

Original Article

Prevalence of Carpel Tunnel Syndrome among Dentists, A Cross-Sectional Study

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ABSTRACT

Background: Carpal Tunnel Syndrome (CTS) is a neuromuscular disorder predominantly seen in professions demanding repetitive and forceful hand movements, notably among dentists. This study aimed to assess the prevalence of CTS among dentists and its impact on their professional activities.

Objective: To determine the prevalence of CTS in dentists and understand how it affects their daily professional tasks.

Methods: This cross-sectional study utilized the Boston Carpal Tunnel Questionnaire to evaluate sensory and functional impairments in a sample of 50 dentists. The questionnaire encompassed demographic details, the Functional Status Scale (FSS), and the Symptom Severity Scale (SSS). Data analysis was conducted using SPSS version 28.0.

Results: The study sample comprised 38% female and 62% male dentists, primarily aged between 20-30 years (48%), followed by 31-40 years (30%), and 41-50 years (22%). It was found that female dentists exhibited a higher prevalence of CTS compared to male counterparts. Regarding symptoms, 40% of the participants reported mild hand or wrist pain during the day, while 10% experienced moderate pain. Furthermore, 30% of the dentists reported experiencing wrist pain 1-2 times per day. A notable 40% felt slight weakness in the hands, and 6% reported moderate weakness.

Conclusion: The study concludes that CTS is highly prevalent among dentists, with a more significant impact observed in female practitioners. These findings highlight the need for targeted preventive measures and ergonomic interventions in dental practice to reduce the risk and burden of CTS.

Keywords: Carpal Tunnel Syndrome, Dentistry, Occupational Health, Boston Carpal Tunnel Questionnaire, Wrist Pain, Neuromuscular Disorders.

INTRODUCTION

Carpal Tunnel Syndrome (CTS), a neuropathy characterized by the entrapment of the median nerve within the carpal tunnel—a constricted osteofibrous passageway in the wrist—has emerged as a notable occupational hazard in the dental profession. The carpal tunnel, demarcated by the carpal bones and the transverse carpal ligament, becomes a site of nerve compression and ischemia. Pathophysiologically, increased pressure within this tunnel precipitates a decrement in median nerve functionality, a phenomenon corroborated by multiple electrophysiological studies (1, 2, 3).

Epidemiologically, CTS exhibits a prevalence of approximately 3-6% in the general adult demographic. However, a distinctive surge in prevalence is observable among dental practitioners, with studies indicating a prevalence rate of 16.7% in this cohort (4, 5). This statistic alarmingly suggests that nearly one in six dentists may encounter CTS symptomatology in their professional lifespan, a rate notably exceeding that observed in the general populace (6, 7). Dental professionals are predisposed to musculoskeletal disorders

(MSDs), particularly those involving the hand, wrist, and lower back, due to prolonged periods of work in static postures and repetitive manual tasks (8).

Age emerges as a pivotal factor in the prevalence of CTS among dental professionals. An age-dependent increase in CTS incidence has been noted, likely attributable to cumulative exposure to repetitive strain and wrist movements across the career span of a dentist (9, 10). Moreover, the duration and intensity of professional practice correlate with CTS risk, implicating the chronicity of exposure to repetitive manual tasks and sustained median nerve compression as key etiological factors.

The prevalence of CTS extends beyond dentists to encompass dental hygienists, who exhibit a staggering 56% prevalence of CTS symptoms, attributable to their repetitive hand and wrist motions, such as in scaling and tooth polishing (10, 11, 12). Furthermore, international studies, such as those conducted in Iran, reiterate the global pertinence of CTS in dentistry, citing a prevalence of 17% among dentists (5). Gender-specific analysis reveals a significant association between female gender and the development of CTS and first CMC joint osteoarthritis in dental professionals (11). Dale et al.'s research further elucidates the broader epidemiological landscape of CTS, identifying a prevalence of 5.8% in the United States with higher incidence rates among industrial workers, women, and the elderly, thereby highlighting specific demographic and occupational risk factors (13).

The overarching goal of this research is to enhance awareness and understanding of Carpal Tunnel Syndrome within the dental community, fostering early recognition, and intervention. By delineating the etiological factors, symptomatology, and preventive strategies pertinent to CTS, this study aims to equip dental professionals with the knowledge necessary to mitigate the onset and progression of this condition. Additionally, the research underscores the importance of comprehensive education, reassurance, and prompt referral in severe cases, aiming to optimize patient outcomes and enhance the quality of life for those affected by CTS. This study not only contributes to the existing body of knowledge but also serves as an invaluable reference for future research exploring the impact of Carpal Tunnel Syndrome across diverse professional domains and populations.

MATERIAL AND METHODS

Following the approval from the research committee, the present cross-sectional study was conducted over a period of six months. The sample size, determined using the Raosoft sample size calculator, comprised 50 participants. This calculation was based on a 90% confidence interval and a 50% distribution rate, ensuring a robust statistical representation of the target population (14).

Data collection employed a convenience sampling technique, wherein participants were recruited from various hospital and clinical settings across Sialkot City. This method facilitated the gathering of a diverse and representative sample of dental professionals within the specified geographical area.

The inclusion criteria for the study encompassed both male and female dentists aged between 20 to 75 years. These individuals were required to have a minimum of one year of professional experience and a daily working duration exceeding eight hours. Exclusion criteria were stringently applied to maintain the study's focus and validity. Dentists with a history of orthopedic trauma dating back more than one year, those with a history of tendinitis of the Extensor carpi ulnaris, De Quervain's tenosynovitis, or any congenital deformities were excluded from the study (14).

The prevalence of Carpal Tunnel Syndrome (CTS) among the participating dentists was assessed using the Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) (15). This questionnaire is bifurcated into two distinct sub-scales: the Symptom Severity Scale (SSS) and the Functional Status Scale (FSS). The SSS, comprising 11 items, evaluates various dimensions of the condition, including pain, paresthesia, numbness, weakness, nocturnal symptoms, and difficulties in grasping. Conversely, the FSS focuses on eight functional daily activities adversely impacted by CTS. These activities range from writing and buttoning garments to holding a book, using a phone, opening jars, and performing household chores.

Both the SSS and FSS sub-scales utilize a 5-point answer scale for each item, ranging from 1 (minimal impact) to 5 (severe impact). The overall score for each scale was derived by calculating the mean item score, providing a quantifiable measure of symptom severity and functional impairment due to CTS.

For data analysis, the study employed the Statistical Package for the Social Sciences (SPSS) Version 28.0. This advanced statistical software enabled the efficient processing and interpretation of the collected data. Qualitative data were presented as percentages, providing a clear and concise representation of categorical variables. For quantitative data, mean values and standard deviations (SD) were calculated, offering a comprehensive statistical overview of the study's findings.

RESULTS

The results from Table 1, focusing on the Symptom Severity of Carpal Tunnel Syndrome among Dentists, indicate varied levels of severity in hand and wrist symptoms. A majority of the participants reported normal or slight symptoms. Specifically, 68% of dentists experienced normal hand/wrist pain at night, while 28% had slight pain, and a small proportion (4%) reported medium severity.

During the day, 50% had normal pain levels, and 40% experienced slight pain, with 10% facing medium severity. Numbness in the hand was normal for 80% of participants, slight for 14%, and medium for 6%. For weakness in the hand, 54% reported normal levels, 40% slight, and 6% medium. Tingling sensations were normal in 82% of the dentists, slight in 16%, and medium in 2%. As for the severity of numbness or tingling at night, 86% experienced normal levels, 8% slight, and 6% medium. Lastly, in terms of difficulty with grasping small objects, 80% of the participants found no difficulty, 18% had slight difficulty, and a mere 2% reported moderate difficulty.

Table 1: Symptom Severity of Carpal Tunnel Syndrome Among Dentists

Symptom	Normal (N, %)	Slight (N, %)	Medium (N, %)	Severe (N, %)	Very Serious (N, %)
Hand/Wrist Pain at Night	34 (68%)	14 (28%)	2 (4%)	--	--
Hand/Wrist Pain During Day	25 (50%)	20 (40%)	5 (10%)	--	--
Numbness in Hand	40 (80%)	7 (14%)	3 (6%)	--	--
Weakness in Hand	27 (54%)	20 (40%)	3 (6%)	--	--
Tingling Sensations in Hand	41 (82%)	8 (16%)	1 (2%)	--	--
Severity of Numbness/Tingling at Night	43 (86%)	4 (8%)	3 (6%)	--	--
Difficulty with Grasping Small Objects	40 (80%)	9 (18%)	1 (2%)	--	--

In Table 2, addressing the Frequency and Duration of Hand/Wrist Pain, it was observed that a significant portion of dentists had minimal issues. For the frequency of hand/wrist pain during the day, 66% of participants reported normal levels, 30% experienced it 1-2 times, and 4% 3-5 times. Regarding waking up at night due to pain in the past 2 weeks, 74% had no such occurrences, 14% woke up once, 10% 2-3 times, and 2% 4-5 times. When assessing the average duration of pain episodes during the day, 62% had no pain, 30% experienced pain lasting less than 10 minutes, 6% for 10-60 minutes, and 2% continuously throughout the day.

Table 2: Frequency and Duration of Hand/Wrist Pain

Description	Normal (N, %)	1-2 Times (N, %)	3-5 Times (N, %)	>5 Times (N, %)	Continuous (N, %)
Frequency of Hand/Wrist Pain During Day	33 (66%)	15 (30%)	2 (4%)	--	--
Waking Up at Night Due to Pain (Past 2 Weeks)	37 (74%)	7 (14%)	5 (10%)	1 (2%)	--
Average Duration of Pain Episodes During Day	31 (62%)	15 (30%)	3 (6%)	--	1 (2%)

Table 3 presents the Functional Status Scale (FSS) among Dentists. This table illustrates how Carpal Tunnel Syndrome affects dentists' daily activities. A vast majority had no difficulty performing tasks like writing (90%), buttoning clothes (98%), and bathing and dressing (96%). Holding a book while reading posed no difficulty for 80%, gripping phone handles for 86%, and carrying grocery baskets for 64%. However, activities like opening jars showed a higher level of difficulty, with 58% reporting no difficulty and 40% experiencing slight difficulty.

Table 3: Functional Status Scale (FSS) Among Dentists

Activity	No Difficulty (N, %)	Slight Difficulty (N, %)	Moderate Difficulty (N, %)	Severe Difficulty (N, %)	Can't Perform (N, %)
Writing	45 (90%)	4 (8%)	1 (2%)	--	--
Buttoning of Clothes	49 (98%)	1 (2%)	--	--	--
Holding a Book While Reading	40 (80%)	8 (16%)	1 (2%)	1 (2%)	--
Gripping Phone Handles	43 (86%)	6 (12%)	1 (2%)	--	--
Opening Jars	29 (58%)	20 (40%)	1 (2%)	--	--

Activity	No Difficulty (N, %)	Slight Difficulty (N, %)	Moderate Difficulty (N, %)	Severe Difficulty (N, %)	Can't Perform (N, %)
Carrying Grocery Baskets	32 (64%)	15 (30%)	2 (4%)	1 (2%)	--
Bathing and Dressing	49 (96%)	1 (2%)	1 (2%)	--	--

The data in Table 4 provides a demographic analysis of Total Symptom Severity Scale (SSS), Functional Status Scale (FSS), and Boston Carpal Tunnel Questionnaire (BCTQ) scores, broken down by gender. For the Total SSS, males had a mean score of 14.4516 with a standard deviation of 3.89734, while females scored slightly higher with a mean of 15.6316 and a standard deviation of 4.19273. In the Total FSS, males had a mean score of 9.0323 (SD: 1.35361), compared to females who had a higher mean of 10.9474 (SD: 3.67384).

Table 4: Demographic Analysis of Total Symptom Severity Scale (SSS), Functional Status Scale (FSS), and Boston Carpal Tunnel Questionnaire (BCTQ) Scores

Category	Gender	Mean	Standard Deviation (SD)	Standard Error of Mean (SEM)	Mean Difference (MD)
Total SSS	Male	14.4516	3.89734	.69998	-1.17997
	Female	15.6316	4.19273	.96188	-1.17997
Total FSS	Male	9.0323	1.35361	.24312	-1.91511
	Female	10.9474	3.67384	.84284	-1.91511
Total BCTQ	Male	23.4839	4.86396	.87359	-3.09508
	Female	26.5789	7.01043	1.60830	-3.09508

Finally, in the Total BCTQ scores, males had a mean of 23.4839 (SD: 4.86396), and females had a mean of 26.5789 (SD: 7.01043). These results suggest that female dentists tend to have higher scores in symptom severity and functional status related to CTS compared to their male counterparts.

DISCUSSION

This study's findings highlight the significant prevalence of Carpal Tunnel Syndrome (CTS) among dentists, a concern that has been echoed in various other studies yet exhibits notable variance across different geographical and professional contexts. The current research observed a CTS prevalence rate of 40% among dentists, a figure that is substantially higher compared to certain other studies but lower than some. For instance, the study by Maghsoudipour et al. reported a prevalence rate of 17.9% in 2019 (9), which is considerably lower than the current study's findings. This disparity may be attributed to differences in study design, sample size, or the specific characteristics of the sampled populations.

Similarly, Faisal Ahmed et al.'s research conducted in Riyadh found a prevalence of approximately 30% (16), again lower than the current study. The geographical and cultural differences, as well as variations in the work environment and practices in Saudi Arabia, could contribute to this difference. In contrast, a study by Hafiza Mubashra in Faisalabad reported a higher prevalence rate of 60% (17), suggesting regional variances or differing methodologies might influence such outcomes.

Ravisankar and Thenmozhi's study at Saveetha Dental College in 2020 found that a majority of dental students (63%) reported no symptoms of CTS (18), which contrasts with the present study's findings of 80% participants reporting no numbness. This difference could be due to the younger age and possibly lesser clinical exposure of dental students compared to practicing dentists.

Comparing with a larger study by Vrushali Shetye, which reported a prevalence rate of 11.06% among a dexterous population (19), the current study's higher rate might be indicative of the specific occupational risks associated with dentistry. Teo et al.'s study in Klang Valley also aligns closely with the current study, showing a prevalence of 37.2% (10), underscoring the widespread nature of CTS in the dental profession.

The study by Zubair et al in Peshawar reported a lower prevalence rate of 21.1% (20), suggesting regional or demographic factors might play a role in the occurrence of CTS among dentists. Additionally, the current study's observation that 80% of participants did not experience functional difficulties contrasts with a Chennai study that reported varying levels of disability associated with CTS (21, 22). This might reflect differences in the severity of CTS symptoms or the adaptability of dentists in managing these symptoms.

CONCLUSION

In conclusion, the study substantiates the hypothesis that Carpal Tunnel Syndrome is highly prevalent among dentists, with a marked emphasis on its increased occurrence in female dentists. These findings underscore the need for targeted interventions and ergonomic adaptations in dental practices to mitigate the risk and impact of CTS, particularly considering the varying prevalence rates and symptom severities observed across different studies and regions.

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