Self-reported musculoskeletal pain among dentists in Visakhapatnam: A 12-month prevalence study

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ABSTRACT

Background: Of the occupational hazards experienced by dental professional worldwide, work-related musculoskeletal disorders (WRMSDs) are quite common. Research in the past has recognized that musculoskeletal disorders in dentistry contribute considerably to sick leave, reduced productivity, and dentist attrition. Considering the magnitude of these disorders, an attempt has been made to determine the prevalence and associated factors of various WRMSD.

Aim: The aim of this study was to investigate the prevalence of self-reported, work-related musculoskeletal problems regarding the perception of pain, over the preceding 12 months and also to identify associated factors which might influence pain among dentists.

Subjects and Methods: A self-administered questionnaire was personally handed over to a select sample of practicing dentists in Visakhapatnam, Andhra Pradesh. The survey was performed using the Nordic Musculoskeletal Questionnaire.

Results: This study revealed musculoskeletal pain with a frequency of 56% in the neck, 39% in the hand, 32% in the lower back, and 18% in the shoulder regions. Chi-square test showed a significant association between pain in the neck and gender, age, height, and weight (P < 0.05). Pain in lower back was associated with gender, body mass index (BMI), height, and experience (P < 0.05). Pain in the hand was only related to the experience of the dentist (P < 0.05).

Conclusion: Within the limits of the study, the prevalence of WRMSD among dentists in Visakhapatnam, especially involving the neck, hand, lower back, and shoulders, is high. Gender, age, height, and weight, BMI and experience were found to be related with musculoskeletal pain.

Key words: Musculoskeletal disorders, musculoskeletal pain, work-related musculoskeletal disorders

The practice of dentistry is a challenging task as it involves a high degree of visual and manipulative elements, psychomotor skills, manual dexterity, and ability to maintain static postures over a long period. The complexity of work-related skills renders dentists susceptible to various health related hazards, and among them, work-related musculoskeletal disorders (WRMSDs) are quite common. These involve disorders of muscles, nerves, tendons, and joints causing musculoskeletal injuries such as carpal tunnel syndrome, tendonitis, ulnar nerve neuropathy, etc.

The human body is designed to facilitate movement, and the ability of the dentist to maintain a neutral and balanced position with all the muscles relaxed poses no problem, but the attainment of static postures by dentists during work causing more than 50% of their muscles to contract results in pain, injury, or musculoskeletal disorders (MSDs). Studies have reported musculoskeletal pain among dentists as ranging from 60 to 78%. The prevalence of WRMSD was higher in dentists when compared to physicians and surgeons.

High prevalence of WRMSD results in lowered productivity due to missed work schedule, inability to perform daily...
activities, and may sometimes also lead to a career ending injury. In a study conducted among dentists in Queensland, one in ten dentists reported taking an annual mean leave of 11.5 days a year, due to MSDs.[8]

A variety of factors have been attributed to WRMSD in dentists which include postural habits such as forced static postures to obtain good vision, improper seating, forced wrist postures during scaling,[9] and demographic variables such as duration of work hours, number of years in practice,[10] gender,[11] obesity, and height.[12]

Considering the prevalence and multitude of factors influencing WRMSD, preventive strategies which involve proper ergonomic positions and regular exercises, combined with professional intervention, especially in those who are at increased risk, are the need of the hour.

Aims and objectives
The aim of this study was to investigate the prevalence of self-reported work-related musculoskeletal problems regarding perception of pain, over the preceding 12 months, and to identify factors such as sex, age, body mass index (BMI), height, exercise, educational qualification, experience and influence of WRMSD on ability to work, among a select sample of dentists in Visakhapatnam, Andhra Pradesh.

SUBJECTS AND METHODS
A self-administered previously validated Nordic Musculoskeletal Questionnaire (Kuorinka et al. 1987) including various parameters related to WRMSD and an information sheet was given to 120 practicing dentists in and around Visakhapatnam, Andhra Pradesh, India. This analytical cross-sectional study was conducted from February to April 2015. Worldwide general prevalence of musculoskeletal pain among dentists as described by the previous studies was found to be over 50%.[13,14] Therefore, a sample size of 97 would be sufficient to determine whether a similar prevalence occurred in target population as determined using 50% of proportion for sample calculation.[8] Dentists with systemic diseases such as uncontrolled diabetes, which may influence the musculoskeletal system and with MSDs unrelated to dental practice were excluded from the study. To avoid lower response rate as associated with this type of surveys, it was decided to personally hand over the survey forms and then collect them after 1 week. Participants were assured of the confidentiality of information obtained from them. Additional information which comprised of fill in the blank or multiple choice questions was requested on age, gender, number of years in practice, and field of dental practice. Influence of WRMSD on the ability to work was collated by employing a scale of zero to ten, where zero-three is considered as mild, four-seven is considered as moderate, and eight-ten is considered as severe.

Data were entered into a spreadsheet program before being analyzed using the Statistical Package for Social Sciences (Version 21.0, IBM SPSS, Armonk, Newyork, USA). Basic statistics were calculated including prevalence rates. Differences in WRMSD prevalence were investigated using the Chi-square test for categorical variables. P values below 0.05 were considered statistically significant throughout.

RESULTS
Forms were collected from all 120 practitioners, but 20 were excluded as they failed to answer all the questions asked. Table 1 represents the profile of the respondents: There were 70 male and 30 female respondents. The average age of the respondents was 34.1 years standard deviation (SD 7), with a female average age of 30.9 years (SD 6.5) and the male average being 35.5 years (SD 6.8). In the study population, 55% were specialists and 45% were general practitioners. When compared to men, women had lesser height and weight, with an average of 161 cm, 59 kg, and a BMI of 22 in females and 170 cm, 73 kg, and a BMI of 25 in males, respectively. Work experience was also found to be less in females when compared to males with an average of 4.9 years and 8.3 years, respectively. With regard to the musculoskeletal pain, neck region is the most frequently affected (56%), followed by pain in the hand region (39%), lower back (32%), and shoulder (18%) [Table 2]. Neck and lower back pain were more prevalent in males than females (P < 0.05) and also increased with increase in height (P < 0.05); the prevalence of neck pain also increased with an increase in age and weight of the individual (P < 0.05) [Tables 3 and 4]. Pain in the hand and lower back were found

| Location       | Total, % | Gender, % |
|----------------|----------|-----------|
|                | Male     | Female    |
| Neck pain      | 56 (56)  | 64.3 (45) | 36.7 (11) |
| Shoulder       | 18 (18)  | 20.0 (14) | 13.3 (4)  |
| Elbow          | 3.0 (3)  | 1.4 (1)   | 6.7 (2)   |
| Hand           | 39 (39)  | 38.6 (27) | 40 (12)   |
| Upper back     | 8.0 (8)  | 10 (7)    | 3.3 (1)   |
| Lower back     | 32 (32)  | 40 (28)   | 13.3 (4)  |
| Hips/thighs    | 6 (6)    | 5.7 (4)   | 6.7 (2)   |
| Knees          | 8 (8)    | 7.1 (5)   | 10 (3)    |
| Ankle          | 10 (10)  | 10 (7)    | 10 (3)    |
to be less in junior practitioners (<10 years in practice) and in senior practitioners (>20 years in practice) \( (P < 0.05) \); pain in the lower back showed a positive correlation with BMI \( (P < 0.05) \) [Tables 4 and 5]. No significant correlation was found between other factors (age, BMI, height, exercise, educational qualification, and experience) and pain in various anatomical locations. The majority of dentists rated that WRMSD had mild to moderate effect on their ability to work [Table 6].

**DISCUSSION**

Dental professionals adopt various ergonomic positions often requiring static postures during an average work day, which translates to a high risk for WRMSD. Various studies have reported the prevalence of MSD in the Indian population ranging from 15% and 18%, respectively. A postal survey conducted among general population in Sweden reported 15–20% of the prevalence of pain which was most common in the neck, shoulders, arms, and lower back. The reported prevalence of pain in the neck (56%), hand (39%), and lower back (32%) in this study is much higher than those reported for the general population and must be seen as being clinically significant and alarming. Similar findings among dentists have been reported in studies conducted around the world which include the prevalence of neck pain to be 57% (Leggat and Smith 2006) and 56% (Szymanska 2002), pain in the hand 34% (Leggat and Smith 2007), and lower back pain 36% (AlWazzan et al. 2001), and 39% (Oberg and Oberg in 1993).

The etiology of MSD in dental practice can be attributed to the dentist’s posture which includes bending and twisting of the neck and back, abduction of the arm, and associated precise and repetitive movements of the arms. All these lead to considerable loads on the muscles of the neck, back, and arms. In this study, neck and lower back pain were more prevalent in males when compared to females, which is contrary to the previous studies which reported a higher prevalence of MSD among females. This could be due to disproportionate sample size between males and females or could be due to more work years spent in practice by males (mean of 8.3) when compared to females (4.9). In this study, there was a significant increase in the prevalence of lower back pain with an increase in BMI, which is consistent with results obtained from the meta-analysis by Shiri et al. which showed a strong association between obese individuals and lower back pain. This could be explained by the increase in the mechanical load on the

**Table 3: Association between neck pain and sociodemographic profile using Chi-square test**

| Variable                  | Neck pain (%) | \( \chi^2 \) | \( P \) | Inference |
|---------------------------|---------------|---------------|--------|-----------|
| Sex                       |               |               |        |           |
| Female                    | 19 (63.3)     | 11 (36.7)     | 6.50   | <0.01     | S         |
| Male                      | 25 (35.7)     | 45 (64.3)     |        |           |           |
| Age (years)               |               |               |        |           |
| 21-30                     | 23 (60.5)     | 15 (39.5)     | 8.91   | <0.05     | S         |
| 31-40                     | 17 (38.6)     | 27 (61.4)     |        |           |           |
| 41-50                     | 4 (26.7)      | 11 (73.3)     |        |           |           |
| 51-60                     | 0 (0.0)       | 3 (100.0)     |        |           |           |
| Height (cm)               |               |               |        |           |
| 151-160                   | 14 (70.0)     | 6 (30.0)      | 10.44  | <0.01     | S         |
| 161-170                   | 19 (47.5)     | 21 (52.5)     |        |           |           |
| 171-180                   | 10 (29.4)     | 24 (70.6)     |        |           |           |
| 181-190                   | 1 (16.7)      | 5 (83.3)      |        |           |           |
| Weight (kg)               |               |               |        |           |
| 41-50                     | 3 (42.9)      | 4 (57.1)      | 9.87   | <0.05     | S         |
| 51-60                     | 9 (60.0)      | 6 (40.0)      |        |           |           |
| 61-70                     | 20 (58.8)     | 14 (41.2)     |        |           |           |
| 71-80                     | 9 (30.0)      | 21 (70.0)     |        |           |           |
| 81-90                     | 3 (21.4)      | 11 (78.6)     |        |           |           |

\( P<0.05 \) is considered as statistically significant (S)

**Table 4: Association between lower back pain and sociodemographic profile using Chi-square test**

| Variable                  | Lower back pain (%) | \( \chi^2 \) | \( P \) | Inference |
|---------------------------|                    |               |        |           |
| Sex                       |                    |               |        |           |
| Female                    | 26 (86.7)          | 4 (13.3)      | 6.86   | <0.01     | S         |
| Male                      | 42 (60.0)          | 28 (40.0)     |        |           |           |
| BMI                       |                    |               |        |           |
| 14-19                     | 2 (66.7)           | 1 (33.3)      | 42.55  | <0.01     | S         |
| 19.1-25                   | 44 (75.9)          | 14 (24.1)     |        |           |           |
| 25.1-31                   | 17 (50.0)          | 17 (50.0)     |        |           |           |
| 31.1-37                   | 5 (100.0)          | 0 (0.0)       |        |           |           |
| Height (cm)               |                    |               |        |           |
| 151-160                   | 18 (90.0)          | 2 (10.0)      | 9.15   | <0.05     | S         |
| 161-170                   | 28 (70.0)          | 12 (30.0)     |        |           |           |
| 171-180                   | 20 (58.8)          | 14 (41.2)     |        |           |           |
| 181-190                   | 2 (33.3)           | 4 (66.7)      |        |           |           |
| Experience (years)        |                    |               |        |           |
| 0-10                      | 56 (75.6)          | 18 (24.3)     | 8.61   | <0.05     | S         |
| 11-20                     | 10 (43.4)          | 9 (56.5)      |        |           |           |
| 21-25                     | 2 (66.7)           | 1 (33.3)      |        |           |           |

\( P<0.05 \) is considered as statistically significant (S). BMI=Body mass index

**Table 5: Association between hand pain and sociodemographic profile using Chi-square test**

| Variable                  | Hand pain (%) | \( \chi^2 \) | \( P \) | Inference |
|---------------------------|--------------|---------------|--------|-----------|
| Experience (years)        |              |               |        |           |
| 0-10                      | 48 (64.8)    | 26 (35.1)     | 14.84  | <0.01     | S         |
| 11-20                     | 12 (52.1)    | 11 (47.8)     |        |           |           |
| 21-25                     | 1 (33.3)     | 2 (66.7)      |        |           |           |

\( P<0.05 \) is considered as statistically significant (S)

**Table 6: Effect of musculoskeletal pain on ability to work**

| Musculoskeletal problems | Change of ability to work due to musculoskeletal pain |
|-------------------------|-----------------------------------------------------|
|                         | Mild | Moderate | Severe |
| Neck                    | 24 (50.0) | 18 (37.5) | 6 (12.5) |
| Shoulder                | 9 (47.4)  | 8 (42.1)  | 2 (15.8) |
| Elbows                  | 2 (100.0) | 0 (0.0)   | 0 (0.0)  |
| Hand/wrist              | 18 (52.94) | 10 (29.41) | 6 (17.65) |
| Upper back              | 5 (55.56)  | 4 (44.44)  | 0 (0.0)  |
| Lower back              | 13 (40.63) | 15 (46.68) | 4 (12.5) |
| Hip/thigh               | 1 (25.00)  | 2 (50.00)  | 1 (25.00) |
| Knees                   | 5 (71.43)  | 2 (28.66)  | 0 (0.0)  |
| Ankle/feet              | 3 (30.00)  | 6 (60.00)  | 1 (10.00) |
Use of magnification
Proper assistance at work by practicing 4 hand dentistry
Maintaining the low back curve during seating reduces
Alternating between standing and sitting during work
Positioning patients at the proper height. Patients should
Maintenance of ideal body weight
Chairside directional stretching performed in the reverse
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The following preventive measures can be recommended
to minimize the musculoskeletal pain among dentists.\(^{(31)}\)

Pain in the neck is significantly associated with height
and weight of the dentists. A related study conducted by
Morken \textit{et al.} reported that weight was correlated with
musculoskeletal symptoms in the head, shoulders, elbows,
hands, and lower back among aluminum workers.\(^{(28)}\) Among
the various risk factors associated with neck pain, height
of the individual has a positive correlation where taller
individuals are more susceptible for the neck injury.\(^{(29)}\) This
can be due to the presence of association between height
disc herniation.\(^{(30)}\) Contrary to this, a study conducted
among South African dentists by Botha \textit{et al.} showed that
for every centimeter decrease in height of the respondents,
the risk of developing neck trouble increased by 3.8%.\(^{(31)}\)

Since WRMSD has a substantial impact on the well-being
of the dentist, identifying the musculoskeletal needs
during work, and adopting preventive measures should be
recommended at the beginning of their careers.

The following preventive measures can be recommended
to minimize the musculoskeletal pain among dentists.\(^{(31)}\)

- Maintenance of ideal body weight
- Proper assistance at work by practicing 4 hand dentistry
- Use of magnification
- Maintaining the low back curve during seating reduces
- Lower back pain. This is achieved through using a
  wedge-shaped cushion which tilts the seat angle by
  5–15\(^{\circ}\), using a saddle type operator stool, and distributing
  weight evenly by placing feet firmly on the floor
- Alternating between standing and sitting during work
- Positioning patients at the proper height. Patients should
  be placed in a semi-supine position for mandibular
  procedures and a supine position for maxillary
  procedures
- Chairside directional stretching performed in the reverse
direction of awkward prolonged static postures.

Limitations
One of the major limitations of this type of study is that
respondents may not be accurately able to report their actual
situation. This study included only practicing dentists and
did not include those who have left the profession as a result
of MSD. In addition, this study was conducted in a relatively
limited geographic area.

CONCLUSION
Considering the higher prevalence of WRMSD, especially
pertaining to the neck, hand, shoulder and lower back,
preventive strategies that minimize the occurrence of these
disorders, especially in those who are at increased risk should
be practiced by the dentists.

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Conflicts of interest
There are no conflicts of interest.

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