

## IDENTIFYING MUSCULOSKELETAL DISORDERS AMONGST DENTISTS-THE NEED FOR THE HOUR

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DOI: 10.5455/ijmsph.2014.010420144

Received Date: 20.02.2014

Accepted Date: 01.05.2014

### ABSTRACT

**Background:** The postures, in which a dentist sits, require over half of the body's muscles to work to hold the body motionless while resisting gravity. The static forces resulting from these postures have been shown to be more taxing than dynamic forces. Therefore, when the supporting muscles begin to reflect fatigue, a process of pain and discomfort begins and could very well lead to musculoskeletal injury.

**Aims & Objective:** The aim of the study was to assess the presence of musculoskeletal disorders amongst dentists practicing in Jaipur city and to determine the factors contributing towards the occurrence of musculoskeletal disorders.

**Materials and Methods:** A close ended with few open ended, self-administered questionnaire consisting of 32 questions seeking information about the recipient's prevalence of pain, practice of dentistry and the musculoskeletal symptoms was completed by all the practicing dentist of Jaipur City.

**Results:** Approximately 73.3% dentists reported having musculoskeletal pain during their dental careers. When pain was compared with the Body Mass ratio or the quetelet index of the individual no significant value was obtained. A higher overall percentage of women reported pain in the neck followed by mid-back than men, and a higher overall percentage of men reported pain in the mid-to lower back regions than women. Dental ergonomics and working postures of dentist were found to be the maximum contributors resulting in pain.

**Conclusion:** It can be concluded that musculoskeletal pain is prevalent among general dental practitioners in Jaipur city. Although, no gender variation was observed amongst the prevalence of pain. The results revealed that musculoskeletal pain is multifactorial.

**Key Words:** Musculoskeletal Disorders (MSDs); Dentists; Prolonged Static Postures (PSPs)

### Introduction

The postures, in which a dentist sits, require over half of the body's muscles to work to hold the body motionless while resisting gravity. The static forces resulting from these postures have been shown to be more taxing than dynamic forces. Therefore, when the supporting muscles begin to reflect fatigue, a process of pain and discomfort begins and could very well lead to musculoskeletal injury. An article by Valachi and Valachi (2003)<sup>[1]</sup> cited a flowchart of muscle activity and pain leading to a musculoskeletal disorder: Prolonged Static Posture → Muscle Fatigue and Muscle Imbalance → Muscle Ischemia/Necrosis, Trigger Points and Muscle Substitution → Pain → Protective Muscle Contraction → Nerve Compression, Spinal Disk Degeneration → Musculoskeletal Disorder. Muscle imbalances could result from an awkward posture. In a steady posture a slight forward bend with the neck and head tilted in an effort to get a better view, while the arms are elevated and unsupported. As this posture becomes the normal working position, the muscles responsible for supporting the working posture become stronger and shorter while the contrasting muscle group becomes weaker.

Musculoskeletal disorders (MSDs) are the most common occupational illness in world, countries like Great Britain, affecting 1.0 million people a year. They include problems such as low back pain, joint injuries and repetitive strain injuries of various sorts. Around 2% of the UK's population experiences back pain.<sup>[2]</sup>

Musculoskeletal symptom (MSS) may be defined as pain commonly experienced by dentists in the course of their career.<sup>[3]</sup> The musculoskeletal health of dentists has been a subject of many studies world over, with pain experience as the main focus. Westgaard et al.<sup>[4]</sup> and Lehto et al.<sup>[5]</sup> attributed work-related musculoskeletal pain as being of multifactorial origin. Musculoskeletal symptoms of dentists assessed by a multi-disciplinary approach. It was thought that the occurrence of MSS is posture related. In a study in New South Wales, Australia by Marshall ED et al.<sup>[6]</sup> in 1997 showed 59% of the dentists who participated in the study reported trunk pain during the previous month. A survey of dentists in Southern Thailand by Chwanadisai S et al.<sup>[7]</sup> in 2000 reported that 63.3% had experienced back pain.

Dentists often cannot avoid Prolonged Static Postures, or

PSPs. Even in optimal seated postures, more than one-half of the body’s muscles are contracted statically, and there is little movement of the vertebral joints. This may result in damaging physiological changes (microchanges) that can lead to back, neck or shoulder pain or Musculoskeletal Disorders, or MSD (macrochanges).

The present study intends to assess presence of musculoskeletal disorders amongst dentists practicing in Jaipur city using a questionnaire. To determine the factors contributing towards the occurrence of musculoskeletal disorders. To provide guidelines regarding prevention and management of musculoskeletal problems and create awareness amongst dentists in Jaipur city.

**Materials and Methods**

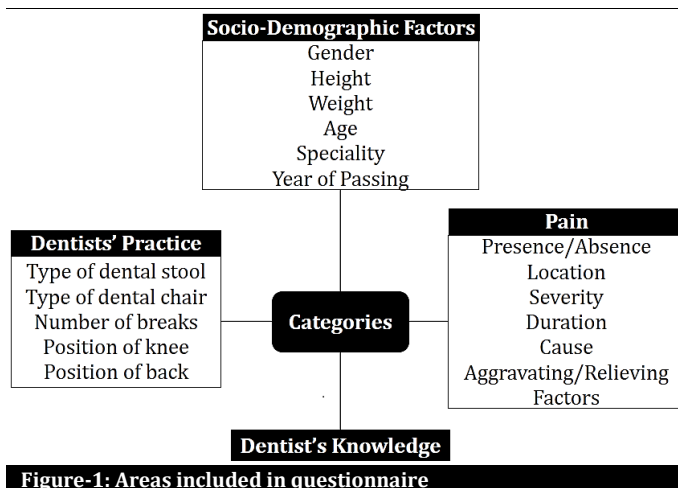
All the registered practicing dentists in Jaipur city were included for the study. Two forty, practicing dentist in Jaipur City were included in the study to which the self-administered questionnaire was taken by the author personally.

Prior to being finalized, the questionnaire was pilot-tested on a group of thirty, MDS staff members of authors institute to ensure clarity and validity. Certain questions which were found to be irrelevant were deleted and those questions which were incomprehensible were modified/rephrased to suit the comprehension level of survey subjects.

The written permission was obtained from the principal to conduct a pilot study amongst the MDS staff of the college and for the main study amongst the practicing dentists in Jaipur city.

To determine the musculoskeletal pain, a close ended with few open ended, self-administered questionnaire was framed. The questionnaire consisted of 32 questions seeking information about the recipient’s prevalence of pain, practice of dentistry and the musculoskeletal symptoms. The questionnaire also included questions assessing the knowledge and awareness of dentists about occupational hazards in dentistry. (Figure 1) The first section was designed to collect general information of the dentists practicing in the survey which included personal data and the socio-demographic profile. A variety of question formats were used including some which involved a yes/no response, a forced-choice selection response. The next section of questionnaire

provided us with information regarding the presence or absence of body pain in dentists Information regarding: the dentists duration of time in practice, the dental school attended, previous posture tuition, type of chair used, if breaks were taken and methods they had taken to alleviate pain were also gathered.



The questionnaire was designed to take approximately 10 minutes to complete. Chi-square tests using an alpha level of 0.05 were used to compare frequencies of responses in a range of categories.

The data was analyzed using common database and statistical software. For each of the parameters in the questionnaire, the percentages, means and standard deviations for each dentist for both men and women were calculated. The differences among dentist based on gender using  $\chi^2$  analysis for proportions and analysis of variance (ANOVA) for means was analyzed.

**Results**

Of the 240 (125 M and 111 F) dentists surveyed 236 responded (response rate of 98.3%) 173 i.e. 73.3% dentists reported having musculoskeletal pain during their dental careers. (Table 1 and 2) The mean age amongst men was 34.3 years and amongst females was 33.7 years. Of the total 165(69.9%) were B.D.S. while the remaining 71 were M.D.S. (30.1%).

When the body weight and mass of an individual was compared to prevalence of pain 107 dentists out of 173 were reported to be overweight. Ninety one of these 107 (85%) reported pain. Whereas 19 dentists were underweight, 16 out of these 19 experienced pain. (Table 3)

**Table-1: Distribution and mean age of dentists (in years)**

Age (Years)	Male (125)	Female (111)	Total (236)
Mean age	34.35	33.7	34.05
Minimum	22	23	22
Maximum	84	72	84

**Table-2: Gender difference Vs. Pain**

Gender	Prevalence of Pain
Male (125)	72.8%
Female (111)	73.9%

**Table-3: Prevalence of Pain vs. BMI**

BMI*	Total	% Reported Pain
Underweight	19 (8.1%)	16 (84.2%)
Normal	85 (36.3%)	61 (71.6%)
Overweight	107 (45.7%)	91 (85%)
Obese	25 (9.8%)	15 (60%)

\* Underweight: 15 to 18.4 kg/m<sup>2</sup>; Normal: 18.5 to 22.9 kg/m<sup>2</sup>; Overweight: 23 to 27.5 kg/m<sup>2</sup>; Obese: 27.6 to 40 kg/m<sup>2</sup>

**Table-4: Prevalence of pain in relation to different working positions**

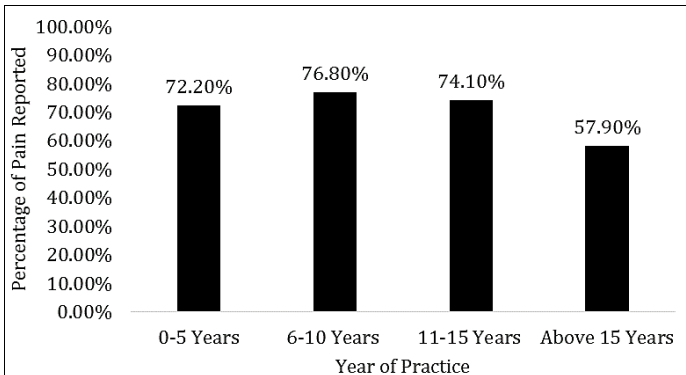
Position	Dentists	Pain (%)	No Pain (%)
<b>Position of Knee</b>			
Right position	145 (61.4%)	33.7%	66.2%
Wrong position	91 (38.5%)	57.1%	42.8%
<b>Position of back while standing</b>			
Right position	163 (69.1%)	33.7%	66.2%
Wrong position	73 (30.9%)	90.4%	6.8%
<b>Position of Back while sitting</b>			
Right position	97 (41.1%)	45.4%	52.8%
Wrong position	139 (58.8%)	60.2%	33.8%

**Table-5: Absence and duration of absence from work**

Absence from work	Yes	No	Total
Male	38 (42.3%)	52 (5.7%)	90
Female	21 (25.4%)	62 (74.6%)	83
Total	59 (34.1%)	114 (65.8%)	173
<b>Duration of absence from work</b>			
	1 week	< 1 week	> 1 week
Male	2 (5.3%)	34 (84.5%)	2 (5.3%)
Female	1 (4.8%)	20 (95.2%)	
Total	3 (5.1%)	54 (91.5%)	2 (3.4%)

**Table-6: Logistic Regression Analysis**

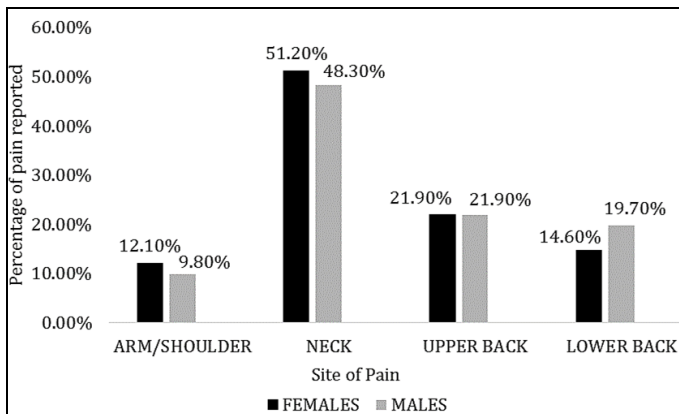
	p Value	Odd's Ratio (95% CI)
Incorrect back position while standing	< 0.05	2.44 (1.29-4.65)
Incorrect back position while sitting	0.01	4.22 (2.12-8.46)
Working without break	0.05	2.59 (1.31-5.17)



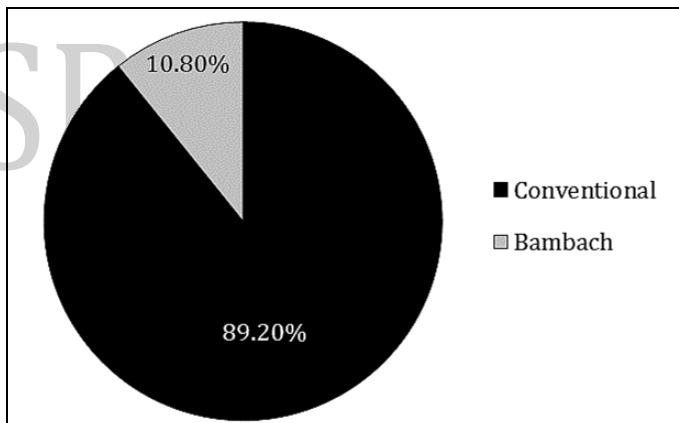
**Figure-2: Years of practices vs. reported pain**

With an increase in years of experience pain amongst dentists was reported to increase. Highest reporting to be amongst the dentist with the experience of 5-10 years

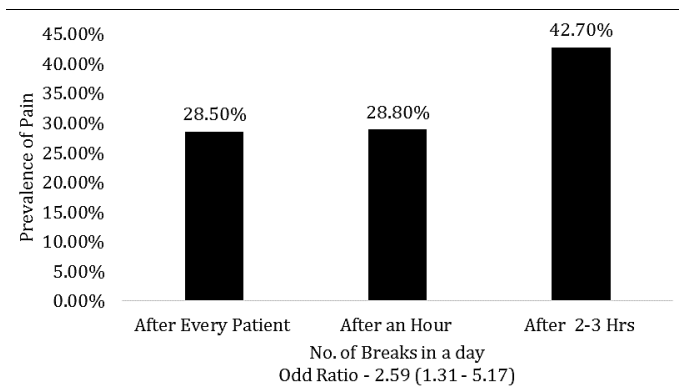
(Figure 2). Out of the four body regions ( i.e. neck /arm/upper back and lower back) pain was reported in the descending order of midback, lower back, followed by neck/shoulder area, right arm/hand and left arm/hand. Higher overall percentage of women reported pain in the neck (p = 0.005) followed by mid-back than men, and a higher overall percentage of men reported pain in the mid- to lower back regions than women (p = 0.017). (Figure 3)



**Figure-3: Site of pain**



**Figure-4: Dental Stool vs. pain**



**Figure-5: Pain VS. Number of breaks**

Out of the 38.5% dentists working in incorrect knee position (<90 degrees) 57.1% reported to have pain. Dentists working in wrong position while sitting or

standing were at a higher risk of 4 and two times respectively compared to dentists working in a correct position. (Table 4) In case of ergonomics the manually operated dental chairs were 2 times at a greater risk than those using fully –automatic. Of the 73.2% dentists using conventional stool 89.2% reported pain in comparison to the 10.8% out of 26.8% using Bambach stool. More than half of the dentists reported pain at night and in winters i.e. 88 out of 173 (50.8%). (Figure 4)

Fifty nine out of 173, i.e. 34.1% dentist had to take leave from their work. Out of the 59 dentist who took leave from the work, 54 (91.5%) was for less than 1 week. This may be due to the pain not being severe, however it is well known dentists experience other pressures from working, and absence from work may have serious financial implications (Table 5). According to Figure 5 the percentage of pain was higher amongst dentist i.e. 42.7% taking breaks after 2-3 hrs as compared to those who took breaks after every patient or procedure. When the questionnaire was subjected to univariate and multivariate analysis it revealed a risk factor of 2.59 (1.31-5.17) and 2.25 (1.11-4.56) respectively amongst dentist receiving no breaks during the day (Table 6).

## Discussion

The results show that a high percentage of dentists report some type of musculoskeletal pain. Out of the total 240 dentists 236 responded to the questionnaire. The response rate from the questionnaire was high, i.e. 98.3% being returned. The response rate according to the present study was high as the forms were personally taken to the dentist and were not mailed or posted as in the study performed by David W. Rising in 2005.<sup>[7]</sup>

An analyses of the results showed that 73.3 % of dentists have experienced musculoskeletal pain. This figure is very high and a worry for current and future dentists. Furthermore, a review article on sex differences in chronic musculoskeletal pain showed a higher percentage of neck/shoulder pain in women than in men, and a higher prevalence of mid- lower back pain in men than in women in the general population.<sup>[8]</sup> In a study by Orhede et al.<sup>[9]</sup> 1992, neck /shoulder pain was reported 49/47% for females and 29/27% for males. The present frequency of trouble in neck, shoulder and lower back were similar to frequencies reported for dentists in other countries (Runderantz et al.<sup>[10]</sup> 1990; Lehto et al.<sup>[16]</sup> 199; Milerad And Ekendvall<sup>[11]</sup> 1990; Shruger et al.<sup>[12]</sup> 1984). Regarding low back trouble, the dentists had a higher frequency of complaints than the Scandinavian

working population (approx 40%).

A study, reports of pain with number of years in dental school by David W. Rising showed that the persistence, duration and frequency of pain increased from the first to the third year of dental school.<sup>[7]</sup> In addition, the perception that dental procedure aggravating the pain increased with each year in dental school.

The traditional approach for prevention and management of dental related musculoskeletal pain is provided by Valachi K and Valachi B to adopt a proper sitting posture, reduce large scale movements and engage in periodic stretching.<sup>[1]</sup> The recommended sitting position is one with feet flat on the floor, torso vertical and a 90° angle between the calf and the thigh. It is suggested that the patient's mouth should be only slightly above the dentist's elbow height. As evidenced by pain survey data, the concept of proper sitting posture (whether utilized or not) has not eliminated pain in the dental community. This most likely result from the preference of many dentists for direct viewing during certain portions of procedures because of increased speed and/or accuracy. The unwillingness of many dentists to tilt the patients head or adjust the patients sitting angle also may contribute to strained musculoskeletal positions for the dentist. Several ergonomic investigations conclude that the least strained sitting position features an inclined backrest (130°), lumbar support and arm rests. However, others claim a detrimental effect from arm support due to stain on the shoulder joint. Although an inclined backrest results in minimal muscle activity and disc pressure, a significant problem arises when this position is used by the dentist. It is unlikely that adequate viewing of the oral cavity could be obtainable from the inclined position without excessive neck strain. However, there was no correlation between length of time in practice and presence of back pain.

In the present study dentists provided varied results when asked if they had ever been taught an "ideal" seating position. Only 39.8% were taught an ideal seating position. This may mean that more time is required in dental teaching hospitals to be spent on the seating position of a dentist in the current dental curriculum. The type of dental stool used found statistically significant values in relation to our study. Dentist experiencing pain while using conventional dental stools were 89%, whereas only 11% reported to have pain when used the Bambach type stool.

Many manufacturer provides people of many professions including dentists with a seat that claims to maintain the shape of the spine in a natural 'S-shape' rather than strained seating positions created by other chairs, therefore creating an upright posture. It is also states that the pelvis is correctly positioned during use therefore less stress is placed on the spine i.e. its curvature is controlled.<sup>[16,17]</sup> This seat is designed to mimic the position of horseback riding and hopes to reduce the pain caused by the repetitive movements and precise actions dentists perform during each working day. Similar to that of Eisenberg et al.<sup>[15]</sup> the absence of work was reported less not because the gravity of disease was less but due to the fact that dentists experience other pressures from working, and absence from work may have serious financial implications.

Breaks are very important at work and therefore we assessed this in our survey. They allow people to mobilize their bodies and relieve themselves from the stress of work. This is in affirmation with the study done by James B. Bramson concluding that dentists who take more breaks suffer less back pain.<sup>[13,14]</sup> It is reasonable to infer that changes in the way we use our body has contributed to this dramatic increase in work-related pain. In short the body must move and must move properly-to stay healthy. The static forces resulting from these PSPs are much more taxing on the body than dynamic forces. Prolonged sitting can over work soft tissues and promote pain syndromes. The resultant microtrauma from these PSPs include muscle imbalance, muscle ischemia, trigger points and spinal disc degeneration.

## Conclusion

As it is never too late to learn the correct working ergonomics and ways to prevent musculoskeletal diseases, after analyzing the results a two page pamphlet was formulated, inclusive of the normal anatomy and physiology of neck and back, the general cause for the pain and the recommended guidelines for working in the right position followed by the stretching exercises in order to help prevent musculoskeletal pain amongst dentists. These hand outs were then handed over to all the dentists practicing in Jaipur city personally.<sup>[18,19]</sup>

Further studies also should include longitudinal reports of body pain in student's population entering dental practice. Furthermore, the interplay between mechanical-ergonomics factors and mental stress should be investigated in both men and women, since data support sex differences. Before we can develop strategies for prevention of and intervention in musculoskeletal pain conditions related to the dental profession, we must understand the role of the various factors and their interaction in the appearance, maintenance and exacerbation of these chronic conditions of each sex.

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**Cite this article as:** Atri M, Nagraj A. Identifying musculoskeletal disorders amongst dentists - The need for the hour. *Int J Med Sci Public Health* 2014;3:730-734.

**Source of Support:** Nil

**Conflict of interest:** None declared