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## Evaluation of Ergonomics and Musculoskeletal disorders among Post-graduate dental students

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### Abstract

Musculoskeletal disorders (MSD) are characterized by the presence of discomfort, disability and persistent pain in the joints, muscle, tendon and other soft parts caused or aggravated by repeated movements and prolonged awkward or forced body postures. The etiology of musculoskeletal disease is multifactorial, with the involvement of biomechanical, individual and psychological factors related to work. Due to prolonged awkward or forced posture at work and failure to adopt preventive measures, dental professionals are at risk of suffering musculoskeletal disorder. This study was a questionnaire based study done in post-graduate dental students from different dental colleges in Bangalore to assess the location of musculoskeletal pain, and to identify the variables related to the occurrence of musculoskeletal signs and symptoms.

**Keywords:** ergonomics, musculoskeletal disorders

### 1. Introduction

The World Health Organization defines a Musculoskeletal Disorder (MSD) as “a disorder of the muscle, tendons, peripheral nerves or vascular system not directly resulting from an acute or instantaneous event (e.g. slips or falls).”<sup>[1]</sup> Dentist are normally included within the group of professionals at risk of suffering musculoskeletal disorder due to prolonged awkward or forced posture at work and failure to adopt preventive measures.<sup>[2]</sup> Dental professionals commonly experience musculoskeletal pain during the course of their careers. While the occasional backache or neck ache is not a cause of alarm, if regularly occurring pain and discomfort is ignored, the cumulative physiological damage can lead to an injury or a career ending disability (Valachi *et al* 2003)<sup>[3]</sup>. In a 2010 study Pargali found that 73% of dentist complained of back and neck pain, even after the evaluation to seated four handed dentistry and ergonomic equipment<sup>[4]</sup>. Dental profession are at a greater risk of work-related musculoskeletal disorders than is the general population. Leggat *et al* in 2006 found that 87.2% reported having at least one MSD and most prevalent region reported are at the neck<sup>[5]</sup>. In a study done on dental students of VIII, IX, X semesters in Colombia, Antonio- Jose *et al* reported 80% of prevalence of muscular pain. Harutunian *et al* in 2001 conducted another study to evaluate the occurrence, intensity, location and identify the variables and in students and professors from different postgraduate dental student of the University of Barcelona (Spain). The study found that most of the dentists (79.8%) had experienced some kind of musculoskeletal pain and neck was the most commonly affected location (58% of all subjects)<sup>[2]</sup>. Both the studies emphasized to promote prevention and occupational health training programs regarding ergonomic postures on dental students during their clinical practices. Our study was undertaken to assess the location of musculoskeletal pain suffered by post graduate students from different dental colleges in Bangalore, and to identify the variables related to occurrence of musculoskeletal signs and symptoms.

### 2. Material and methods

The study was conducted across different dental colleges in Bangalore. A total of 119 post graduate students of different specialties including Prosthodontics, Oral Surgery, Periodontology, Pedodontics, Endodontics, and Orthodontics who volunteered to participate were included in the study. Students suffering from previously diagnosed scoliosis, chronic lumbar pain, those who also performed other work activities requiring forced postures, who

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had undergone disc hernia surgery, history of fractures or muscular tear of lower members, those who played sports at least thrice a week were excluded. The participants' perception of symptoms were established with a set of questionnaires containing questions regarding sociodemographic information (age and gender, duration and type of professional practice), ergonomic features (working hours in the sitting and standing position, working habits, posture related questions, curvature of spine when working, placement of elbow in relation to patient mouth, condition of workplace), musculoskeletal disorders resulting from professional practice, presence and locations of pain, consequences of pain (sick leaves, need for analgesics) and preventive or mitigating measures (stretching exercise, physiotherapy, swimming, others). Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data. Chi square test was used to find relationship of pain to variables.  $p < 0.05$  was considered to be statistical significant.

### 3. Results

The questionnaire was completed by 119 students, out of which 62 were males and 57 were females. Participants work of an average of 6 days and 41.9 hours in a week.

**3.1 Ergonomic features:** Students sat 61.4% of their working hours. 91.3% students claimed to maintain their chair in ergonomic position. Only 67.5% students use backrest while working. 37.9% students work with an assistant

**3.2 Musculoskeletal disorders:** Total prevalence of musculoskeletal pain (both male and female) was 59.6%. Prevalence of musculoskeletal pain in female was 74% and males is 21%. 6.5% experienced pain on using vibrating instruments like micromotor, airtor, ultrasonic scaler. Lumbar zone was the most frequently affected area (48.5 % of the participants) followed by shoulders (44.2%), neck (42.6%), cervical zone (35.7%), dorsal zone (34.2%), wrist (25%), hand (21.4%), forearm (15.7%) and arm (15.7%). Among the students who had musculoskeletal pain, 12 % had used anti-inflammatory drugs, 24% physical therapy, 5% had used heat/ice therapy and 8.5% of students took rest as a preventive measure. Pain in cervical and lumbar regions were associated with presence of pain in other locations.

**3.3 Musculoskeletal demands:** 58.77% of the students felt that their job require frequent repetitive and forceful motions. 57.4% students claimed sustained muscle contraction in their clinical practice whereas 88.9% reported frequent bending of the neck, shoulder, elbow wrist and finger joint.

**3.4 Posture related queries:** 95.3% student's work with legs slightly separated. 82.07% students support themselves on the sole of the feet when working. With respect to placement of elbow in relation to patient's mouth, 45% of participants place their elbow in relation to same patient level (height).

**3.5 Condition of the work place:** Majority of the students consider they have enough space (84.4%) and light (92.7%) at their work place. However 27.3% felt that there is excessive noise that is annoying/distracting.

**3.6 Exercises:** Overall, 15% of the students performed stretching exercises after clinical practice and among those suffering from pain, only 16.9 % did stretching exercises.

**3.7 Relation of pain to variables:** The occurrence of pain was related to following variables: gender, curvature of spine when working, frequent and forceful bending of body, use of back rest. Prevalence of pain was more on female compared to male ( $p=0.002$ , statistically significant). Students who worked with curved upper body (curved spine) have more pain than that of straight body ( $p < 0.0002$  statistically significant). Other variables did not reach statistical significance.

### 4. Discussion

Dentists are usually included among the professionals with a higher incidence of musculoskeletal disease in the course of their professional life. Our study found 59.6% of the students have some kind of musculoskeletal pain, in coincidence with information found in literature of high incidence of MSD.<sup>[5]</sup> This result may be alarming considering the young age of the participant who have lot of years to practice ahead.

This study is in agreement with previous studies that have shown a positive relationship between MSD and inadequate postures. Many of the student suffering from MSD were working with improper use of backrest of chair, improper spinal curvatures, and improper body posture like frequent and forceful bending of neck and upper body which may be attributed to lack of knowledge and/or awareness.

Our study investigate relation of pain with other 3 variables: gender, spinal curvature while working, frequent or forceful bending body. Pain prevalence was more in students who worked with curved upper body (curved spine) compared to them who works with straight spine.

The most common area affected by pain was lumbar zone, followed by shoulder, neck, cervical zone. This is in contrast to studies that have shown that neck was the region most commonly affected by pain.<sup>[5]</sup> Coinciding with our study, most authors found that females are more susceptible to MSD than male. Some authors relate this difference to a lesser muscle tone and a higher incidence of osteoporosis among women<sup>[7]</sup>. In this work it was found that majority the students, although experiencing musculoskeletal discomfort, did not take measures to prevent or lessen the symptoms.

The risk factors for MSDs are multifactorial. It includes prolonged static postures, Improper work habits: twisting of the spine, connected with excessive tightening of some tissues and the straining of others, lack of rest, mechanical stresses, improper lighting, vibration of motor instruments, poor fitness level, poor nutrition, lack of exercise<sup>[8]</sup>. A risk factor itself is not necessarily a causation factor for any particular MSD. Many times it is not simply the presence of a risk factor, but the degree to which the risk factor is expressed that may lead to MSDs.

### 5. Conclusion

Musculoskeletal disease is multifactorial, with the involvement of biomechanical, individual and psychological factors related to work. Consequently the preventive strategy must be multifactorial and should focus on the following areas: proper ergonomics position, breaks at work, general health and physical exercise<sup>[2]</sup>. Knowledge, adopting adequate postures in clinical practice and having favorable work environment could reduce the frequency of lesions to the musculoskeletal system avoiding an early retirement from the profession. Therefore, it is of vital importance to promote occupational health training and prevention programs regarding ergonomic postures which must be acquired by dental students during their clinical practice, resulting in healthy lifestyles.

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