



## CORRELATION OF RISK FACTORS AND CARPAL TUNNEL SYNDROME SYMPTOMS IN DENTISTS IN MALUKU AND NORTH MALUKU

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### Abstract

**Objective:** To find the correlation between risk factors and Carpal Tunnel Syndrome (CTS) symptoms in dentists in Maluku and North Maluku

**Material and Methods:** A cross-sectional survey was conducted on 182 dentists registered in Indonesian Dentist Association (Persatuan Dokter Gigi Indonesia/PDGI) in the province of Maluku and North Maluku, Indonesia. A self-administered questionnaire were distributed online. It consisted of two parts, individual characteristics in the first part and the Boston CTS questionnaire in the last. The data were analyzed by Pearson's Correlation test using SPSS version 26 and presented in frequencies and percentages.

**Results:** A total of 182 dentists participated in this research out of whom 52 (28.6%) were males and 130 (71.4%) were females. Total 87 (47.8%) dentists reported the symptoms of CTS with 18 (9.89%) had functional impairment in hand and wrist. CTS symptoms appeared to increase in age, where 85.7% of dentists over 50 years had these symptoms ( $p=0.000$ ). Dentists with high Body Mass Index (BMI) were more likely to complain of CTS symptoms than dentists within normal BMI ( $p=0.000$ ). Occupation period was also correlated with CTS symptoms ( $p=0.000$ ). However, there was no relationship between CTS symptoms and gender or duration of working with vibrating tools.

**Conclusion:** Dentists in Maluku and North Maluku appeared to have CTS symptoms. Age, high BMI and more years of working experience were related with CTS symptoms. No correlations were found between gender or duration of working with vibrating tools and CTS symptoms.

**Keywords:** CTS symptoms, dentist, risk factors

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## 1. Introduction

Dentists have a high risk of developing musculoskeletal disorders. Approximately 65% of dentists reported musculoskeletal complaints in the form of pain, discomfort, impaired function and increased working time (1). One of these musculoskeletal disorders is Carpal Tunnel Syndrome (CTS).

The carpal tunnel is a narrow tunnel formed by the deep arch anterior to the wrist by the carpal bones and the flexor retinaculum. The median nerve within this tunnel can undergo compression that causes CTS (2). Symptoms include paresthesia, loss of range of motion, loss of muscle strength, and decreased motor function on the palmar, thumb, forefinger, and middle finger surfaces (3).

Ergonomic risk factors for CTS are repetitive work, mechanical pressure, incorrect posture, and vibration from instruments (4). In addition, there are several anthropometric factors associated with CTS such as age, gender, body mass index (BMI), and medical conditions that increase the risk of CTS such as diabetes and rheumatoid arthritis (3).

The prevalence of CTS among dentists had been reported in various studies. 25.7% of dentists in Chennai, India suffered from CTS with varying degrees of severity (5). A study of 234 dentists in Jeddah, Saudi Arabia indicated that 9% of them had CTS with an increasing risk with age (6). Meanwhile, research in Riyadh revealed that 30.5% of dentists struggled with CTS, and female dentists had a greater risk than men (7).

CTS research on dentists had not been widely performed in Indonesia. High prevalence of caries and periodontal disease in Indonesia contributed to a significant amount of work for dentists in providing dental and oral treatments. This situation might contribute to the high prevalence of CTS among dentists in Indonesia. As in a study of 44 dentists at the Puskesmas in Tangerang Regency, Ariyani (2020) found 27% of them showed symptoms of CTS (8). Based on the background description above, the authors wish to study about the risk factors related to CTS symptoms at dentists in Maluku and North Maluku.

## 2. Methods

This study was a quantitative analysis with a cross-sectional design and purposive sampling method. The population of this study were dentists registered at five PDGI branches in the Province of Maluku and North Maluku who were practicing and willing to participate in the study. Those over 74 years of age, pregnant and suffering from diabetes mellitus or bone and joint disorders (such as osteoarthritis and rheumatoid arthritis) were excluded.

CTS risk factors were conditions related to the occurrence of CTS, such as age, sex, BMI, occupation period and duration of using vibrating tools like scalers and handpieces. BMI was classified as severe underweight (<17.0), mild underweight (17.0-18.4), normal (18.5-25.0), mild overweight (25.1-27.0) and severe overweight (>27.0).

Symptoms of Carpal Tunnel Syndrome (CTS) were complaints in the hand or wrist in the form of pain, weakness, numbness or tingling, with a score of the Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) > 1.00. Symptoms are stated as mild with a score of 1.00 – 1.99, moderate symptoms with a score of 2.00 – 2.99, severe symptoms 3.00 – 3.99 and very severe symptoms > 4.00

The questionnaire used consists of two parts. The first contained data on individual and occupational characteristics, and the second part was the Indonesian version of the BCTQ (9). The BCTQ is a questionnaire developed by Levine (1993) to assess the degree of symptom severity and functional status of the hand and wrist in CTS sufferers (9–11). The BCTQ refers to the symptoms felt in the previous two weeks. It can be filled in by the patient himself and is divided into two parts. The Symptom Severity Scale contains 11 questions that evaluate the severity, frequency, timing and type of complaint. The Functional Status Scale contains eight questions that assess how this syndrome affects daily life. A rating scale from one to five was utilized, with one indicating no functional problems or symptoms and five indicating a task inability or the presence of the most symptoms. The total score on the two parts was calculated by dividing the absolute score by the number of elements (9,10).

The questionnaire in the form of a Google Form was distributed via the PDGI whatsapp groups. Respondents then filled out forms containing Informed Consent and the questionnaire.

Microsoft Excel was applied for data entry and management, and SPSS Statistics for Windows (version 26.0. Armonk, NY: IBM Corp) was used for data analysis. Pearson's Correlation test was used to find the connection between variables. All tests were considered statistically significant if the p-value was less than 0.05.

## 3. Result

The questionnaires were distributed to members of PDGI Ambon, PDGI Ternate, PDGI North Halmahera, PDGI South Halmahera and PDGI Tidore Islands. There were 239 dentists in those five branches of PDGI as of March 2023, with 192 dentists completed the questionnaire (response rate 80.3%) and 10 people were excluded (N=182).

The majority of respondents were women (71.4%, 130 people). Most of the respondents were under 40

years old (80.8%). Normal BMI was owned by 107 participants (58.8%). One out of ten dentists who took part in this study admitted to have a smoking habit and more than a third of the respondents claimed to exercise regularly. It was also found that 50.5% of respondents had practiced dentistry less than 5 years. And most (80.8%) of respondents used vibrating devices for less than 180 minutes per day (Table 1).

As many as 95 dentists did not convey CTS symptoms. Of the 87 people (47.8%) who reported CTS symptoms with various degrees of severity, most complained of tingling in the hands and palms (n=59), numbness (n=36), and pain (n=35). 18 of them have impaired function due to these symptoms (Table 2).

As seen in Table 3, 48.5% of women reported symptoms of STK (n=130), but the differences between genders were not statistically significant (p=0.070). There was an increase in the percentage of CTS symptoms reported in each age group, where 85.7% of dentists over 50 years had symptoms of CTS (n=14). This difference was statistically significant (p=0.000). BMI was a risk factor for CTS (p=0.000). 65.85% of dentists with a BMI of more than 27 in this study described symptoms of CTS (n=41).

Among dentists with less than five years working experience, 34.8% (n=92) had CTS symptoms. Whereas those who had spent more than 20 years in practice, 81.9% (n=11) reported CTS symptoms. Statistically, the number of years in dental practice was related to the occurrence of CTS symptoms (p=0.000). The amount of time using vibrating devices daily showed no correlations with CTS symptoms (p=0.0335)

#### 4. Discussion

This study showed that 47.8% of dentists in Maluku and North Maluku exhibited CTS symptoms. The majority of them (44%) described mild complaints. The prevalence was greater than the research conducted by Alhusain (2019), which showed that 30.5% of dentists in Riyadh had CTS symptoms (7). A similar study by Zubair (2022) in Pakistan revealed that 21.2% of dentists in Peshawar, Pakistan had CTS complaints, of which 11.4% were mild symptoms (12). A similar study in Jeddah in 2019 showed a smaller prevalence, namely 9% (6). In this study, it was illustrated that the percentage of reported CTS symptoms increased with age. Of the 14 dentists over the age of 50, only 2 people claimed no symptoms related to CTS. This was in line with a research by Haghghat (2012) which stated that the prevalence of CTS in dentists increases with age (13). Furthermore, the frequency and severity of symptoms also increase with age (12).

CTS is a work-related illness. The risk of CTS was equal between men and women who had similar work assignments (3). Dentists in Maluku and North Maluku did not find differences between gender in reporting CTS symptoms. This finding was similar to researches by Zubair (2022) and Haghghat (2012) (12,13). However, a study by Maghsoudipour (2021) displayed different results where female dentists were more at risk of suffering CTS (14), or other musculoskeletal disorders (6). Alhusain (2019) also found that female dentists are 2 times more at risk of having CTS symptoms than male dentists (7). Women generally had smaller wrists with narrower carpal tunnels. Therefore, CTS complaints were more likely to occur (7,15).

Most of the dentists in this study had normal BMI, that was 18.5 to 25.0. Those with BMI more than 27, 65.85% had symptoms of CTS. This statistically showed that there was a relationship between BMI and the occurrence of CTS symptoms. Alhusain (2019) also concluded that there was a significant correlation between obesity and CTS. Dentists with BMI of more than 30 were more likely to exhibit CTS symptoms than dentists with normal weight (7). Ariyani (2020) in a study in Tangerang also found BMI as a risk factor for CTS among dentists (8). Obesity was indeed a strong risk factor for CTS in the general population (16,17) as being overweight increased fat deposits in the carpal tunnel (18). Increased hydrostatic pressure in the tunnel also occurred in those with high BMI due to changes in the fluid balance (2).

Occupation period of dentists in Maluku and North Maluku showed a significant relationship with the development of CTS symptoms. Alhusain (2019) also indicated that dentists with more years of working period reported more CTS symptoms than those of fewer years, but this difference was not statistically significant (7). Khan (2014) in his research in Karachi revealed that dentists who had practiced between 16 and 20 years were more likely to have symptoms (19). However, a study in Malaysia showed the opposite, in which dentists with more years of clinical practice reported less CTS symptoms. This was because experienced dentists had more skilled and decision authority (20).

Research by Maghsoudipour (2021) suggested exposure to vibration of more than 2 hours per day as a significant risk factor for CTS (7,14). Alhusain (2019) stated that an increase in pain of the hands was clearly observed in dentists who worked more than 8 hours per day, although there was no descriptions of the use of handpiece or scaler in them (7). However, Limbu (2019) concluded that there was no significant difference in nerve conduction tests between medical residents who were not exposed to vibration and dental residents who had been exposed to vibrating handheld devices

for 2 to 6 years (4). This study of dentists in Maluku and North Maluku also failed to show a relationship between duration of using vibrating tools and CTS symptoms.

## 5. Conclusion

In conclusion, dentists in Maluku and North Maluku appeared to suffer from carpal tunnel syndrome. Age, body mass index and years of work were significantly correlated with CTS symptoms. Gender and duration of using a vibrating device had no relationship with CTS symptoms.

To our knowledge, this is the first study regarding CTS in dentists in Eastern Indonesia. One limitation is that the results of this study cannot be generalized to dentists throughout Indonesia. Larger samples are needed to identify risk factors for CTS in dentists, including the type of dental specialty. In addition, the self-reporting nature of BCTQ in the study might cause external bias.

Future studies should concentrate on intervention and prevention strategies to ensure that dentists can practice safely and effectively.

## Conflict of Interest

The authors of the current study declare no conflict of interest.

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Table 1. Characteristics of Respondents (N=182)

Characteristics	n	%
Maluku		
Ambon	116	63.7
North Maluku		
South Halmahera	16	8.8
North Halmahera	15	8.2
Ternate	17	9.3
Tidore Kepulauan	18	9.9
Age (years)		
23-30	74	40.7
31-40	73	40.1
41-50	21	11.5
>50	14	7.7
Gender		
Male	52	28.6
Female	130	71.4
Body Mass Index		
Severe underweight (<17.0)	1	0.5
Mild underweight (17.0 – 18.4)	6	3.3
Normal (18.5 – 25.0)	107	58.8
Mild overweight (25.1 – 27.0)	27	14.8
Severe overweight (>27.0)	41	22.5
Smoking		
Yes	19	10.4
No	163	89.6
Exercise		
Yes	64	35.2
No	118	64.8
Occupation Period (years)		
0-5	92	50.5
6-10	36	19.8
11-15	30	16.5

16-20	13	7.1
>20	11	6.0
Duration of Working with Vibrating Tools (hours/day)		
<3	147	80.8
>3	35	19.2

Table 2. Carpal Tunnel Syndrome Symptoms

Tingling Sensations	n	%
Yes	59	32.42
No	123	67.58
Numbness (Loss of Sensation)		
Yes	36	19.78
No	146	80.22
Hand or Wrist Pain		
Yes	35	19.23
No	147	80.77
Weakness in Hand or Wrist		
Yes	24	13.19
No	158	86.81
Hand Function Difficulty		
Yes	18	9.89
No	164	90.11

Table 3. Correlation of Risk Factors and CTS Symptoms

	M±Std. D	Carpal Tunnel Syndrom Symptoms								p
		None		Slight		Medium		Total		
		n	%	n	%	n	%	n	%	
Age (years)	35.10 ± 9.18									0.000 *
23-30		5 1	28. 0	2 3	12. 6	0	0.0	74	40. 7	
31-40		3 3	18. 1	3 8	20. 9	2	1.1	73	40. 1	
41-50		9	4.9	1 1	6.0	1	0.5	21	11. 5	
>50		2	1.1	8	4.4	4	2.2	14	7.7	
Gender										0.070
Male		2 8	15. 4	2 4	13. 2	0	0.0	52	28. 6	
Female		6 7	36. 8	5 6	30. 8	7	3.8	13 0	71. 4	
Body Mass Index										

Severe underweight (<17.0)		1	0.5	0	0.0	0	0.0	1	0.5	0.000 *
Mild underweight (17.0 – 18.4)		4	2.2	2	1.1	0	0.0	6	3.3	
Normal (18.5 – 25.0)		61	33.5	44	24.2	2	1.1	107	58.8	
Mild overweight (25.1 – 27.0)		15	8.2	11	6.9	1	0.5	27	14.8	
Severe overweight (>27.0)		14	7.7	23	12.6	4	2.2	41	22.5	
Occupation Period (years)										
0-5		60	33.0	31	17.0	1	0.5	92	50.5	0.000 *
6-10		19	10.4	17	9.3	0	0.0	36	19.8	
11-15		11	6.0	17	9.3	2	1.1	30	16.5	
16-20		3	8.0	8	4.4	2	1.1	13	7.1	
>20		2	1.1	7	3.8	2	1.1	11	6.0	
Duration of Working with Vibrating Tools										
<3 hours/day		74	40.7	67	36.8	6	3.3	147	80.8	0.335
>3 hours/day		21	11.5	13	7.1	1	0.5	35	19.2	

Pearson's Correlation test

\*Correlation is significant at the 0.05 level (2-tailed)