Prevalence of Low Back Pain and Carpal Tunnel Syndrome among Dental Practitioners in Dakshina Kannada and Coorg District

Abstract

Context: Dental practitioners who usually have to work for long durations in a particular fixed posture are more prone to musculoskeletal disorders (MSDs), particularly those involving the hand and wrist and also of the lower back. Aims: To study the prevalence of carpal tunnel syndrome (CTS) and low back pain (LBP) among dental practitioners and to correlate the symptoms with the duration of practice. Subjects and Methods: A closed-end questionnaire was distributed to 100 dental practitioners from Dakshina Kannada and Coorg districts of Karnataka, India. Statistical Analysis Used: Analyses were carried out using Chi-square test and Fisher’s exact test. Results: The study found that 86% of the total population of dentists practicing for more than 5 years showed symptoms of CTS and 54.0% experienced LBP. Conclusion: Symptoms of MSDs related to hands, wrists, and low back are widely prevalent among the dentists, which severely impact their work efficiency. Precautionary measures early in the clinical practice such as proper ergonomics in the operating field and few strengthening exercises as described in this study can reduce the onset and progression of the symptoms.

Keywords: Carpal tunnel syndrome, dental practitioners, ergonomics, low back pain, musculoskeletal disorders, strengthening exercises

Introduction

Dentistry is a field which requires fine technical skills and increased concentration as the practitioners have to work in a limited area within the patients’ oral cavity which demands a compromised working posture. It is also noticed that most of the time, the practitioner tends to bend to get direct visibility to the maxillary arches instead of the indirect vision from the mouth mirror that can lead to backache. Likewise, prolonged duration of use of vibratory instruments with tight pinch-like grip to avoid slippage of tiny armamentarium into the oral cavity leads to symptoms of carpal tunnel syndrome (CTS).1

Injuries to supporting system of the human body such as joints, ligaments, tendons, and blood vessels by a combination of trauma or a single event are called musculoskeletal disorder (MSD).2,3 MSDs are very common among dental practitioners who use precise hand-wrist motions and prolonged static postures. Compression and pressure on the median nerve often lead to the development of symptoms of CTS sustained grasping pressure, stress due to mechanics of work can also lead to digital nerve injuries, and increased stress can be noted when postures which twist and rotate the lumbar region are practiced, leading to symptoms of backache.4

Symptoms of CTS include numbness or tingling sensation of all the digits of the hand, except the little finger. Burning sensation, pain and stiffness of hands on waking, radiation of pain to forearm, shoulder, and neck can also be seen rarely. Postures which increase pressure on disc causing spinal hypomobility are often the responsible factors for the degenerative changes within lumbar spine. Muscles either shorten or lengthen depending on the adaptive postures, leading to muscular imbalance and structural changes accompanied with frequent onsets of pain.

Aims and objectives

Aims and objectives were to study the prevalence of low back pain (LBP) and CTS among dental practitioners and also to correlate the duration of practice with the occurrence of symptoms.

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Subjects and Methods

A random sample of 100 dental practitioners of both genders who were willing to participate in the study from Dakshina Kannada and Coorg districts and have been practicing for more than 5 years was considered for the study. The study was a cross-sectional questionnaire study with convenience sampling method conducted within a period of 2 months duration. The questionnaire was self-prepared by consulting the specialists in the field and questions were relevant to the present study. Dental practitioners from two districts willing to participate in the study were given the questionnaire and the strengthening exercise chart. Each practitioner was given the questionnaire and the investigator assured completeness of the record. Informed consent was obtained from each subject and ethical clearance was obtained for the study from the University Ethical Committee. They were given a questionnaire based on the symptoms of CTS and LBP. The questions were mainly related to ergonomics, duration of work, use of vibratory instruments, and postures they prefer to work. The exclusion criteria included practitioners who are pregnant, with menopause, with history of renal failure, with history of hypothyroidism, those using oral contraceptives, with history of congestive heart failure, diagnosed with tumors and tumor-like lesions, and with history of fracture of wrist. An early detection of the onset of these disorders could help them use preventive measures that could help them change their working style and increase their working capacity and reduce the chances of early retirement. The data thus obtained were subjected to statistical analysis using software IBM SPSS Statistics, Version 22 (Armonk, NY: IBM Corp). The test used was Fisher’s exact test with $P = 0.05$. No response was not included in the statistical analysis. Every clinician who participated was given a preventive measure chart, wherein he/she was made aware of the need to improve ergonomics and use certain exercises which would help overcome the already developed symptoms.

The contents of the chart included as follows.

Posture maintenance and ergonomics in clinic

It ensured least strain to arms, back, and neck and even distribution of weight as well as easy visibility and ample working space [Figure 1].

Periodic breaks between patients

A 5-min gap between successive patients is helpful to recover the strained musculature, relax the wrists and arms, and perform few movements different from those used.

Figure 1: Posture maintenance and ergonomics in clinic

![Correct Operating Position](image1)

![Incorrect Operating Position](image2)

Figure 2: Carpal tunnel syndrome exercises (a) spider pushup of mirror (b) flicking wrists (c) stretch arm strong (d) tendon glide
Periodic breaks and release of trigger points
A set of exercises that would release trigger points is shown in Figure 3 that could be practised chairside [Figure 3].

Strengthening exercises for back pain
It helps in stretching and strengthening the spinal and abdominal muscles, which in turn maintains correct posture and reduces symptoms of backache.

Hamstring stretch in supine position
It strengthens the back and releases back ache. Repeat the cycle for three times [Figure 4a].

Cat and camel stretch
Hold each position for 5 seconds. Repeat both stretches alternatively for ten times. It strengthens back and decreases abdominal fat [Figure 4b].

Body tilt to strengthen back
Sustain for 20 seconds. The entire procedure is repeated five times. Furthermore, it is used to strengthen back and increase flexibility [Figure 4c].

Pelvic tilt
Repeat ten times [Figure 4d].
Partial curl
Sustain for 35 seconds and then relax. Repeat ten times [Figure 4e].

| Back pain | Carpal tunnel syndrome |
|------------|------------------------|
| Gender     | Yes (%) | No (%) | Absent (%) | Present (%) |
| Female     | 13 (61.9) | 8 (38.1) | 2 (9.5) | 19 (90.5) |
| Male       | 41 (51.9) | 38 (48.1) | 12 (15.2) | 67 (84.8) |
| Total      | 54 (54.0) | 46 (46.0) | 14 (14.0) | 86 (86.0) |
| P*         | 0.41 (NS) | 0.79(NS)* |

Age (years)

|          | Back pain | Carpal tunnel syndrome |
|----------|------------|------------------------|
| 30-40    | 26 (49.1) | 27 (50.9) | 4 (97.5) | 49 (92.5) |
| 40-50    | 23 (65.7) | 12 (34.3) | 7 (20.0) | 28 (80.0) |
| 50-60    | 5 (41.7)  | 7 (58.3)  | 3 (25.0) | 9 (75.0)  |
| Total    | 54 (54.0) | 46 (46.0) | 14 (14.0) | 86 (86.0) |
| P*       | 0.20 (NS) | 0.79(NS)* |

*Chi-square test. **Fisher’s exact test. *P<0.05 statistically significant. NS=Nonsignificant

Table 1: Comparison of low back pain and carpel tunnel syndrome according to gender and age

| Practice dentistry (q18) | Total (%) |
|--------------------------|-----------|
| 5 years (%) | 10 years (%) | >10 year (%) | P |

| Back pain | Yes (%) | No (%) | Absent (%) | Present (%) |
|-----------|---------|--------|------------|-------------|
| Yes       | 7 (41.2) | 12 (63.2) | 35 (54.7) | 54 (54.0) |
| No        | 10 (58.8) | 7 (36.8) | 29 (45.3) | 46 (46.0) |

| Carpal tunnel syndrome | Absent (%) | Present (%) |
|------------------------|------------|-------------|
| Absent                 | 0          | 2 (10.5)    | 12 (18.8) |
| Present                | 17 (100.0) | 17 (89.5)   | 52 (81.3) |

Numbness/pain felt at working fingers

| No response | Yes (%) | No (%) | Absent (%) | Present (%) |
|-------------|--------|--------|------------|-------------|
| No response | 1 (5.9) | 2 (10.5) | 12 (18.8) | 15 (15.0) |
| Fingertip   | 5 (29.4) | 0      | 11 (17.2) | 16 (16.0) |
| Entire palm | 0       | 9 (47.4) | 5 (7.8)   | 14 (14.0) |
| Rarely      | 11 (64.7) | 8 (42.1) | 36 (56.3) | 55 (55.0) |

Pain while using vibratory instruments

| No response | Yes (%) | No (%) | Absent (%) | Present (%) |
|-------------|--------|--------|------------|-------------|
| No response | 2 (11.8) | 0      | 2 (3.1)    | 4 (4.0)     |
| Yes         | 1 (5.9)  | 3 (15.8) | 10 (15.6) | 14 (14.0) |
| No          | 14 (82.4) | 16 (84.2) | 52 (81.3) | 82 (82.0) |

Awakenings during night with numb hand

| Yes (%) | No (%) | Absent (%) | Present (%) |
|---------|--------|------------|-------------|
| Yes     | 0      | 0          | 7 (10.9)    | 7 (7.0)     |
| No      | 17 (100.0) | 19 (100.0) | 57 (89.1)  | 93 (93.0) |

Pain irradiates from wrist to shoulder

| Yes (%) | No (%) | Absent (%) | Present (%) |
|---------|--------|------------|-------------|
| Yes     | 1 (5.9)  | 5 (26.3)   | 11 (17.2)   | 17 (17.0)  |
| No      | 16 (94.1) | 14 (73.7)  | 53 (82.8)   | 83 (83.0)  |

Hand stiffness in the morning

| Yes (%) | No (%) | Absent (%) | Present (%) |
|---------|--------|------------|-------------|
| Yes     | 2 (11.8) | 0          | 6 (9.4)     | 8 (8.0)    |
| No      | 15 (88.2) | 19 (100.0) | 58 (90.6)  | 92 (92.0) |

Symptoms limit you from daily work

| No response (%) | Yes (%) | No (%) | Absent (%) | Present (%) |
|-----------------|--------|--------|------------|-------------|
| No response     | 0      | 0      | 9 (14.1)   | 9 (9.0)     |
| Yes             | 0      | 2 (10.5) | 4 (6.3)    | 6 (6.0)     |
| No              | 17 (100.0) | 17 (89.5) | 51 (79.7) | 85 (85.0) |

*Fisher’s exact test. *P<0.05 statistically significant, P>0.05 NS. NS=Nonsignificant

Table 2: Prevalence of back pain and carpel tunnel syndrome as compared to duration of practice

Results

Prevalence of LBP and CTS was compared based on age and gender in Table 1 among 100 participants in the present study. 21 (21%) were females and 79 (79%) were males. Majority (53%) of the participants belonged to the age group of 30–40 years. Overall 54 (54%) participants reported having LBP and 86 (86%) participants reported symptoms of CTS. Similar proportions of males and females reported LBP and CTS. Proportion of participants

Hip extension
Lie on your stomach and lift one of the legs straight without bending the knees, sustain for 5 s and relax; repeat ten times by switching the feet [Figure 4f].

Back stretch
Stand straight with both the feet close to each other bend forward to touch the toes without bending the knees, then come up with both arms raised above the head, and slightly bend backward. Try doing at least 10 repetitions [Figure 4g].
with back pain was higher in 40–50 years age group, but the occurrence of CTS decreased with age.

Presence and absence of symptoms were compared with the duration of practice in Table 2, wherein majority of the participants with 10 or more years of clinical practice reported of LBP, but at least one symptom of CTS was observed in most of the participants irrespective of the period of clinical practice.

Significance of the duration of practise, type of practise whether sitting or standing, hours of practise, number of patients treated, mode of travel, regular exercise, break between patients were all questioned but were found to be nonsignificant as there was back pain irrespective of all these facts as seen in Table 3.

Practitioners who used vibratory instruments on every patient were more likely to report of CTS. Majority of the participants presented with symptoms of CTS irrespective of whether break was taken or not as noticed in Table 4.

Discussion

One of the common MSDs seen in dental practitioners is CTS, a disorder due to compression of median nerve of the wrist, which is further aggravated by factors such as repetitive actions, prolonged grip-like grasp, and continued perception of vibrations from the dental instruments. Clinical symptoms include sensations such as tingling and numbness related to the thumb, forefinger, middle finger, and half of ring finger which makes it a total of three and a half fingers. Severe cases show signs of pain limiting the efficiency and hindering the proficiency of the dental practitioners.

Symptoms of CTS observed was 86 (86%) in practitioners who participated in the study, which was much higher than the results found by Borhan Haghighi et al.,[7] wherein the prevalence was 18.5%. This might be due to the fact where the dental practitioners in this study treated more patients with less rest between patients. Twenty-three percent of the US dental hygienist experienced symptoms of CTS according to Hayes et al.,[3] 20% of dental professionals had CTS according to Pai et al.,[8] and according to a review by Hayes et al.,[2] 64%–93% of dental professionals experienced pain due to CTS. In the present study [Table 4], prevalence of CTS was high in practitioners who used more of vibratory instruments. It is a form of repeated strain injury common to the dental professionals.

Prevalence of LBP in the present study was 54% which corresponds to nearly half the population. According to a review by Hayes et al.,[2] 60.1% of polish dental practitioners, nearly 60% of Danish dental practitioners, and 53.7% of Queensland dentists experienced LBP, which is almost in line with the present study. Lesser prevalence was found in Dutch (45%), 36.3% in Saudi Arabian practitioners, and 23.5% of hygienists of the United States dental army staff. A 12-month prevalence

| Table 3: Factors predisposing to the onset of back pain |
|--------------------------------------------------------|
| Back pain                                             | Total (%) | P       |
|                                                      | Yes (%)   | No (%)  |
| Type of pain                                          |           |         |
| No response                                           | 1 (1.9)   | 37 (80.4) | 38 (38.0) | 1.00 (NS) |
| Sharp shooting                                        | 4 (7.4)   | 1 (2.2)  | 5 (5.0)   |           |
| Dull aching                                           | 49 (90.7) | 8 (17.4) | 57 (57.0) |           |
| Pain radiate to the leg                               |           |         |
| No response                                           | 0         | 36 (78.3) | 36 (36.0) | 1.00 (NS) |
| Yes                                                   | 14 (25.9) | 2 (4.3)  | 16 (16.0) |           |
| No                                                    | 40 (74.1) | 8 (17.4) | 48 (48.0) |           |
| Decrease in pain with time                            |           |         |
| No response                                           | 2 (3.7)   | 35 (76.1) | 37 (37.0) | 1.00 (NS) |
| Yes                                                   | 35 (64.8) | 7 (15.2) | 42 (42.0) |           |
| No                                                    | 17 (31.5) | 4 (8.7)  | 21 (21.0) |           |
| Bend your body for visibility                         |           |         |
| No response                                           | 0         | 13 (28.3) | 13 (13.0) | 0.59 (NS) |
| Yes                                                   | 29 (53.7) | 15 (32.6) | 44 (44.0) |           |
| No                                                    | 25 (46.3) | 18 (39.1) | 43 (43.0) |           |
| Mode of traveling                                     |           |         |
| Two-wheeler                                           | 4 (7.4)   | 1 (2.2)  | 5 (5.0)   | 0.47 (NS) |
| Four-wheeler                                          | 50 (92.6) | 45 (97.8) | 95 (95.0) |           |
| 5 min                                                 | 30 (55.6) | 28 (60.9) | 58 (58.0) |           |
| 10 min                                                | 6 (11.1)  | 3 (6.5)  | 9 (9.0)   |           |
| Very rarely                                           | 27 (50.0) | 34 (73.9) | 61 (61.0) |           |
| None                                                  | 23 (42.6) | 12 (26.1) | 35 (35.0) |           |
| Type of dentistry                                     |           |         |
| Two-handed                                            | 32 (59.3) | 20 (43.5) | 52 (52.0) | 0.17 (NS) |
| Four-handed                                           | 22 (40.7) | 26 (56.5) | 48 (48.0) |           |
| Exercise regularly                                    |           |         |
| Yes                                                   | 31 (57.4) | 33 (71.7) | 64 (64.0) | 0.20 (NS) |
| No                                                    | 23 (42.6) | 13 (28.3) | 36 (36.0) |           |
| Patients treated per day                              |           |         |
| <10                                                   | 9 (16.7)  | 10 (21.7) | 19 (19.0) | 0.09 (NS) |
| >10                                                   | 27 (50.0) | 13 (28.3) | 40 (40.0) |           |
| >20                                                   | 18 (33.3) | 23 (50.0) | 41 (41.0) |           |
| Hours of practice in a day                            |           |         |
| No response                                           | 0 (0.0)   | 2 (4.3)  | 2 (2.0)   | 0.92 (NS) |
| 4 h                                                   | 12 (22.2) | 8 (17.4)  | 20 (20.0) |           |
| 8 h                                                   | 29 (53.7) | 25 (54.3) | 54 (54.0) |           |
| 10 h                                                  | 13 (24.1) | 11 (23.9) | 24 (24.0) |           |
| Break taken between your work                         |           |         |
| No break                                              | 18 (33.3) | 15 (32.6) | 33 (33.0) | 0.69 (NS) |
| 5 min                                                 | 30 (55.6) | 28 (60.9) | 58 (58.0) |           |
| 10 min                                                | 6 (11.1)  | 3 (6.5)  | 9 (9.0)   |           |
| Very rarely                                           | 27 (50.0) | 34 (73.9) | 61 (61.0) |           |
| None                                                  | 23 (42.6) | 12 (26.1) | 35 (35.0) |           |

Fisher's exact test. *P<0.05 statistically significant, P>0.05 NS. NS=Nonsignificant
Table 4: Factors predisposing to the onset of carpal tunnel syndrome

| Carpal tunnel syndrome | Total (%) | P  |
|------------------------|-----------|----|
| Absent (%) Present (%) |
| Number of patients treated per day |
| <10 | 4 (28.6) | 15 (17.4) | 19 (19.0) | 0.52 (NS) |
| >10 | 4 (28.6) | 36 (41.9) | 40 (40.0) |
| >20 | 6 (42.9) | 35 (40.7) | 41 (41.0) |
| Hours of practice in a day |
| No response | 2 (14.3) | 0 | 2 (2.0) | 0.06 (NS) |
| 4 h | 4 (28.6) | 16 (18.6) | 20 (20.0) |
| 8 h | 8 (57.1) | 46 (53.5) | 54 (54.0) |
| 10 h | 0 | 24 (27.9) | 24 (24.0) |
| Break taken between work |
| No break | 3 (21.4) | 30 (34.9) | 33 (33.0) | 0.32 (NS) |
| Break taken | 11 (78.6) | 56 (65.1) | 67 (67.0) |
| Use of vibratory instruments |
| Every patient | 0 | 4 (4.7) | 4 (4.0) | 0.01* |
| Very rarely | 4 (28.6) | 57 (66.3) | 61 (61.0) |
| None | 10 (71.4) | 25 (29.1) | 35 (35.0) |

Fisher’s exact test. *P<0.05 statistically significant, P>0.05 NS. NS=Nonsignificant

A cross-sectional study was conducted using convenience sampling of dental practitioners who have been practicing for 5 years and more. The clinicians were requested to fill in a questionnaire which focused on the possible causes for the onset of LBP and CTS. A strong correlation was found between dentistry and MSDs such as LBP and CTS, though no difference was seen based on gender, age group, and number of patients treated per day, there was a definite correlation between the years of practice, use of vibratory instruments, lack of rest between patient treatment and unscientific postures of treating patients. A definite working pattern and instruments with proper grip designs and proper ergonomics can reduce the incidence of these disorders and prevent early retirement among dentists in the future. The syllabus in dental schools should include chapters on ergonomics including stress relief exercises and strengthening exercises to overcome risk factors.

**Conclusion**

The onset of these MSDs can progress to severe forms if care is not taken at a proper time. Awareness of the onset of these disorders early in the professional life would be beneficial to the practitioner as he/she can inculcate preventive approaches to overcome them. Proper magnification, use of loupes, proper lumbar support, use of fog-free mouth mirrors, and good ergonomic condition of the dental clinic should be implemented so that the onset of MSDs can be prevented. In case the symptoms such as tingling sensation indicative of CTS are seen, then the dental surgeon should immediately start with physiotherapeutic exercises. The chairs should be designed such that proper lumbar support is attained. Onset of LBP can also be overcome with the regular practice of strengthening exercises. The exercises given in the present study can be included as part of curriculum.

With advancement in technology and digitalization, use of computers, laptops, smartphones, and other gadgets can also be added factors that could trigger the onset of CTS. The bad roads which can lead to jerking motion of the vehicle throughout the journey, stress in day-to-day life could be few other reasons contributing to LBP. Further studies could be carried out considering all the factors together. By studying the prevalence of LBP and CTS, we get a clear picture for the need to train the dentist during their study period itself about the occupational risks, their management, and control in this regard. Periodic rest during patient treatment and treatment with spaced appointments should be considered. Further studies can be conducted to implement these exercises in the affected population and study the outcomes.
Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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