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Musculoskeletal Pain Reports among Mashhad Dental Students, Iran

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Abstract: Dental practitioners are susceptible to Musculoskeletal Disorders (MSDs). The symptoms may begin from education courses. The aim of this study was to assess prevalence of musculoskeletal pain reports and correlated factors among the Mashhad Dental School students, Iran. A total of 177 undergraduate and postgraduate dental students, who were involved in educational clinical training, completed a questionnaire focusing on pain reports of different body anatomical regions. Variables such as gender, academic grade, academic year, clinical working hour, regular exercise times and also pain characteristics including pain duration intensity and frequency were evaluated. As results 82% of undergraduate students and 90% of postgraduate students reported body pain in at least one region. The most prevalent pain locations were: chest/shoulder (46.9%), head/neck (41.8%), middle back (33.9%) and right hand (25.4%). Severity of reported pain was increased due to performing dental work, increased working stress and working fatigue. Regular exercise was associated with alleviated some pain characteristics. As conclusions musculoskeletal pain reports were highly prevalent among dental students. Attention to prevention of musculoskeletal disorders should be considered as priority in dental schools. For dental students exercise training courses for strengthening muscles of shoulder/chest, neck and back are necessary.

Key words: Musculoskeletal pain, student-dental group practice

INTRODUCTION

Musculoskeletal disorders (MSDs) are one of the most important occupational health problems for medical workers especially dental health personnel. MSDs are significant burden in dentistry (Leggat *et al.*, 2007; Puriene *et al.*, 2007; Hayes *et al.*, 2009a).

It has been claimed 64 to 93% of all dental personnel suffer from MSDs. Dentists that usually study with a prolonged static posture are susceptible to MSDs particularly in neck, back and shoulders (Lake, 1995; Finsen *et al.*, 1998; Ylipaa *et al.*, 2002; Crawford *et al.*, 2005; Lindfors *et al.*, 2006; Smith *et al.*, 2006; Garcia *et al.*, 2010). Researchers have recognized that MSDs in dentistry contribute considerably to loss of working days due to illness and reduced productivity (Osborn *et al.*, 1990; Alexopoulos *et al.*, 2004). Rundcrantz *et al.* (1990) stated that 72% of the dentists examined reported symptoms of MSD in neck, shoulders or head. However pain and discomfort were less in subjects who had adopted ergonomic technique. Some study-related factors have been suggested as predisposing dentists to the

disorder are: long time static postures, awkward back postures, Vision-demanding task, precision hand and wrist movements, work with vibrating tools and psychosocial stressors (Akesson *et al.*, 1995; Lake, 1995; Finsen *et al.*, 1998; Graham, 2002; Szymanska, 2002; Alexopoulos *et al.*, 2004; Lindfors *et al.*, 2006).

The current generation of university students is known to be increasingly burdened by back pain (Smith and Leggat, 2007). Little researches suggest that MSDs in dental practitioners begin as early as clinical training period at dental school (Melis *et al.*, 2004; Thornton *et al.*, 2008; De Carvalho *et al.*, 2009). According to Thornton *et al.* (2008) 61% of dental students have reported musculoskeletal symptom related to study at dental school clinic during the past year. Assessing MSDs risk factors in dental hygiene students who did not undertake weekly regular exercise reveal an increased risk of lower back pain. Report of neck pain was much more in students with 16-20 h of desk-based study per week. Furthermore 6-10 h of working on computer per week was a risk factor for shoulder and upper back pain (Hayes *et al.*, 2009b).

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Although, tertiary education pressures and physical burden of dental clinical training are high, the literatures that surveyed musculoskeletal disorders in dental students are few (Melis *et al.*, 2004; Thornton *et al.*, 2008; De Carvalho *et al.*, 2009; Hayes *et al.*, 2009a). Given the above and considering the increasing number of dental students in Iran in recent years it seems that further research in this area is needed.

The aim of this study was to determine prevalence and evaluate correlated factors of musculoskeletal disorder among a sample of dental students in Mashhad Dental School (Mashhad, Iran).

MATERIALS AND METHODS

Dental students at the Mashhad University of Medical Sciences in Mashhad, Iran were the study population. In this cross sectional study a total of 195 participants were randomly selected from undergraduate and postgraduate students who were in clinical training stage. Exclusion criteria included history of rheumatoid arthritis, history of trauma, disease or surgery of neck, shoulder, lower back, hand and knees. After explaining the aim and process of study to volunteers, they signed consent form.

They were asked to fulfill a self-reported questionnaire. Rising's paper was used as template in planning the study questionnaire (Rising *et al.*, 2005). Questionnaire consisted of some individual characteristic issues such as age, gender, body weight, body height and some study related questions include: Academic year, undergraduate/post graduate stage, working hour in clinic, number of patients visited per day and per week, frequency of weekly regular exercise, level of fatigue at clinical work, minutes of break time between patients, pain presence and location of it during last academic year. The students marked pain location among 26 anatomical regions specified (Rising *et al.*, 2005). Questions structures were various: multiple choices, yes/no and open end. For ease of data analysis 26 body regions were classified to 7 main regions head and neck, chest and shoulder, middle back, lower back, right arm to finger tips, left arm to finger tips and knees. If the pain report was in more than one region, students marked the more severe pain location.

Pain characteristics were assessed by three dependent variables: pain duration, pain intensity and pain frequency. Pain duration was categorized to: less than 1, 1-3, 4-8, 9-16 and 17-24 h/day. Pain frequency was recorded as: 10, 25, 50, 75% and almost every day of academic year days. Pain intensity, perceived pain alteration during clinical working, effect of clinical working

stress on perceived pain and level of fatigue during clinical working were rated on Likert ordinal scale ranging from 1 (very low) to 5 (very sever).

Frequency of weekly regular exercise was recorded as never, 1, 3, 5 times/week and every day.

After data collection SPSS software (version 15) was used for analysis. Statistical analyses were done by using Chi-square, Mann-Whitney and Kruskal-Wallis analyses. Correlation tests were used for determining relationship between pain characteristics and some factors such as frequency of weekly exercise, level of fatigue and stress during clinical study.

A physical and occupational medicine educated confirmed the validity of the questionnaire. For reliability assessment, 20 questionnaires were distributed randomly among 20 students to answering. After 10 days, questionnaires were gave them to fulfill again. The similarity percent of answers of test-retest questionnaire was 95%.

RESULTS

Of all 195 subjects, 177 participants returned completed questionnaires (response rate: 90.7%). A 135 respondents were undergraduate and 42 students were postgraduate.

The students' age ranged from 20 to 31 years (mean: 23.63±2.99 years). A 49.1% of participants were male and 50.9% were female. A 88.1% of students were right-handed during dental practice and the remaining were left-handed. Mean clinical working time was 17.6±10.07 and 14.27±13.77 h/week in undergraduate and postgraduate students, respectively. Each undergraduate student treated averagely 2.25 dental patients/day that rate was 2.11 for postgraduates. Mean break time between appointments was 23.56 and 10.17 min in undergraduates and postgraduates, respectively.

A 81.6% of undergraduates and 90.2% of postgraduates reported pain in at least one body region. Chi-square analysis revealed no statistically significant difference in pain prevalence between two groups ($p = 0.23$). Frequency distribution of reported pain anatomical regions based on gender, academic years and grade of students have been shown in Table 1.

The order of most prevalent pain locations was: chest/shoulder (46.9%), head/neck (41.8%), middle back (33.9%), right hand (25.4%), lower back (15.8%), left hand (11.9%) and knees (9%).

Table 2 shows frequency distribution of the most severe pain locations. Mann-Whitney analysis results showed gender had not statistically significant correlation with different pain characteristics include: duration

Table 1: Frequency distribution of musculoskeletal complaints from different anatomical regions among dental students

| Grade | Academic year | Gender | Head/neck | | Chest/shoulder | | Middle back | | Lower back | | Right hand | | Left hand | | Knees | |
|---------------|---------------|--------|-----------|------|----------------|------|-------------|------|------------|------|------------|------|-----------|------|-------|------|
| | | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Undergraduate | 4th | Male | 3 | 60.0 | 3 | 60.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| | | Female | 3 | 25.0 | 9 | 75.0 | 1 | 8.3 | 1 | 8.3 | 2 | 16.7 | 1 | 8.3 | 0 | 0.0 |
| | 5th | Male | 6 | 42.9 | 6 | 42.9 | 5 | 35.7 | 4 | 28.6 | 6 | 42.9 | 1 | 7.1 | 0 | 0.0 |
| | | Female | 6 | 66.7 | 4 | 44.4 | 1 | 11.1 | 1 | 11.1 | 4 | 44.4 | 2 | 22.2 | 2 | 22.2 |
| | 6th | Male | 5 | 23.8 | 7 | 33.3 | 6 | 28.6 | 3 | 14.3 | 4 | 19.0 | 2 | 9.5 | 3 | 14.3 |
| | | Female | 9 | 52.9 | 12 | 70.6 | 10 | 58.8 | 5 | 29.4 | 7 | 41.2 | 5 | 29.4 | 3 | 17.6 |
| Postgraduate | 1st | Male | 10 | 37.0 | 13 | 48.1 | 8 | 29.6 | 4 | 14.8 | 3 | 11.1 | 1 | 3.7 | 0 | 0.0 |
| | | Female | 16 | 51.6 | 11 | 35.5 | 11 | 35.5 | 8 | 25.8 | 10 | 32.3 | 6 | 19.4 | 4 | 12.9 |
| | 2nd | Male | 6 | 31.6 | 9 | 47.4 | 9 | 47.4 | 1 | 5.3 | 1 | 5.3 | 1 | 5.3 | 3 | 15.8 |
| | | Female | 10 | 50.0 | 9 | 45.0 | 9 | 45.0 | 1 | 5.0 | 8 | 40.0 | 2 | 10.0 | 1 | 5.0 |
| Total | 177 | 74 | 41.8 | 83 | 46.9 | 60 | 33.9 | 28 | 15.8 | 45 | 25.4 | 21 | 11.9 | 16 | 9.01 | |

Table 2: Frequency distribution of the most severe pain locations that dental students have reported

| Grade | Academic year | Gender | Head/neck | | Chest/shoulder | | Middle back | | Lower back | | Right hand | | Left hand | | Knees | |
|---------------|---------------|--------|-----------|------|----------------|------|-------------|------|------------|-----|------------|------|-----------|-----|-------|------|
| | | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Undergraduate | 4th | Male | 3 | 15.0 | 4 | 20.0 | 3 | 15.0 | 0 | 0.0 | 1 | 5.0 | 0 | 0.0 | 2 | 10.0 |
| | | Female | 5 | 29.4 | 3 | 17.6 | 6 | 35.2 | 0 | 0.0 | 2 | 11.7 | 0 | 0.0 | 1 | 5.8 |
| | 5th | Male | 6 | 22.2 | 6 | 22.2 | 6 | 22.2 | 2 | 7.4 | 1 | 3.7 | 1 | 3.7 | 0 | 0.0 |
| | | Female | 11 | 35.4 | 7 | 22.5 | 7 | 22.5 | 2 | 6.4 | 2 | 6.4 | 0 | 0.0 | 0 | 0.0 |
| | 6th | Male | 2 | 10.5 | 6 | 31.5 | 5 | 26.3 | 1 | 5.2 | 1 | 5.2 | 0 | 0.0 | 1 | 5.2 |
| | | Female | 2 | 10.0 | 5 | 25.0 | 4 | 20.0 | 0 | 0.0 | 4 | 20.0 | 0 | 0.0 | 1 | 5.0 |
| Postgraduate | Male | 3 | 60.0 | 2 | 40.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | |
| | Female | 2 | 16.6 | 7 | 58.3 | 0 | 0.0 | 1 | 8.3 | 1 | 8.3 | 1 | 8.3 | 1 | 8.3 | |

($p = 0.08$), intensity ($p = 0.14$) and frequency ($p = 0.09$) during past academic year. Correlations between academic year and different pain characteristics were not significant too.

A 41.4% of respondents had not take any exercise and only 1.1% had take regular daily exercise. Kruskal- wallis analysis revealed that students exercise had not statistical significant effect on pain presence in different body regions ($p > 0.05$ in all regions).

Evaluating the correlation between exercise and pain characteristics resulted in that there was a significant negatively correlation between regular exercise and pain intensity ($p = 0.002$, $r = -0.1$) and between exercise and fatigue during dental practice ($p = 0.020$, $r = -0.19$) in undergraduate students. Also regular exercise in postgraduate students was negatively associated with pain duration ($p = 0.03$, $r = -0.17$).

Spearman correlation coefficient did not show significant correlation between student's BMI and different pain characteristics include duration ($p = 0.36$), intensity ($p = 0.88$), frequency ($p = 0.11$). But perceived pain during clinical working was negatively associated with BMI ($p = 0.037$, $r = -0.17$).

A 48.3% of students reported pain intensity as moderate, 31.8% mild and 7.9% severe. There was a significant positive correlation between pain intensity and three factors: performing clinical study, increased working stress and working tiredness ($p < 0.001$ in all three) ($r = +0.50$, $+0.29$, $+0.35$, respectively).

DISCUSSION

This study evaluated prevalence of pain reports in a sample of dental students. Results showed most undergraduate (81.6%) and postgraduate (90.2%) students reported pain at least in one body region which agree with previous studies (Osborn *et al.*, 1990; Hayes *et al.*, 2009a). Pain in shoulder/chest and neck/head regions was revealed as a serious problem such that at least 41% of respondents reported trouble in these regions.

Most related papers assessed prevalence and causes of MSDs in Dentists, but studies on dental students are limited (Melis *et al.*, 2004; Thornton *et al.*, 2008; De Carvalho *et al.*, 2009; Hayes *et al.*, 2009a). Although mean age of dental students is lower than dentists and students visit fewer patients per day than dentists, but should not be forgotten that in 20s, vertebral discs contain much water and disposed to degenerative injuries. Degeneration process could initiate from disk inflammation and progressed to disc hernia. Also poor posture of vertebral column and following muscle

contractions could lead to muscle pain, so muscle and skeletal pain reports in dental students and dentists is expected. In dental students who are in the beginning of professional life pain complaints more related to muscle disorders where as in dentists it is usually due to musculoskeletal problems (Dylla and Forrest, 2011). However prevalence of MSDs especially lower back pain is generally high in the society, so studies with control groups from other occupations and even non-working persons may be required to give a better view of MSDs in dentistry.

According to Valachi (2003) study one of the causes of MSDs in dentists is poor, static and long time sitting and standing postures. Some articles have mentioned other causes like improper working tools, inheritance and contextual factor such as obesity (Garcia *et al.*, 2010).

In current research most prevalent pain regions were orderly: chest and shoulders, head and neck, middle back, right hand and lower back. In some other studies most reported pain regions are consistent with us whereas pain in neck, head, shoulder and back were most complaints (Thornton *et al.*, 2008; Dajpratham *et al.*, 2010). Prevalence of shoulder and neck pain in our survey is near to the results of a recent study among dental hygiene students in which 37% of students reported neck pain (Morse *et al.*, 2007). Melis *et al.* (2004) reported prevalence rate of neck pain among Italian dental students as 40.4% which is near identical to our finding. Most dental students for better vision and access in clinical working elevate head, flex neck and rotate shoulder and chest to an asymmetric unstable and unsupported position. These poor body postures may justify prevalence of neck and shoulder pains in dental students.

Back pain was compliant in more than one third of our students. Varies prevalence rates of back pain had been reported among dental professionals from as low as 21% to as high as 40% (Ratzon *et al.*, 2000; Al Wassan *et al.*, 2001; Szymanska, 2002; Hayes *et al.*, 2009b).

Given the wide range in previous results, comparison with the current findings is difficult. However it shows a serious need strategy to prevent back pain occurrence in dental practitioners.

In this study modest reported pain intensity was moderate so it was not mild and negligible, (Shrestha *et al.*, 2008).

According to our results performing dental practice, higher level of stress and fatigue during dental working lead to more severity of pain. We did not find any study on correlation between dental practice's stress and pain intensity. Increased stress lead to more pain during dental practice is a hypothesis that could be evaluated in future studies.

Contrary to Rising and Diaz caballero who reported more prevalence of MSDs in females, the correlation between sex and pain characteristic in our study was not significant (Rising *et al.*, 2005; Diaz-Caballero *et al.*, 2010; Chowanadisai *et al.*, 2000). However a review of back pain among students has suggests gender as a confounding variable rather than a true risk factor (Smith and Leggat, 2007). In another study the difference between prevalence of men and women neck pain was not significant too (Melis *et al.*, 2004). Same working conditions, working tools and body postures may explain this equality in both sexes. Nevertheless longitudinal studies are required for better sight in this regard.

According to results, regular exercise was associated with decreased pain intensity and fatigue during dental practice. This finding agrees with (Hayes *et al.*, 2009a). He stated regular exercise positively correlated with reduced prevalence of MSDs. Obviously exercise lead to strengthening of musculoskeletal system. This strengthened system better resists and tolerate long time static postures of dental practice. It seems some specific exercises for strengthening muscles especially in shoulder/chest, neck and back regions in dentists is momentous and this necessity must be reflected in educational curricula of dental students.

We found that increased BMI was associated with reduced pain during clinical working. Apparently this is contrary to general belief. Akesson *et al.*, (1999) stated overweight (BMI more than 25 kg m^{-2}) is a risk factor for carpal tunnel syndrome. Generally overweight lead to increased pressure on lower limb joints, arthritis and varices. On the other hand weight loss lead to improved pain of arthritis. In explaining this paradox with our results should say that our student's mean BMI was 22.58 ± 3.22 , hence they were generally normal and we did not have any obese student. In other words students with higher BMIs were still within normal range. On the other hand our study focus was on upper not lower limbs while BMI likely correlated with lower limbs. For more certainty a study with aiming of comparing MSDs in overweight, normal and underweight dental students could be suggested.

Finally, it seems that dental students are a high-risk group for development of musculoskeletal disorders. In our study MSDs were a silent epidemic. It is important to elucidate strategies for reducing MSDs before it affected a large number of dentists. This survey showed that MSDs reports begin during dental education and clinical training which in turn suggest that preventive ergonomic interventions should be considered for this group and dental curricula should contain learning's about balanced working postures and musculoskeletal cares. However further research in this area especially longitudinal studies are needed.

CONCLUSION

As conclusion of our survey:

- Prevalence of Musculoskeletal pain reports in sampled dental students was high
- Pains of shoulder and neck regions were the most complaints
- Most students reported the severity of pain as moderate degree
- Regular exercise was associated with alleviated some pain symptoms
- Increased stress during dental practice lead to more pain severity

For dental students ergonomic training courses to prevention MSDs are necessary.

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