

# Prevalence and Risk Factor associated with Musculoskeletal Pain among Students of MGM Dental College: A Cross-Sectional Survey

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## ABSTRACT

**Background:** The aim of this study was to determine the prevalence and associated risk factors for development of musculoskeletal pain among the dental students of 3rd, 4th year and interns, at MGM Dental College, Navi Mumbai.

**Materials and methods:** A valid and reliable close ended questionnaire was administered to 230 students of 3rd year, 4th year and interns who met the inclusion criteria. A response rate of 77% was achieved. The variables included in the questionnaire were (1) presence of pain, (2) awareness regarding correct posture, (3) areas of the body affected by pain, (4) clinical setting, (5) practices to reduce pain. Statistical analysis was applied using Chi-square test.

**Results:** In this study, we found a total of 81% prevalence of musculoskeletal pain among the dental students. Eighty-one percent were unaware of the correct posture for dental clinical procedures.

Statistical significance was observed between different clinical activities and musculoskeletal pain when Chi-square test was applied. Maximum pain was observed in the hand (92%) followed by wrist (85%) and lower back (72%). Sixty-three percent of the students having pain performed cervical flexions and torsions to improve vision of the oral cavity. Seventy-five percent of the students reported that they were uncomfortable with their current working stool. Five percent of the participants performed exercises after clinical practice of which none reported musculoskeletal pain.

**Conclusion:** Dental students are prone to development of musculoskeletal pain due to lack of awareness regarding correct posture, prolonged static postures, inadequate operating stools and lack of exercises.

**Keywords:** Musculoskeletal pain, Ergonomics, Dental students, Operating stool, Exercise.

**How to cite this article:** Madaan V, Chaudhari A. Prevalence and Risk Factor associated with Musculoskeletal Pain among Students of MGM Dental College: A Cross-Sectional Survey. *J Contemp Dent* 2012;2(2):22-27.

**Source of support:** Nil

**Conflict of interest:** None declared

## INTRODUCTION

Dentistry is a profession that generally produces muscular pain and soreness.<sup>1</sup> The musculoskeletal health of dental professionals has been the subject of numerous studies worldwide, and their focus has been on the pain experienced by the practitioner.<sup>2</sup> Because their work area is narrow, performance of dental treatment results in a very inflexible

work posture.<sup>3</sup> Studies indicate that back, neck and shoulder or arm pain is present in up to 81% of dental operators.<sup>4</sup>

An average of 2 out of 3 dental professionals experience occupational pain. Musculoskeletal disorders (MSDs) account for the most common reason (29.3%) for early retirement age in dentists worldwide.<sup>5</sup>

Recently, 'Ergonomics' has become a popular term. The term has been used with most professions, but increasingly in the dental profession. It is a discipline that studies workers and their relationship to their occupational environment. This includes many different concepts, such as how dentists position themselves and their patients, how they utilize equipment, how work areas are designed and how all of these impact the health of dentists.<sup>6</sup>

It is very important to maintain an adequate work posture and that the instruments and furniture that the dentist is working with have adequate working characteristics.<sup>7</sup> Also, they are exposed to biomechanical risk factors, which indicate that work forced postures, would imply more risk of soreness and presence of skeletal-muscle lesions. These lesions could begin to appear at the beginning of their clinical practice as students, by acquiring inadequate postures and working habits that will accompany them for the rest of their professional life, acquiring an unhealthy lifestyle in their work environment.<sup>8</sup>

Melis M et al (2004) conducted a study to determine time to develop musculoskeletal problems among a dental student population in Sardinia (Italy). Author found out that musculoskeletal symptoms appeared after relative short clinically training period. They suggested that ergonomics should be covered in the educational system to reduce risks to dental practitioners.<sup>9</sup>

Diaz-Caballero AJ et al (2010) carried out a study to identify the ergonomics factors and the presence of muscular pain in dental students practicing at the dental clinics of the College of Dentistry, University of Cartagena, Colombia, South America. During the course of the study they found out that 80% of the students reported of muscular pain due to clinical practice. The most common site of muscular pain was in the back, neck, shoulders and hands.<sup>10</sup> Sharma P and Golcha V (2011) carried out a study among Indian dentists and found out that there was high prevalence of pain in Indian dentists.<sup>11</sup>

However, there are lacunae in data regarding musculoskeletal pain among the dental students in India. Hence, the need was felt to conduct a study to check prevalence and risk factors associated with MSDs among the students of 3rd year, final year and interns of MGM Dental College, Navi Mumbai.

## MATERIALS AND METHODS

### Objectives

1. To determine prevalence of musculoskeletal pain in dental students of MGM Dental College and Hospital.
2. To determine risk factors associated with the development of MSDs in dental students.

### Null Hypothesis

There is no musculoskeletal pain among dental students.

The cross-sectional descriptive study was carried out. Inclusion criteria of the study was:

1. The students who had been exposed to clinical setting during the 5 years of dental course, hence the dental students from 3rd year, 4th year and interns were selected.
2. Those who were present on the day of survey distribution. The exclusion criteria of the study was:
  - The students who have not been exposed to clinical work,
  - The students who have history of hospitalization and
  - Students who were absent on the day of survey distribution.

The total number of students who were eligible for this study was 300, out of which 230 students participated for the survey. The measurement tool was a self-administered close ended questionnaire. The variables included in the questionnaire were as follows:

1. Presence of pain
2. Awareness regarding correct posture

3. Areas of the body affected by pain
4. Clinical setting
5. Practices to reduce pain.

Basic demographic information was also collected. Based on these variables, a questionnaire was formed which was then subjected to validity and reliability. The questionnaire is in a simple, tick-box format consisting of 10 questions covering a number of questions having single or multiple answers.

Individual students of 3rd year, 4th year and interns were approached, who agreed to participate in the survey during scheduled lecture and clinical sessions. Study objectives were described, after which each student was given a participant information statement and questionnaire. Informed consent was implied by the voluntary completion and return of the questionnaire after 10 minutes. The students not present on that day were excluded from the survey to prevent contamination of information.

Data obtained was entered into Microsoft Excel program (2010) software. Data was obtained in number and percentages. The analysis was performed by using Chi-square test ( $\chi^2$ ) to identify the significant difference between the discrete data. Online software was used to calculate Chi-square value ([http://www.physics.csbsju.edu/cgi-bin/stats/contingency\\_form](http://www.physics.csbsju.edu/cgi-bin/stats/contingency_form)). Statistical significance, i.e. p-value was set at 0.05.

## RESULTS

Eligible sample was 300 out of which 230 participants responded (Table 1).

*Presence of pain:* An astonishing 186 (81%) of the total 230 participants reported musculoskeletal pain during clinical practice. Data regarding occurrence of pain have been listed in Table 2.

**Table 1:** Details regarding participants

Sr. no.	Year	Eligible participants	No. of participants	Males	Females
1	3rd year	100	83 (83%)	15 (18%)	68 (82%)
2	4th year	100	79 (79%)	20 (25%)	59 (75%)
3	Interns	100	68 (68%)	13 (19%)	55 (81%)
Total		300	230 (77%)	48 (21%)	182 (79%)

**Table 2:** Prevalence of musculoskeletal pain

Sr. no.	Year	No. of participants	Presence of pain	Males	Females
1	3rd year	83	65 (78%)	12 (80%)	53 (80%)
2	4th year	79	64 (81%)	18 (90%)	46 (80%)
3	Interns	68	57 (84%)	11 (85%)	46 (84%)
Total		230	186 (81%)	41 (85%)	145 (80%)

Chi-square: 0.735 at df: 2; p-value: 0.692

**Awareness of correct working posture:** Forty-four (19%) said that they were aware of the correct ergonomic posture regarding clinical practice.

**Pain experience after using vibrating instruments:** Thirteen (7%) of the participants having muscular pain complained of pain after using vibrating instruments like air rotor, micro-motor handpieces or ultrasonic scaling unit.

**Activities of clinical practice producing pain:** During an academic year students have to go through clinical postings in various disciplines of dentistry. We asked the students to report the clinical practice which produces maximum pain. Details of which are mentioned in Table 3. Statistical significance was observed between different clinical activities and musculoskeletal pain when Chi-square test was applied Chi-square value = 14.9 at degrees of freedom (df) = 6, p-value = 0.021.

**Area affected with pain:** Participants were asked to tick one or more area of body where they experienced maximum pain while performing clinical procedures (Graph 1). Maximum pain was observed in the hand followed by wrist and lower back (Chi-square = 25.9 at df = 16, p-value = 0.05).

**Change of positions during clinical practice:** One hundred and thirty-one (57%) of the participants varied the work posture during their clinical practice.

Additionally, a large number of participants [145 (63%)] reported that they do perform torsion or cervical flexions to improve vision during clinical practice.

**Comfort on the operating stool:** Only 58 (25%) of the participants said that they were comfortable working in the current operating stool.

**Position on the work stool:** Only 169 (73%) answered that they sit forward in the working stool, 51 (22%) said they sit in the middle and 12 (5%) backward in the operating stool.

Only 12 (5%) said that they performed stretching exercises after the clinic hours. And two (1%) sought medical help for their existing musculoskeletal pain all of which were interns.

### DISCUSSION

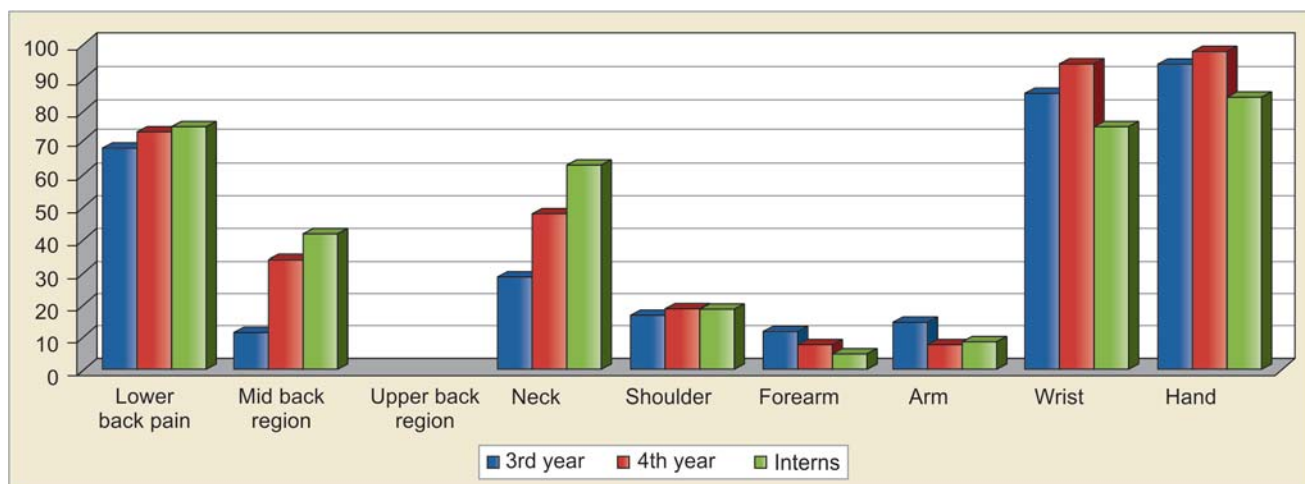
A cross-sectional study was carried out to assess the prevalence of pain and risk factor associated with the MSDs among the dental students of MGM Dental College in which out of 300 eligible dental student, 230 agreed to participate.

De Carvalho et al<sup>12</sup> in their study on 227 Brazilian dental students found an overall prevalence of musculoskeletal pain during or after clinical work in 173 students thus amounting to 76.2%. Diaz-Caballero et al<sup>10</sup> in their study found an 80% prevalence of musculoskeletal pain among dental students. This study is in agreement with the results presented since a total of 186 (81%) out of 230 students in the facility

**Table 3: Clinical activities producing pain**

Sr. no.	Year	Total participants experiencing pain	Periodontics	Endodontia	Exodontia	Prosthodontics
1	3rd year	65	57 (88%)	45 (69%)	7 (11%)	0 (0%)
2	4th year	64	63 (98%)	46 (73%)	7 (11%)	2 (3%)
3	Interns	57	44 (77%)	50 (88%)	10 (18%)	8 (14%)
Total		186	164 (88%)	141 (76%)	(13%)	10 (5%)

Chi-square: 14.9 at df: 6; p-value: 0.021



**Graph 1: Areas affected with musculoskeletal pain**

reported of musculoskeletal pain during or after clinical practice suggesting that dental students are at a high risk of developing MSDs during the course of their career.

Lindfors et al in 2006<sup>13</sup> reported that female group of dentists showed a higher incidence of muscular pain, contradictory to this, our study showed no significant difference in presence of pain among males and females.

Kanteshwari K et al (2011) conducted a study to analyze the awareness level of practitioners regarding the correctness of various postures involved in carrying out dental procedures; and estimate whether any correlation exists between correct/incorrect posture and the occurrence of MSDs. They found out that fewer than 50% of the respondents indicated awareness regarding ergonomic posture of which 70% had musculoskeletal pain.<sup>14</sup> A result of this study is in agreement with current study done where, 19% of the respondents indicated awareness regarding ergonomic postures, implying that a large number of students lack this awareness. Interestingly, among dental students who did not suffer any musculoskeletal pain 78% reported that they were aware of correct posture regarding clinical procedure. Thus, it can be concluded that the lack of awareness of ergonomic postures could be a contributory factor for musculoskeletal pain.

Musculoskeletal pain may be induced by mechanical vibrations affecting the body through the upper limbs and causing changes in the vascular, neural and osteoarticular systems. These changes may produce an occupational disease called vibration syndrome.<sup>15</sup> In this study, 15 of 186, i.e. 7% students reported of pain after using vibrating instruments, of which 67% were interns and the rest were students of final year. Due to increased frequency of use of vibrating instrument owing to an increased work load, prevalence of musculoskeletal pain is more among interns than 3rd and 4th year students.

A significant finding of this study is that prevalence of musculoskeletal pain changes with type of work among dental students. Third years (88%) and final year (98%) students reported of maximum pain in the wrist and hands during periodontics posting due to use of hand scaling instruments and also reduced level of awareness about correct postures at that stage of dental practice. Interns (78%) reported maximum pain in the lower back and hands during endodontic procedure. Data obtained for exodontia and prosthodontics were extremely low as compared to other disciplines probably because of more strained position and prolonged static posture and fine movements during endodontic and periodontic work compared to prosthodontics and exodontia.

Hand, wrist and arm pain are much more prevalent among dental professionals than the general public, due to

the sustained grips and prolonged awkward postures dentists must employ throughout the day.<sup>16</sup> Studies show that around 70% of dental students experience wrist pain by 3rd year of their dental studies.<sup>8,17</sup> However, our study shows a much higher prevalence of hand and wrist pain as a total of 172 (92%) respondents having musculoskeletal pain complained of having pain in the hand and 158 (85%) of the students reported pain in the wrist during or after clinical procedures. The results show that final year students had maximum pain in the hand (94%) followed by 3rd year (85%) and interns (74%). This may be due to more work load and stress during the 4th year and also due to use of micro-motor handpiece and manual scaling instruments.

Repetitive forceful pinching or gripping, a sustained non-neutral position, use of vibrating tools are among the major risk factors of development of musculoskeletal disorders of hand and wrists.<sup>18-21</sup>

Improper positioning of the patient in relation to the operator, back position and neutral position maintenance have been found to contribute to back pain.<sup>1,22,23</sup>

This study agrees to the findings of study conducted by KA Al Wazzan et al in Saudi Arabia which reported a high prevalence (74%) of lower back pain among dental professionals.<sup>24</sup>

We found a total of 72% prevalence of lower back pain among the participants. Interns reported a higher prevalence of lower back pain (75%) than 4th year (73%) and 3rd year (68%) owing to the long working hours in the clinic during internship.

Morse et al (2007)<sup>25</sup> reported a 37% prevalence of neck pain and 11% prevalence of shoulder pain in dental students. We found a sharp increase in incidence of neck pain from 3rd year students (29%) to interns (63%) which suggest that prolonged static postures and increased work load may be one of the major risk factors in development of musculoskeletal pain. However, no significant difference was found in the prevalence of shoulder pain which hovered around at 19%.

MSDs often are the direct result of failure by dentists to maintain neutral postures in their daily work. Unsurprisingly, research indicates that more than 80% of dental professionals complain of pain in their upper body and back due to prolonged strained positions.<sup>22</sup> In this study, we found out that 145 (63%) of the participants performed cervical flexion and torsions to improve vision and access to the oral cavity. All of these students had either lower back, neck or shoulder pain. This indicates that abnormal twisting or bending and working in a strained position causes musculoskeletal pain.

Studies have shown that lumbar support of an adequate operating stool helps preserve the lumbar curve, reducing

muscle activity, disk pressure, as well as back and leg pain.<sup>26,27</sup> Therefore, it is very important to have an ergonomically stable stool in the dental operator to reduce the incidence of musculoskeletal disorders. In this study, we found that only 25% of the students were comfortable with their current operating stool.

In regard to muscle activity, results of a study conducted by JL Hardage et al (1983)<sup>28</sup> suggest that the dental operator should sit low with the lumbar support always in contact with the lower back as it is a significant factor in reducing muscle activity of the upper and lower back for the dentist practicing sit-down dentistry. In contrast to the above stated it has been observed in this study that 169 (73%) of the total respondents said that they sit forward in the working stool, 51 (22%) said they sit in the middle and 12 (5%) backward in the operating stool. This represents a clear deficit in the knowledge of ergonomics while delivering dental procedures.<sup>29</sup>

Dentists should perform specific exercises for the trunk and shoulder girdle to enhance the health and integrity of the spinal column; stretching exercises for the hands and head and neck; maintain good working posture; optimize the function of the arms and hands; and prevent injuries.<sup>4</sup> However, in this study only 12 (5%) of the total 230 participants said that they performed stretching exercises after college hours. In accordance with the above stated facts none of them complained of any musculoskeletal pain.

The results from study may be difficult to generalize as students were recruited from a single dental faculty. The sample size in this study was not calculated as there was lack of previous data, hence given these findings, future research may benefit from including more specific questions related to instrument use and hours of clinical practice per day.

## CONCLUSION

By and large, dentists 'put up with' their pain because they do not know specifically what has caused it, much less what to do about it. When many of their professional colleagues have similar musculoskeletal symptoms, the logical conclusion is that such symptoms and their sequelae are an unavoidable part of the work of the profession. So they continue to work for their equipment more often than not (rather than making their equipment work for them), and the cycle continues. This study suggests a high prevalence (81%) of musculoskeletal pain among dental students and clearly indicates a concern for the future occupational health of this group. The result of this study identifies certain risk factors for the development of musculoskeletal pain which are lack of awareness about correct working posture, increase in frequency of use of vibrating instruments, prolonged static postures, performing exaggerated flexions

or cervical torsions, inadequate operating stools and lack of exercises. This shows that development of musculoskeletal pain is multifactorial in origin. Adopting adequate postures in clinical practice and having a favorable work environment could reduce the frequency of musculoskeletal pain thus, avoiding an early retirement from the profession. Therefore, dental professionals need to carefully consider the adoption of appropriate strategies to help minimize the impact of this important occupational health issue on the next generation of dental practitioners, and make sure that ergonomics of dental setting is appropriately taught to the students right from their inception in dentistry, to intercept development of MSDs.

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