Work-related musculoskeletal disorders among dental surgeons: A pilot study

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Abstract

Aim: To describe the work-related musculoskeletal disorders among on-job dental surgeons. Objectives: To identify the musculoskeletal disorders in terms of perception of pain and stiffness experienced by the dental surgeons due to the rigors of dental work, to determine the prevailing working environment with particular reference to dental work station in relation to musculoskeletal disorders, and to find the association between pain and stiffness experienced by the dental surgeons and the selected socio-demographic variables. Materials and Methods: The study was conducted on 30 graduated dental surgeons having a work experience of 1 year or more, post graduates and faculty members of various specialties at Yenepoya Dental College Hospital, Mangalore. The subjects were selected randomly from the hospital and they were given closed-ended questionnaire to find out perception of pain and stiffness experienced in the past 6 months. The observation of the working environment was done by walk-through observational survey. Results: The study showed that 6.6% dental surgeons always experienced shoulder pain, while 83.3% dental surgeons sometimes experienced back pain and 70% sometimes experienced neck pain. Majority of the dental surgeons (73.3%) experienced stiffness in the back and 23.3% experienced severe pain in their neck. It was observed that the number of patients attended per day by the dental surgeons had a significant association (\( P = 0.024 \)) with the pain they experienced in their hip/thigh region. The frequency of pain experienced by the dental surgeons in the hip/thigh and knee joints also showed a significant association (\( P = 0.037 \)) with the height of the dental surgeons. Conclusion: The study revealed that various socio-demographic variables contributed to the musculoskeletal disorders experienced by the dental surgeons. However, the number of patients attended per day by the dental surgeons vis-à-vis pain experienced in the back, wrist, and hip/thigh was significant.

Keywords: Dental surgeon, musculoskeletal disorders, perception of pain, stiffness and dental work station

Introduction

Musculoskeletal disorders (MSDs) are described as disorders of the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs. The term “work-related musculoskeletal disorders” (WMSDs) refers to MSDs that are made worse or longer lasting by work conditions. MSDs are some of the most important work-related problems currently reported.[1] Dentists are among the most important workers of MSDs; their work includes risk factors that may lead to many pathologies such as tendinitis, synovitis, tenosynovitis, and bursitis.[2,3] Occupational diseases have not only physical, psychological, and social consequences, but also economic[4] and security impacts when they reach a level of severity that directly affects work capacity, causing absences and early retirement.

Dental surgeons often cannot avoid prolonged static postures. Even in optimal seated postures, more than one-half of the muscles of the body are contracted statically and there is little movement of the vertebral joints. This may result in damaging physiological changes that can lead to back, neck, or shoulder pain or MSDs. If regularly occurring pain or discomfort is ignored, the cumulative physiological damage can lead to an injury (macro change) or a career-ending disability.[5]

Basic operating posture is considered an important occupational health issue for dental surgeons. It is generally agreed that the physical posture of the operator should be such that all the muscles are in a relaxed, well-balanced, and neutral position. Postures outside of this neutral position are likely to cause musculoskeletal discomfort. A thorough understanding of the underlying physiological mechanism leading to these problems is necessary to develop and implement a comprehensive approach to minimize the risk of work-related injury.[6] In dentistry, bad working habits and repetitive tasks such as scaling, root planning, and uncomfortable physical postures contribute greatly to MSDs.
stress, and loss of productivity. The key objective for clinicians is to find a position that allows them to achieve optimum access, visibility, comfort, and control at all times.[7]

The objectives of this pilot study were to identify the MSDs in terms of perception of pain and stiffness experienced by dental surgeons due to the rigors of dental work, to determine the prevailing working environment with particular reference to dental work station in relation to MSDs, and to find the association between pain and stiffness experienced by dental surgeons and selected socio-demographic variables.

Materials and Methods

The study was conducted on 30 graduated dental surgeons having working experience of 1 year or more, post graduates, and faculty members of various specialties at Yenepoya Dental College Hospital, Mangalore. The subjects were selected randomly from the Hospital and they were given closed-ended questionnaire to find out perception of pain and stiffness experienced in the past 6 months. The observation of the working environment was done by walk-through observational survey.

A written consent was obtained from all the participants on a voluntary basis and ethical clearance to conduct the study was obtained from Yenepoya University Ethical Committee. The tools (Dental Workstation Observation Check List-Closed-ended questionnaire), was developed specifically for the study purpose by modifying the Ergonomics Recommendations for Dental Programs from Indian Health Service, and Musculoskeletal Disorders Rating Scale. The check list was validated by seven experts in the subject and the modifications suggested were implemented, and reliability was established on 20 subjects. The same was pre-tested on 5 subjects. Inter-rater reliability was tested for the Dental Workstation Observation Check List by using Pearson product-moment correlation coefficient (PMCC): (r = 0.672), Reliability for Musculoskeletal Disorders Rating Scale (pain and stiffness) was tested by using Cronbach’s alpha: frequency of pain – alpha (0.7933), frequency of stiffness – alpha (0.7282) and intensity of pain – alpha (= 0.6601).

The developed tools contained the following variables. Dental Workstation Observation Check List

- Manual material handling
- Physical energy demands
- Instruments
- Environment
- Other musculoskeletal demands

Musculoskeletal Disorders Rating Scale

- Socio-demographic proforma-age, gender, field of dental practice, years in profession, average working hours per day, average workdays per week, average patients treated per day, height and weight.
- Pain and stiffness-frequency of pain, stiffness and intensity of pain. Statistical analysis was performed with the SPSS version 13 statistical package. Statistical significance was accepted for P <0.05.

Results

The data on MSDs in terms of pain and stiffness are presented in Table 1. The study revealed that the frequency of pain was “always” (6.6%) in the case of shoulder and “sometimes” in the case of back and neck, which formed 83.3 and 70%, respectively. With respect to the frequency of stiffness among dental surgeons while performing their professional duties, it was observed that only 3.3% had knee pain always and a majority number of dentists observed pain sometimes in the back, (73.3%) followed by shoulder pain (46.7%) and neck pain (33.3%).

In the case of intensity of pain, it was observed that 23.3%
had severe pain in the back followed by shoulder pain (13.3%) and 66.7% had moderate pain in the back followed by neck pain (33.3%), whereas 46.7% had mild pain in the ankle, followed by 40% reporting pain in the back, wrist, and hand. Findings of the prevailing working environment in terms of the quality of dental work station [Figure 1] revealed that all the (100%) dental surgeons had to twist at the waist, and bend at the waist to handle the instruments and to achieve postures involving sustained muscle contraction of upper limb. Similarly, 96.7% required frequent bending in the neck and 90% required frequent bending in the shoulder joint. Further, the study also reveals that about 86.7% of dental surgeons were unable to change position while performing their work and 83.3% had to frequently bend their elbow joints, continuously monitoring the work, and the same percentage of surgeons were using finger pinch grip. 80% of the dental surgeons had to reach a distance greater than 20 inches to perform the work and all these activities make the job of the dental surgeon a bit difficult and thus affect their musculoskeletal health.

The association between frequency of pain and the selected socio-demographic variables presented in Table 2 shows that there was a statistically significant association between patients treated per day and pain in the hip/thigh ($P = 0.024$) experienced by the treating dental surgeons, and similarly, there was a significant association between the frequency of pain in the hip/thigh and knee and the height of the dental surgeons ($P = 0.037$). All the remaining variables like gender, age, working hours per day, and weight had no significant association with the frequency of pain in neck, back, shoulder, elbow, wrist, hand and ankle/foot.

The association between frequency of stiffness and the selected socio-demographic variables is presented in Table 2, which shows that there was a statistically significant association between age and stiffness in the neck ($P = 0.030$) and hip/thigh ($P = 0.031$). Similarly, there was a significant association between working hours per day and stiffness in the hand ($P = 0.018$) and a significant association was found between patients treated per day and stiffness in the wrist ($P = 0.048$).

Table 2: Association between frequency of pain, frequency of stiffness, intensity of pain, and the selected socio-demographic variables ($n = 30$)

| Variables               | Frequency of pain | Frequency of stiffness | Intensity of pain |
|-------------------------|-------------------|------------------------|-------------------|
|                         | Hip/thigh | Knee | Neck | Wrist | Hand | Hip/thigh | Neck | Back |
| Gender                  | 0.141     | 0.580       | 0.794 | 0.800 | 0.179 | 0.800    | 0.910 | 0.137 |
| Age                     | 0.704     | 0.243       | 0.030* | 0.448 | 0.437 | 0.031*   | 0.314 | 0.454 |
| Working (hours/day)     | 0.605     | 0.840       | 0.613 | 0.448 | 0.018* | 0.383    | 0.504 | 0.504 |
| Patients treated/day   | 0.024*    | 0.616       | 0.494 | 0.048* | 0.647 | 0.647    | 0.968 | 0.018* |
| Height                  | 0.037*    | 0.037*      | 0.348 | 0.045* | 1.000 | 0.268    | 0.638 | 0.452 |
| Weight                  | 0.385     | 0.765       | 0.796 | 0.645 | 0.341 | 0.645    | 0.033* | 0.705 |

*Statistically significant ($P < 0.05$)

Figure 1: Description of prevailing working environment (dental work station) ($n = 30$)
Also, there was a significant association between the height of the dental surgeon and the stiffness in the wrist joint ($P = 0.045$). Frequency of stiffness in back, shoulder, elbow, knee, and ankle/foot was independent of gender and weight.

The association between intensity of pain and the selected socio-demographic variables depicted in Table 2 shows that there was a statistically significant association between patients treated per day and the intensity of pain in the back ($P = 0.018$), and similarly, there was a significant association between the weight of the dental surgeon and the intensity of the pain in the neck ($P = 0.033$). Intensity of pain in shoulder, elbow, wrist, hand, hip/thigh, knee, and ankle/foot was independent of gender, age, working hours per day, and height.

**Discussion**

Dental surgeons are normally included within the group of professionals at risk of suffering from MSDs due to prolonged awkward or forced postures at work and failure to adopt preventive measures. The present study found that most of the dental surgeons had some kind of musculoskeletal pain and stiffness while performing their professional work in the last 6 months.

The mechanism of musculoskeletal pain production has been studied extensively. The onset of modern dentistry, as evidenced by four-handed dentistry, has made the major part of the dentist tasks purely sedentary in nature. This has resulted in dramatic rise in musculoskeletal symptoms.

Karwaski et al. reported that the symptoms are a product of many risk factors including prolonged static postures, repetitive movements, and poor positioning. Ratzen, on the other hand, linked musculoskeletal pain occurrence in the dentists to the frequent assumption of static postures, which usually requires more than 50% of the body’s muscles to contract to hold the body motion less, while resisting gravity. The static forces resulting from these postures have been shown to be much more tasking than dynamic forces. Repeated prolonged static postures are thought to initiate a series of events that could account for pain, injuries, or career-ending problems seen in MSDs.

Lalumandir et al. reported that all dental specialties show a high occurrence of MSDs, but with variations in frequency and locations. In this study, we found that frequency of pain varies with the number of patients treated per day in the area of hip/thigh and with the height of the dentists in case of hip/thigh and knee joints.

According to some studies, the frequency of stiffness remains stable with age. In the present study, we found that the frequency of stiffness varies with the age in case of neck and hip/thigh, while it varies with working hours per day in case of hand, and with number of patients treated and height of the dental surgeon in case of wrist. The intensity of pain varies with the patients treated per day in case of back and with the weight of the dental surgeon in case of neck.

Repetitive movements and prolonged body postures can be expected to cause muscle damage as well as ligament and joint injuries. In our study, we observed that majority of the dental surgeons had bad postures while performing their professional work.

Bernard found that 48% of workers had work-related neck disorders, 42% had work-related back disorders and 37% had work-related shoulder disorders. Contrary to this, our study showed that 73.3% had work-related neck disorders, 86.6% had work-related back disorders, and 20.6% had work-related shoulder disorders.

Yamalik reported that age, gender, and perceived general health status are strongly associated with chronic complaints and seeking medical care. Elderly people, women, and those who experience poor general health also report more chronic complaints. Back pain has been reported to be more associated with sickness absence than neck and shoulder pain. Symptoms such as carpal tunnel syndrome (CTS), ulnar nerve entrapment, pronator syndrome, tendinitis, tenosynovitis, thoracic outlet syndrome, and rotator cuff tendonitis may occur among all dental personnel. To sum up, dentists report a high prevalence of various types of work-related musculoskeletal symptoms and most are perceived symptoms from the neck, shoulders, and lower back.

The present study reveals back pain as the most common complaint of the dental surgeons under study, followed by neck pain and ankle/foot pain. The study conducted by Alexopoulos et al. gave similar results. Most studies consistently report that back pain is the most common musculoskeletal complaint among the dental surgeons.

**Conclusion**

Within the limitations of the study, MSD is a significant occupational health problem among the dental surgeons. The study revealed that various socio-demographic variables contributed to the MSDs experienced by the dental surgeons. However, the number of patients attended per day by the dental surgeons vis-à-vis pain experienced in the back, wrist, and hip/thigh was significant. However, an interventional study is needed to decrease the prevalence of MSDs among the dental surgeons.

**Acknowledgments**

The authors are thankful to all the dental surgeons who participated in the study. Special thanks to Dr. Ghulam Jeelani Qadiri, MD, Dean,
Faculty of Medicine, Prof. Padma Kumar, MPT, Dean, Faculty of Physiotherapy, Mrs. Suchirita, MSc, Statistician, and Dr. Arun, A. B., PhD, Dy. Director, Yenepoya Research Center.

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How to cite this article: Shaik AR, Sripathi Rao BH, Husain A, D’sa J. Work-related musculoskeletal disorders among dental surgeons: A pilot study. Contemp Clin Dent 2011;2:308-12.

Source of Support: Nil. Conflict of Interest: None declared.