

Wrist Injury and Dentistry

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ABSTRACT

In dentistry, two of the most commonly reported pain syndromes of the wrist occur in nearly the same area. Easily confused, but of entirely different origin, de Quervain's disease is a painful inflammation of the tendons in the thumb, whereas osteoarthritis (OA) of the thumb is a degenerative joint process. Both appear frequently among dental professionals, since a primary risk factor is repetitive thumb use. These syndromes can be debilitating, and OA of the thumb can force early retirement, especially among dental hygienists. Therefore it is a good investment in your health to implement early ergonomic prevention strategies.

Key words: Osteoarthritis, Dental hygienists, Health, Tendons

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INTRODUCTION

Dentists, especially dental hygienists, frequently have hand/wrist symptoms (musculoskeletal diseases). Carpal tunnel syndrome, de Quervain's tenosynovitis, osteoarthritis of the thumb, and other cumulative trauma diseases (CTDs) that impact the wrist. Registered dental practitioners have been documented to suffer from musculoskeletal diseases (MSD), which have harmed their daily performance and career longevity. Carpal tunnel syndrome, also known as median nerve compression, is a condition in which your hand feels numb, tingly, or weak [1]. From the shoulder to your palm, the median nerve runs anatomically. It connects your thumb, index, and long fingers, as well as a portion of your ring finger, to your touch, temperature, and pain receptors. The carpal tunnel is formed by the wrist (carpal) bones and a strong ligament as this nerve runs through the palm side of your wrist. This tunnel also houses the tendons that go through the thumb and fingers. A membrane sheath (the synovial membrane) surrounds each tendon, lubricating the tendon's gliding and sliding action. Because the nerve is the carpal tunnel's most fragile and sensitive structure, anything that injures or impinges on it will result in aberrant feelings [2].

"Usually, these atypical sensations include tingling, scorching electric shock, or numbness," says orthopaedic surgeon Dr. Donald Pfeifer. He goes on to say that the sensations are signs of median nerve compression, which is what causes carpal tunnel syndrome, and that the most prevalent cause is overuse from repetitive and forceful grasping [3]. Repetitive hand motions, strong pinching or

clutching, persistent uncomfortable wrist postures, and vibration are all risk factors for carpal tunnel syndrome and other hand problems. CTS (carpal tunnel syndrome) is basically an entrapment syndrome produced by pressure on the median nerve within the carpal tunnel [4].

De Quervain's Disease (also known as de Quervain's Tenosynovitis) affects the two thumb tendons that force the thumb forward and away from the hand at the CMC joint, which is located between the base of the thumb and the wrist. Discomfort, tenderness, and edoema are frequent symptoms on the thumb side of the wrist [5]. Gripping is frequently difficult, and moving the thumb exacerbates the pain. Forceful, persistent, or recurrent thumb abduction (flexed forward, off of the plane of the hand) paired with angling the hand abruptly to one side is the most common cause in dentistry. Scaling, extractions, and suctioning with a palmar grip are just a few examples of dental procedures that might cause the issue [6]. Women are four times more likely than males to acquire this condition and the prevalence are highest among team members aged 35 to 55.

Osteoarthritis (OA) is the most prevalent joint condition in the United States and a leading cause of disability. The joints, like your muscles and spinal discs, need to move in order to be nourished and stay healthy. While moderate to high levels of exercise do not promote OA, research shows that aberrant static loading and immobility can. Furthermore, during precision handgrip, joint forces are highest in the hands [7]. It's simple to see why dentists are among the most vulnerable to this syndrome's effects. Pinching and twisting aggravates these symptoms. When you pronate your forearm (palms-down) and apply a lateral pinch grip, the major stabilising ligament (the beak ligament) at the thumb CMC joint becomes tight. When this ligament weakens, the CMC joint moves incorrectly,

resulting in joint injury. The condition is more common in women over the age of 40 [8].

These disorders can be severe, and OA of the thumb, particularly among dental hygienists, can induce early retirement [9]. Our team has extensive knowledge and research experience that has translate into high quality publications [10-29].

Therefore the aim of this study is to assess and to create awareness about possible wrist injuries among dental students so that early ergonomic prevention strategies can be implemented as a good investment in health and wellbeing.

MATERIAL AND METHODS

This cross-sectional study was conducted in 2022 among the undergraduate and postgraduate dental students of the Saveetha Dental College and Hospital, Chennai, India. To evaluate the knowledge of the participants about wrist injury ergonomics, a self-administered questionnaire containing 15 questions were made. The questionnaire was validated and later distributed to the participants using Google forms. The participation of the subjects was kept voluntary and nobody was not obligated to fill the form. Questions were answered with “yes” or “no” or by marking the correct responses. Data was tabulated using Google sheets and then exported to SPSS version 23 for statistical analysis. Descriptive statistics as percent were calculated to summarise qualitative data. Chi-square type of analysis was also done to assess the correlation. The results were represented with a pie chart and bar diagram.

RESULTS

The overall response for each question and the percent analysis were calculated for each question. Figure 1 shows that 39.0% of the participants were aware of the fact that 70% of the dentists reported wrist and hand pain at some point in their career while 45.0% of the participants did not know about this and 16.0% of the participants were not sure. Figure 2 shows that 48.0% of participants did not know that there was a higher prevalence of the symptoms of Carpal Tunnel Syndrome (CTS) among dentists than the general population. Figure 3 shows us that nearly half, 49.0% of the participants were not aware of the fact that the exposure to high frequency vibrations from the dental hand piece and the ultrasonic scalers could predispose them to neuropathy and CTS. Figure 4 shows us that 8.0% of the respondents have felt a temporary numbness or a tingling sensation in their hand (symptoms of CTS). Figure 5 shows us that a majority of the participants, of about 71.0% do not practice hand stretching while only 27.0% participants do. Figure 6 shows us that 22.0% of the postgraduates and 27.0% of the undergraduates' participants did not know about the fact that the exposure to high frequency vibrations from the dental hand piece and the ultrasonic scalers could predispose them to neuropathy and CTS. Figure 7 shows us that 22.0% of the female participants were more aware of the prevalence that 70% of the

dentists reported wrist and hand pain at some point in their career than the male participants. Figure 8 shows us that the female participants of 6.0% were the most predisposed to the symptoms of CTS (Temporary numbness or tingling sensation) than the male participants (2.0%).

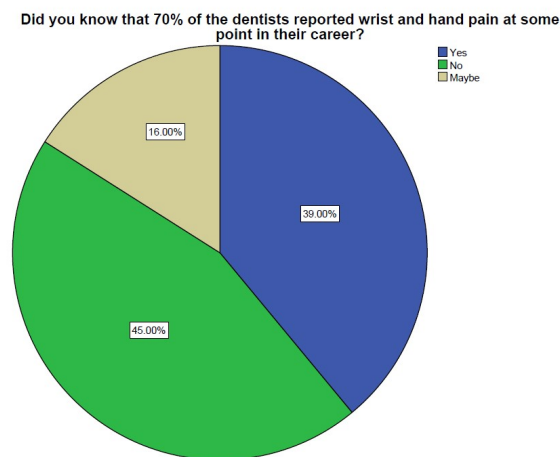


Figure 1: Pie chart representing the percentage of participants who knew that 70% of the dentists reported wrist and hand pain at some point in their career. 39.0% of participants were aware of the fact while 45.0% did not know about this and chose the option 'no' and 16.0% of the participants were not sure and chose the option 'maybe'. Blue indicates 'yes', green indicates 'no' and beige indicates 'maybe'.

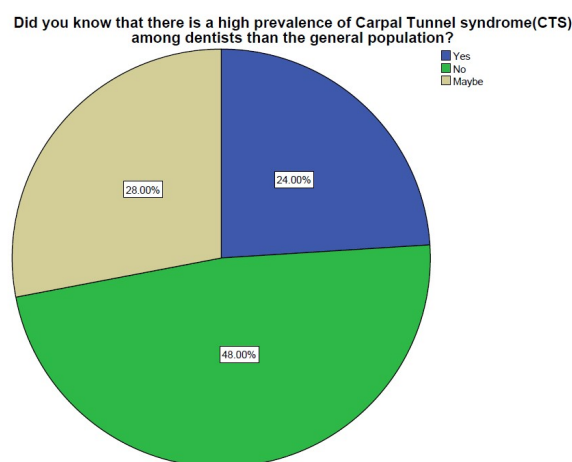


Figure 2: Pie chart representing the percentage of participants whether they knew that there was a higher prevalence of the symptoms of Carpal Tunnel Syndrome (CTS) among dentists than the general population. 24.0% of the participants answered with a 'Yes', 48.00% of the participants answered with a 'No' and 28.0% of the participants were not sure and answered with a 'Maybe'. Blue indicates 'yes', green indicates 'no' and beige indicates 'maybe'.

Did you know that the exposure to high frequency vibrations from the dental handpiece/Air Rotor and the ultrasonic scalers could predispose neuropathy and CTS

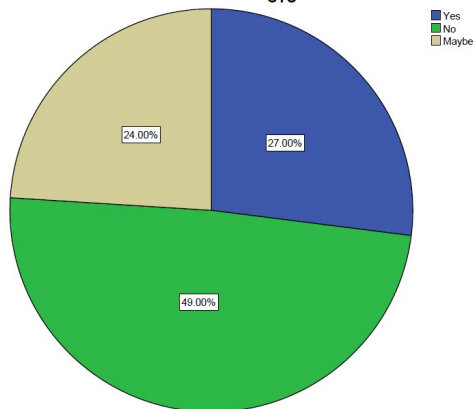


Figure 3: Pie chart representing the percentage of participants if they knew about the fact that the exposure to high frequency vibrations from the dental hand piece and the ultrasonic scalers could predispose them to neuropathy and CTS. 27.0% of the participants answered with a 'Yes', 49.00% of the participants answered with a 'No' and 24.0% of the participants were not sure and answered with a 'Maybe'. Blue indicates 'yes', green indicates 'no' and beige indicates 'maybe'.

Have you ever felt a temporary numbness or a tingling sensation in your hand

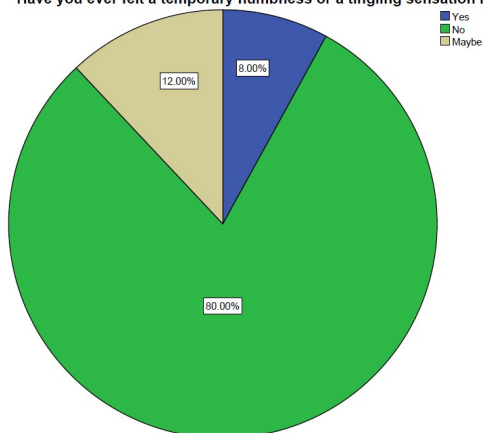


Figure 4: Pie chart representing the percentage of participants if they have ever felt a temporary numbness or a tingling sensation in their hands. 8.0% of the participants answered with a 'Yes', 80.00% of the participants answered with a 'No' and 12.0% of the participants were not sure and answered with a 'Maybe'. Blue indicates 'yes', green indicates 'no' and beige indicates 'maybe'.

Do you practice hand stretching often?

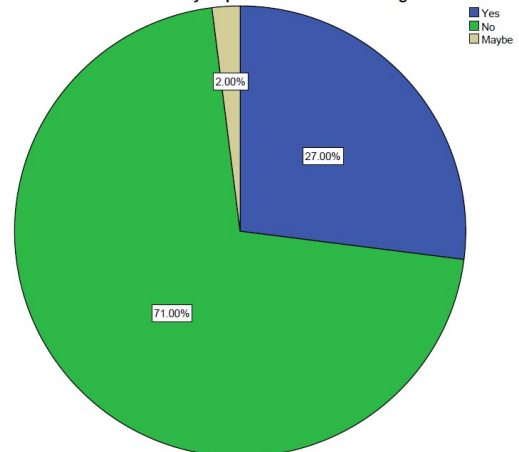


Figure 5: Pie chart representing the percentage of participants who practice hand stretching often. 27.0% of the participants answered with a 'Yes', 71.00% of the participants answered with a 'No' and 2.0% of the participants were not sure and answered with a 'Maybe'. Blue indicates 'yes', green indicates 'no' and beige indicates 'maybe'.

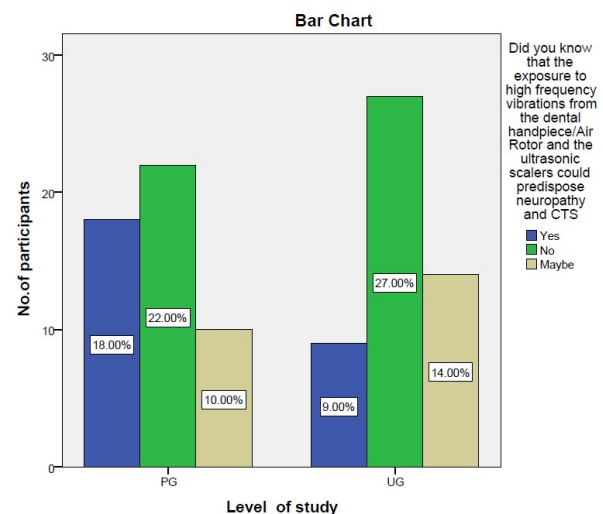


Figure 6: This bar graph depicts the association between the level of education and the percentage of participants who knew about the fact that the exposure to high frequency vibrations from the dental hand piece and the ultrasonic scalers could predispose them to neuropathy and CTS. Blue indicates 'yes', green indicates 'no' and beige indicates 'maybe'. The X-axis represents the level of education of the participants. Y axis represents the frequency of participants who knew what an 'Artefact' in histopathology is. Wherein the awareness level in the present study showed higher awareness levels in the postgraduates than the undergraduates. The chi-square test was analysed P value=0.204 ($p>0.05$) which is statistically not significant.

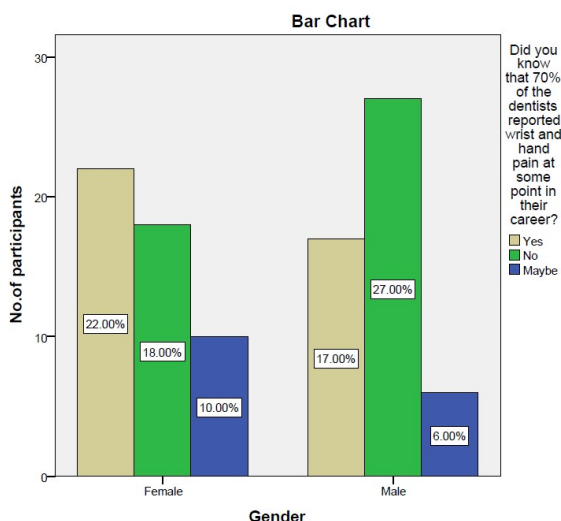


Figure 7: This bar graph depicts the association between the gender and the percentage of participants who knew that 70% of the dentists reported wrist and hand pain at some point in their career. The X-axis represents the gender of the participants. Y axis represents the frequency of participants who knew that 70% of the dentists reported wrist and hand pain at some point in their career. From the graph it was found out that female participants were most aware. The chi-square test was analysed P value=0.186 ($p>0.05$) which is statistically not significant. Beige indicates 'yes',

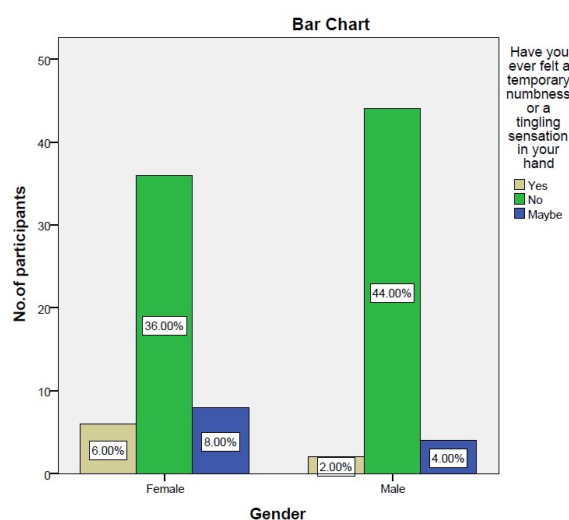


Figure 8: This bar graph depicts the association between the gender and the percentage of participants who have felt a temporary numbness or a tingling sensation in their hand. The X-axis represents the gender of the participants. Y axis represents the frequency of participants who have felt a temporary numbness or a tingling sensation in their hand. From the graph it was found out that female participants were most associated with symptoms of CTS (temporary numbness or tingling sensation). The chi-square test was analysed P value=0.203 ($p>0.05$) which is statistically not significant. Beige indicates 'yes', green indicates 'no' and blue indicates 'maybe'.

DISCUSSION

Work-related physical load was linked to the prevalence of musculoskeletal symptoms among dentists, which appears to be especially significant for hand/wrist issues.

Dentists, particularly dental hygienists, have a significant rate of hand/wrist issues [30]. Low back problems are followed by hand/wrist issues, which have a significantly higher chronicity than any other problem. According to a study, Carpal tunnel syndrome affects roughly 5% of dentists, whereas 56% of dental hygienists experience some symptoms of the condition [31].

Dentists with back pain reported increased neck and hand/wrist discomfort than dentists who did not have back pain. Neck and hand/wrist pain were shown to be highly linked, with 50% of those who had neck pain also having hand/wrist discomfort in the previous 12 months.

According to Figure 1, we can see that 45.0% of the participants did not know and 16.0% of the participants were not so sure of the fact that nearly 70% of the dentists reported wrist and hand pain at some point in their career. This shows us the lack of awareness among the participants about wrist injury and its importance in dentistry [32]. Although structural or genetic factors might play a role in some illnesses, the manner of clinical practise can also play a role. One of the most effective ways to reduce the risk of getting one of these severe and potentially career-limiting illnesses is a part of the message that a dentist usually delivers to his/her patients: prevention is better than cure.

Figure 2 shows us that there is a general lack of awareness among participants (dental students) about the prevalence of Carpal Tunnel Syndrome. Huntley and Shannon discovered that the frequency of CTS in dental hygienists' records ranged from 1% to 54 percent based on a study of the literature [33]. From Figure 3 we can see that nearly half the participants (49.0%) did not know that the exposure to high frequency vibrations from the dental hand piece and the ultrasonic scalers could predispose them to neuropathy and CTS [34]. Awareness is vital in order to take preventive measures that could prevent harm. Valachi B stated that the use of ultrasonic scalers on a regular basis might develop CTS in a dentist, not only due to the increasing vibrations and repetitive motions, but also because of the uncomfortable posture over time and also that CTS can be triggered by a prolonged static posture during tooth preparation using an air rotor hand piece [35]. Figure 4 shows us that 8.0% of the participants have felt respondents have felt a temporary numbness or a tingling sensation in their hand (symptoms of CTS). In a comparable study, Osborn found that 7% of Minnesota dental hygienists had been diagnosed with CTS, and almost two-thirds had reported one or more hand symptoms [36]. Figure 5 shows us that 71.0% of the participants did not practice hand

stretching exercises which are proven to increase the chances of experiencing wrist injury than those who are practicing hand stretching [37]. From Figure 6 we can see that the postgraduates were evidently more aware of the risk of using high frequency vibration instrumentation. De Sio et al. states that mechanical vibrations influencing the organism through the upper limbs can cause alterations in the vascular, neural, and osteoarticular systems, resulting in musculoskeletal discomfort [38]. Vibration syndrome is an occupational condition that can result from these changes. Figure 7 showed better awareness among the female groups regarding the same. Figure 8 shows us that among the participants, the female group showed higher prevalence of the symptoms associated with CTS. This is in accordance with another research by Leggat et al that female dentists and dental assistants had a greater incidence of symptoms of arm, wrist, shoulder, and neck MS problems than their male counterparts [39,40].

Carpal tunnel syndrome can cause weakness, lack of coordination, and chronic nerve damage if left untreated. It is ideal to visit an orthopaedic doctor when symptoms of CTS are noticed. Taking action soon could mean avoiding nerve damage. Other specialists believe that cycling between instruments of various diameters during the day might help relieve CTS symptoms. Some of the symptoms associated with CTS can be alleviated by using the right hand piece [40]. Your handpiece should be small, light, and easy to hold. Unbalanced hand pieces, with the engine at the end, necessitate a harder grip and more wrist extension. Switching from a prophyl angle to a prophyl jet-type, air-polishing system has also helped some hygienists improve CTS symptoms.

CONCLUSION

The aforementioned findings show that postgraduate women are more aware of cumulative trauma diseases (CTDs) that impact the wrist than men, and that postgraduates have a higher level of awareness than undergraduate students. Importantly, there is a need for enhanced awareness as the hand is the greatest professional asset to a dental professional. Detrimental habits are to blame for a large portion of Carpal Tunnel Syndrome and other musculoskeletal disorders. It is considerably easier and better to learn ergonomically acceptable body placement and instrumentation techniques than it is to experience an injury and then change long-standing hazardous habits.

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