is the science of designing jobs, equipment, and workplaces to fit workers. Proper ergonomic design is necessary to prevent repetitive strain injuries, which can develop over time and can lead to long-term disability.^[15] There is very limited literature available on ergonomic design for college furniture.^[16,17] The optimal seat height is about one-quarter of the body height; therefore, it is suggested that the seat height should be adjustable and have a range to fit different people who would be using it. Adjustable backrest with firm lumbar support is a desirable feature. The seat should have adequate depth to suit the tallest and the shortest users. Lastly, it should be stable for the intended purpose.^[18] Cushioned seats are better than unpadded wooden or metal seats regarding sitting comfort.^[17]

Some studies have suggested a participatory model approach along with ergonomic improvements in furniture design in dealing with work-related MSD.^[19] The students could be engaged in ergonomic education and ergonomic exercises during the time they spend in the coaching institute. Standing desks in classrooms have also been suggested to promote standing rather than sitting. These desks have been noted to reduce the likelihood of MSD of neck, shoulders, elbows, and lower back.^[20] Availability of standing desks could promote standing/light physical activity among students, which, even if for a short duration, could be beneficial in preventing MSDs. It is necessary that the teachers in these institutes are sensitized to address this preventable MSD burden and, if necessary, refer the students for appropriate medical care.

Limitations

Psychological disorders like anxiety, high distress levels, and depression have been shown to lead to the occurrence of MSD^[13] and coaching students usually have a high level of mental stress. The mental stress could have also contributed to the high level of MSD found among these students, and it would be unjustified to attribute MSD to physical factors alone. Self-reported symptoms could suffer from a recall bias leading to over or underestimation of severity as the symptoms could range from non-specific to specific and severity could range from mild, moderate to severe. There is also a likelihood of oversampling students with than without MSD. Anthropometric measurement of the students was not performed; this could have helped in suggesting suitable furniture design.

Conclusion

Students with musculoskeletal complaints from these coaching institutes could report to outpatient clinics of multiple specialties like general practice, family medicine, orthopedics, general medicine, physical medicine, etc. In fact, family physicians may be first medical contact for these students. This study serves to sensitize the medical community to this largely under-reported problem in young individuals who are in the phase of life preparing for their future career while inadvertently risking their long-term health in the process. This information can also be used by public health practitioners and policy-makers to design health strategies that target this at-risk population.

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Conflicts of interest

There are no conflicts of interest.

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