

Stress Fatigue and Ergonomics in Dentistry

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Abstract: *The objective of this study was to evaluate the intensity of pain suffered by Dental personnel, identify the variables related to the occurrence of musculoskeletal symptoms, and establish possible preventive measures for such disorders. A cross-sectional study was made among students and faculty members from different postgraduate courses of various dental hospitals between March and April 2009. A total of 74 dentists (54 postgraduate students and 20 faculty members) were asked to complete an anonymous questionnaire containing 19 questions. Most of the dentists (79.8%) had experienced some kind of musculoskeletal pain in the last 6 months. On comparing the different locations of pain, the neck was found to be the most commonly affected location (58% of all subjects). A higher frequency of intense pain involving cervical, lumbar, dorsal and wrist area was seen in women ($p < 0.05$). Professionals dedicated exclusively to oral surgery had higher incidence of wrist pain ($p < 0.05$). No statistically significant correlation was found between the workload (hours) and pain in the different anatomical locations ($p > 0.05$). The implementation of preventive measures is necessary, in view of the high incidence of these disorders*

Key words: Musculoskeletal disorders, Ergonomics, Preventive measures, Dentists.

Introduction

In Greek, "Ergo", means work and, "Nomos", means natural laws. Ergonomics therefore, is an applied science concerned with designing products and procedures for maximum efficiency and safety. A fundamental principle of Ergonomics is to design the work area and task around the human body, rather than force the worker to adapt to poor design and task function. Dental professionals are concerned about patient comfort, but probably pay little attention to their own until they begin to experience musculoskeletal disorders. Dentists are usually included among the professionals with a higher incidence of musculoskeletal disease in the course of their Professional life.

Important advances in the field of ergonomics in dentistry have been made in recent years. These advances have focused on improving and the working environment. Though preventive measures related to the dental profession have not been adopted, the main risk factors involved must be identified in order to design adequate prevention strategies. (Szymanska., 2002; Lalumandier *et al.*, 2001).

The objective of this study was to access the intensity and location of musculoskeletal pain suffered by students and faculty members from different graduate programs (Oral Surgery, Pedodontics, Periodontics, Prothodontics, Endodontics,) of various dental hospitals; to identify variables associated with symptoms and signs of musculoskeletal disorders; and to establish preventive measures.

Materials and Methods

A cross-sectional study was conducted between March and April 2009 among 54 students and 20 teaching faculty members from various post graduate programs. (Oral Surgery, Pedodontics, Periodontics, Prothodontics, Endodontics) of various dental hospitals. Participant perceptions of symptoms were established with an anonymous questionnaire containing 19 questions that had been used in an earlier study. The study variables were divided into three groups according to the classification described by Gonzalez (2004).

1. Sociodemographic information : Age and gender, duration and type of professional practice, and leisure activities.
2. Ergonomic features : Dominant limbs, weight and height-Working hours in sitting positions. Characteristics of the working chair. Characteristics of the instrument holder.
3. Musculoskeletal disorders resulting from professional practice. Locations of pain. Additionally, within each region, a visual analog scale (VAS) was included for the quantification of pain. A set of closed or semi-closed questions was added for assessing the following points:

Consequences of pain: Sick leaves and need for analgesics. Preventive or mitigating measures: physiotherapy, swimming, others. Intensity of work, workload (days and hours of work per week), number of patients seen per week.

Statistical analysis

A descriptive and bivariate analysis (Pearson chi squared test, Student t-test and Pearson correlation coefficient) was performed with the Statistical Package for Social Sciences (SPSS version 11.5 statistical package Inc.Chicago, IL,

USA). Statistical significance was accepted for $p < 0.05$.

Results and Discussion

The questionnaire was completed by 74 professionals (54 students and 20 teaching faculty members) out of an initial sample of 100 subjects. Regarding the sociodemographic variables, 53% of the dentists who participated in the study were women, and the average age was 28.9 years (range 23-52 years). The professionals worked an average of 4.6 days and 31.6 hours a week, and attended an average of 45.8 patients during that time.

In relation to the ergonomic features, practitioners sat 77.5% of their working hours, and 89.2% were right handed. All of the respondents claimed to have a chair with a back, though 28% did not use it. In turn 52.7% of the dentists were not involved in any activity between successive visiting patients.

With regards to the musculoskeletal pain during the past 6 months, the neck region was the most frequently affected area (58% of the participants), followed by pain in the lumbar area (52.7%), and back pain (40.5%) wrist pain (27.1%) and the pain in the shoulders (24.3%) (Table 1). In turn 17.6% of the participants suffered pain in a single location, 20.3% in two locations, and 42% in three or more locations (mean=2.16; SD=1.7). Although the incidence of musculoskeletal pain was important, only 15% of the dentist included in the study applied for sick leave, and 12% had to use nonsteroidal anti-inflammatory drugs (NSAIDs). In turn, 33.8% of the respondents claimed to perform some preventive activity (sports 52% correct postures 16%, physiotherapy 16%, stretching 8% yoga 4%, massage 4%). Table 2 shows the relationship between the incidence of pain and other variables. Pain in the cervical and lumbar regions was associated with the presence of pain in other locations, with statistically significant value ($P < 0.05$) Wrist pain was more

significant in professionals who also had shoulder pain (Pearson correlation's <0.05.). The participants who did stretching or other preventive actions between patients suffered lesser low back pain, though no significant differences were found (student t test P=0.398). Oral surgeon reported a higher incidence of pain in the wrist than the rest of the professionals (Student t-test; p=0.043). No significant correlation were found between workload (week days and hours of work and number of attended patients) and pain in different anatomical locations (Pearson correlation; p>0.05)

Dentists are normally included within the group

region most commonly affected by pain was the neck, followed the lumbar zone (Szymanska, 2002). It is important to underscore that the great majority of the respondents had mild symptoms, and that only a small percentage suffered moderate or severe pain. This was more significant in professionals who also had shoulder pain (Pearson correlation; P<0.05.).

Lalumandier *et al.*, (2001) reported that all dental specialists show a high occurrence of musculoskeletal disorders, but with variations in frequency and order in different locations. Found musculoskeletal discomfort to be more frequent

Table 1.*Intensity scored by VAS: mild <40 mm; moderate 40-70 mm; severe >70mm.significant differences were found between males and females regarding pain in all locations except the shoulders (Student t-test; p< 0.05).

Location	Gender	Mean (0-100)	Professionals with pain	Mean (0-100)	Mild N (%)	Moderate N (%)	Severe N (%)
Cervical	Female	29.3	43 (58.1%)	20.9	25 (33.8%)	16 (21.65)	2 (2.7%)
	Male	13.4					
Dorsal	Female	20.1	30 (40.5%)	14.9	17 (22.9%)	10 (13.5%)	3 (4.1%)
	Male	10.1					
Lumber	Female	25.2	39 (52.7%)	19.8	22 (29.7%)	13 (17.6%)	4 (5.4%)
	Male	14.9					
Wrist	Female	13.2	20 (27.1%)	8.8	15 (23.3%)	3 (4.1%)	2 (2.7%)
	Male	4.8					
Shoulder	Female	9.7	18 (24.3%)	9.6	11 (14.8%)	3 (4.1%)	4 (5.4%)
	Male						

of professionals at risk of suffering musculoskeletal disorder, due to prolonged awkward or forced postures at work and failure to adopt preventive measures (Szymanska., 2002). Our study found that most professionals suffered some kind of musculoskeletal pain in the last 6 months, in coincidence with the information found in the literature. (Szymanska, 2002) In agreement with different studies, the

in the oral surgeon than other dental specialists, and attributed this to an increased work load (Lalumandier *et al.*, 2001; Lehto *et al.*, 1990). In our study, oral surgeons suffered more pain in the wrist (p=0.043), though no statistically significant association was found between the pain and workload (Pearson correlations>0.05). The wrist pain in oral surgeons could be explained by specific activities of this speciality,

Table 2. Indicates to what extent does the varying degrees of musculoskeletal pain affect the clinician, in terms of proficiency, physical activity outside work and sleep.

Effects of Musculoskeletal Pain In Dental Professionals				
	Pain reported	Dental Practice	Physical Activity	Sleep
Hands	46(90%)	35(75%)	37(73%)	
Arms	46(73%)	36(60%)	45(73%)	
Shoulder	44(78%)	40(72%)	30(47%)	28(61%)
Neck	50(90%)	45(87%)	33(57%)	35(61%)
Lower back	45(77%)	38(83%)	29(53%)	30(75%)

such as suturing.

Coinciding with our study most authors find that females are more susceptible to this kind of pain but the reason is unclear. Some authors relate this difference to a lesser muscle tone and a higher incidence of osteoporosis among women. (Lehto *et al.*, 1990). The role of age is even more controversial, some studies claim that pain remains stable with age (Lehto *et al.*, 1991) others believe that musculoskeletal discomfort is maximum around the sixth decade of life. A third group of authors believe that discomfort is greater in young professionals. In our study, we found young professionals to have a higher incidence of neck pain. This could be due to incorrect working postures as older dentists use more indirect vision and usually avoid neck overload (Rundercrantz *et al.*, 1990).

In this work we found that the professionals, although experiencing musculoskeletal discomfort, did not take measures to prevent or lessen the symptoms. Specifically, 33.8% of our respondents claimed to take some preventive actions. However, these actions were not the most appropriate solution, since the main preventive measures should be changing postures, taking breaks, and stretching between successive patients-and these measures were little used by our subjects. However, no decrease in pain intensity was recorded among the dentists who practiced preventive measures, with the exception of those who performed stretching. These seemingly

disappointing results must be analyzed with caution, since professionals showing a higher incidence of pain are those who most frequently try to implement preventive measures (Rucker and Sunell, 2002; Valachi and Valachi., 2003a,b).

The etiology of musculoskeletal disease is multifactorial, with the involvement of biomechanical, individual and psychosocial factors related to work. Consequently, the preventive strategy must be multifactorial and not only focused on ergonomics (Andrews and Vigoren, 2002; and Valachi and Valachi., 2003a,b). Any useful study on musculoskeletal disorders among dentists should include an analysis of preventive measures. Those measures in turn should focus on the following areas; ergonomics, breaks at work, general health and physical exercise (Andrews and Vigoren, 2002; Valachi and Valachi., 2003a,b).

The ergonomic factors to be taken into account could be summarized as supporter of the upper limbs, the use of instruments with larger handles, and working with a mechanically adjustable chair presenting an adjustable backrest. The use of indirect vision and correct patient positioning in the dental chair to avoid awkward or forced neck postures are also important. Proper lightning and the use of systems such as magnifiers and microscopes also help reduce the fatigue and increase productivity. (Valachi and Valachi, 2003a, b).

Repetitive movements and prolonged body

postures can be expected to cause muscle damage, as well as ligament and joint injuries (Rucker and Sunell, 2002; Valachi and Valachi, 2003a,b). Daily work planning should allow a break for the alternating muscle groups in order to maintain productive work. In our study, 52% of the professionals did not take breaks between attended patients. The applied Occupational and Environmental Hygiene guidelines recommend at least six minutes of rest every hour for professionals who perform repetitive movements. The three types of break which are recommended for professionals are as follows:

1. Frequent stops and shaking exercises (relaxing of arm, shaking and dropping them for periods of 15 seconds)
2. Breaks to allow recovery (periods of 10-15 minutes every 2-3 hours)
3. Breaks between successive patients (dentists to perform opposite movements to those done during work).

General health is another aspect to be taken into account for the correct prevention of musculoskeletal disorders. It is essential to dedicate time to leisure activities, and to implement other measures for the control of mental stress.

Lastly, the preventive role of physical exercise is also a key element to be taken into account. Dental professionals should also learn to avoid risks factors-the ultimate objective being the definition of personalized rehabilitation exercises, stretching and regular aerobic activity. Aerobic exercise has been shown to prevent or improve general pain, facilitate weight loss, and strengthen the torso.

It thus may be conclude that musculoskeletal pain is common among dentists, with a higher incidence in young women. The neck region is the most affected area. Among different professional surveyed, the oral surgeons

showed a higher incidence of pain in the wrist.

Regarding prevention 66.2% of the respondents took no measures to avoid such problems, while 38.8% claimed to practice preventive measures, though performed incorrectly.

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