

Original Article

## Probable carpal tunnel syndrome and its coping strategies among clinical dental support staff in Hospital Universiti Sains Malaysia

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**Abstract** Prolonged work with highly repetitious flexion and extension of the wrist and forceful grip task were shown to increase the risk of developing carpal tunnel syndrome (CTS) among dental personnel. The present study was carried out to determine the prevalence, risk factors and coping strategies of probable CTS among clinical dental support staff in Hospital Universiti Sains Malaysia (HUSM). A cross-sectional study was conducted and a set of questionnaire consisting of socio-demographic status, work-related and psychosocial risk factors and coping strategies was distributed. Ninety-five clinical dental support staff completed and returned the questionnaire with a response rate of 80.5%. The prevalence of probable CTS was 38.9%, with the highest prevalence was found among dental surgery assistants (40.5%) followed by dental technologists (29.7%). There was no significant association between work-related or psychosocial risk factors with probable CTS ( $p>0.05$ ). Most of the respondents with symptoms of CTS chose religion as the coping mechanism; mean 7.11 (SD 1.13). Awareness training should be emphasized among clinical dental support staff on the prevention of CTS.

**Keywords:** carpal tunnel syndrome, coping behavior, dental personnel.

### Introduction

Clinical dental support staff spend majority of their working days in an awkward static position. For example, the dental nurses who are treating patients aged 17 years old and below, are working with the wrist in flexion and extension position for a prolonged duration, repeatedly to perform procedures in the oral cavity. The prolonged static postures, repetitive movements, poor positioning, genetic predisposition, and physical conditioning may contribute to the risk of musculoskeletal pain (Barcenilla *et al.*, 2012).

Carpal tunnel syndrome is one of the most common musculoskeletal disorders related to ergonomic problems among dental personnel (Puriene *et al.*, 2008). The highest prevalence of CTS was among the dental hygienists (56.5%)

and the dental technologists (34.0%) (Lalumandier and McPhee, 2001). The common complaints related to CTS are burning sensations, pins and needles and/or numbness in the distribution of the median nerve (Luchetti and Amadio, 2007). The pain and discomfort due to CTS will affect the quality of work by the dental personnel because they use the hand and fingers to perform their daily work procedures.

Although the clinical dental support staff is at risk of developing CTS which will give significant impacts to them, the study to quantify this problem in Malaysia was still lacking. Therefore, the present study aimed to determine the prevalence of probable CTS and its association with the risk factors (individual, work-related and psychosocial factors) among clinical dental support staff in HUSM. The coping strategies for symptoms of CTS among the study subjects were also determined.

## Materials and methods

The cross-sectional study was carried out from 16th August until 3rd September 2015. The dental technologists, dental staff nurses, dental surgery assistants and healthcare assistants in HUSM who have been working for more than 12 months were included in the study. This criterion was made because the pain was always reported after six to twelve months on the job (Veiersted *et al.*, 1993).

### Sample size calculation

The sample size was calculated based on a single proportion formula. According to the calculation, 107 subjects were needed to measure the prevalence of probable CTS among clinical dental support staff, based on calculations of the prevalence of CTS among dental hygienist (Anton *et al.*, 2002) and precision being set at 0.08 (Naing *et al.*, 2006). With anticipation of 10% drop-out, a total of 118 subjects were needed for the present study. Sampling method was not applied due to limited number of targeted group. The study has included all the clinical support staff that fulfilled the study criteria.

### Research tools

A self-administered questionnaire that consisted of socio-demographic profile, individual factors, work-related factors, psychosocial factors, CTS clinical diagnosis and coping strategies was used. The work-related factors questionnaire were adopted from Samat *et al.* (2011). It encompassed questions of job category, work duration of current job, previous job, working hours, history of using dental instruments, and history of using computer during and after office hour.

The Malay version of the Job Content Questionnaire (JCQ) that was translated and validated by Edimansyah *et al.* (2006) was used to obtain data on psychosocial factors. Twenty-one items were selected to constitute a minimum set of questions for seven scales of the JCQ, which were skill discretion (5 items), decision authority (3 items), decision latitude (8 items), psychological job demand (7 items), coworker support (3 items), supervisor support (3 items) and social support (6 items). All questions were scored on a

Likert scale of 1 to 4 (strongly disagree, disagree, agree and strongly agree).

The present study used a clinical questionnaire developed by Kamath and Stothard (2003) to define the probable CTS. This instrument has been reported to achieve sensitivity of 85%, as compared to 92% with the nerve conduction test. This questionnaire has been translated into Malay language and was pretested among clerical staff in Pasir Puteh, Kelantan (Azim *et al.*, 2009). It consists of nine hand symptoms commonly related to CTS, including pain which cause wake up at night (score 1 for 'yes' and score 0 for 'no'), tingling and loss of sensation cause wake up at night (score 1 for 'yes' and score 0 for 'no'), tingling or numbness in the morning (score 1 for 'yes' and score 0 for 'no'), trick movements (score 1 for 'yes' and score 0 for 'no'), tingling of little finger (score 0 for 'yes' and score 3 for 'no'), tingling during resting (score 1 for 'yes' and score 0 for 'no'), neck pain (score -1 for 'yes' and score 0 for 'no'), severe pain during pregnancy (score 1 for 'yes', score -1 for 'no' and score 0 for 'not applicable'), and relief with a splint (score 1 for 'yes', score -1 for 'no' and score 0 for 'not applicable'). Total score was computed and according to the questionnaire, those scored three and above were indicative of having symptoms which related to CTS. Because of that, the present study defined probable CTS as those who scored three and above.

The last part of the questionnaire was about coping strategies that was originally developed by Carver *et al.* (1989). The Malay version of the brief COPE questionnaire that was validated by Yusoff *et al.* (2010) was used. It comprised of 28 questions for 14 domains. Those domains were self-distraction, denial, emotional support, behavioural disengagement, venting, instrumental support, positive reframing, active coping, substance use, planning, acceptance, humor, religion and self-blame.

### Data collection and analysis

All the clinical dental support staff (dental technologists, dental staff nurses, dental surgery assistants and healthcare assistants) in HUSM that fulfilled the inclusion and exclusion criteria was invited

to participate in the study. They were provided with informed consent form to ensure they understood the purpose, risk and benefit of the study taken. A self-administered questionnaire was distributed to the subjects to be completed.

### **Data analysis**

The obtained data were analyzed using the SPSS IBM version 22.0. The mean (SD) or median (IQR) for numerical variables, frequency (%) for categorical variables and the prevalence of probable CTS were calculated at 95% Confidence Interval (CI). The associations between the risk factors (individual factors, work characteristics and psychosocial job factors) and probable CTS were analyzed using simple logistic regression for categorical data, and independent t-test for continuous data. The results of crude odds ratio (OR), *p*-value and 95% CI were recorded for each categorical variable. Mean differences, 95% CI, and *p*-value were recorded for the continuous variables. The *p*-value of <0.05 was taken as significant at 95% CI.

### **Ethical approval**

The ethical approval for this research was obtained from Human Research and Ethics Committee, Universiti Sains Malaysia (Ref: USMCK/ JEPeM/ 15060207).

### **Results & Discussion**

From the total of 118 clinical dental support staff in HUSM who fulfilled the inclusion and exclusion criteria, only 95 of them completed and returned the questionnaire (response rate= 80.5%). Table 1 shows the socio-demographic characteristics of the respondents. The majority of the respondents were female (66.3%), and Malay (96.8%) with the mean age was 35 (SD 8.23). It is correlated with the report of Safian *et al.* (2008) that the majority of the population in Kelantan are Malays.

The present study found that the prevalence of probable CTS among clinical dental support staff in HUSM was 38.9% (95% CI: 29.0, 48.9). Among those who have been diagnosed with probable CTS, dental surgery assistants and dental

technologists have the highest prevalence compared to dental staff nurses and healthcare assistants, with the prevalence of 44.1% (95% CI= 26.53, 61.70), 44.0% (95% CI= 23.09, 64.91), 32% (95% CI= 12.35, 51.65) and 27.3 (95% CI= 4.11, 58.65) respectively. Lalumandier and McPhee (2001) found that 73% of dental assistants complained of hand problems, and a number of them revealed probable or classic symptoms of CTS. This suggested that the dental assistants were prone to develop upper extremity symptoms, CTS and back pain. From the observation in the dental clinic, the dental surgery assistants were repeatedly using small-diameter instrument during mixing of the dental materials and spending long hours folding the gauze with wrist at flexion position. This routine work procedure might associate with the higher risk of developing CTS among the dental surgery assistants because the repetitive flexion of the wrist for prolonged periods will induce swelling in the carpal tunnel and effects on median nerve conduction (Barcenilla *et al.*, 2012).

The findings from the present study showed no significant association between individual, work-related and psychosocial factors, and probable CTS (Table 2, 3 and 4). However, chronic diseases such as diabetes mellitus and rheumatoid arthritis were reported to have association with CTS in other studies (Becker *et al.*, 2002; Geoghegan *et al.*, 2004). The specific relationship of CTS to diabetes was thought to be median nerve entrapment caused by the diabetes-induced connective tissue changes (Becker *et al.*, 2002). Some studies reported that there was significant association between psychosocial risk factor and CTS. Munirah *et al.* (2014) reported that decision latitude is the significant associated factor of probable CTS among dentists, where low of decision latitude may increase the risk of probable CTS (OR: 0.82; 95% CI: 0.71, 0.95). Decision latitude is referring to how the workers manage and accomplish their tasks (Karasek *et al.*, 1981). Furthermore, Canivet *et al.* (2013) stated that contentment of the job will be increased and the risk of CTS among dentists can be reduced by promoting better job control at work place.

CTS affects the quality of life negatively and coping strategies are needed to have a better one. The present study found that religion is the highest coping strategy used by the clinical dental support staff in order to cope with the symptoms of CTS [Mean= 7.1 (SD= 1.13)] as shown in Table 5. The religion coping strategy might serve as a source of emotional support, as it turns the source of stress into positive interpretation. Being close to God makes one feel calmer and experience less stress. As cited from the Quran (Chapter 13: Verse 28): "Those who have believed and whose hearts are assured by the remembrance of Allah. Unquestionably, by the remembrance of Allah hearts are assured" (Ahamed, 1999). Previous studies have also repeatedly demonstrated that most Americans turn to religion for comfort and support when dealing with stressful life events (Schottenbauer *et al.*, 2006).

The present study has several limitations that should be taken in consideration in the future. This includes cooperation given by the targeted respondents since there were some of them who were not willing to participate due to time constraint. Besides that, the use of questionnaire in the present study might lead to recall bias among the respondents. However, the use of the validated questionnaire was considered

as the most convenient way to help in screening CTS in a study population.

Findings of the present study have shown that prevention of CTS among the dental support staff is highly needed. Regular ergonomic training and health education related to the risk of musculoskeletal problems should be initiated at the HUSM dental clinic. Strengthening the curriculum at the Dental Training College Malaysia related to the knowledge of ergonomic related hazards is also recommended since the dental nurses, dental technologists and dental surgery assistants were trained in that college.

### **Conclusion**

There was a relatively high prevalence of probable CTS among clinical dental support staff in HUSM especially among dental surgery assistants and dental technologists. However, there was no significant association between psychosocial and work-related risk factor and probable CTS. The most common coping strategy used by the clinical dental support staff in HUSM was religion.

### **Acknowledgement**

We would like to thank all dental support staff from HUSM for their involvement in the present study.

**Table 1** Sociodemographic characteristics of clinical dental support staff in HUSM

Variables		Frequency (%)
<b>Age</b>		35 (8.23) <sup>a</sup>
<b>Gender</b>		
	Male	33 (33.7)
	Female	63 (66.3)
<b>Race</b>		
	Malay	92 (96.8)
	Chinese	3 (3.2)
<b>Marital status</b>		
	Single	15 (15.8)
	Married	75 (78.9)
	Divorced/Widowed	5 (5.3)
<b>Education Level</b>		
	Secondary School	4 (4.2)
	SPM/STPM	11 (11.6)
	Degree/Diploma	78 (82.1)
	Master	2 (2.1)
<b>Monthly Household Income (RM)</b>		3843.68 (1956.58) <sup>a</sup>

<sup>a</sup> Mean(SD)

**Table 2** The association between individual factors and probable CTS among clinical dental support staff in HUSM

Variables	Probable CTS n=37 frequency (%)	Non-probable CTS n=58 frequency (%)	Crude OR (95% CI)	$\chi^2$ -stat (df)	p-value
<b>Age</b>	34.5 (7.50) <sup>a</sup>	35.5 (8.70) <sup>a</sup>	1.1 (-2.38,4.53) <sup>b</sup>	0.62 (93)	0.538 <sup>c</sup>
<b>Household Income</b>	4001.3 (2040.44) <sup>a</sup>	3743.1 (1912.39) <sup>a</sup>	258.2 (-1078.0,561.90) <sup>b</sup>	-0.63 (93)	0.533 <sup>c</sup>
<b>Basal Metabolic Index</b>	24.5 (4.04) <sup>a</sup>	25.8 (5.54) <sup>a</sup>	1.3 (-0.84,3.35) <sup>b</sup>	1.19 (93)	0.236 <sup>c</sup>
<b>Gender</b>					
Male	10 (31.25)	22 (68.75)	1		
Female	27 (42.86)	36 (57.14)	1.65 (0.67,4.05)	1.22 (1)	0.269
<b>Hormone Replacement Therapy*</b>					
No	19 (41.3)	27 (58.7)	1		
Yes	8 (50.0)	8 (50.0)	1.42 (0.45, 4.45)	0.36 (1)	0.547
<b>Exercise</b>					
Yes	13(34.2)	25(65.8)	1		
No	24(42.1)	33(57.9)	1.40 (0.60, 3.28)	0.60 (1)	0.438
<b>Chronic Disease</b>					
No	27 (36.0)	48 (64.0)	1		
Yes	10 (50.0)	10 (50.0)	1.78 (0.66, 4.81)	1.28 (1)	0.258

\* Includes only female staff, n=27 (for probable CTS group), n=36 (for non-probable CTS group)

<sup>a</sup> Mean (SD)

<sup>b</sup> Mean difference (95% CI)

<sup>c</sup> Independent t-test

**Table 3** The association between work-related factors and probable CTS among clinical dental support staff in HUSM

Variables	Probable CTS n=37 Mean (SD)	Non-Probable CTS n=58 Mean (SD)	Mean difference (95% CI)	t- stat (df)	p-value
Duration of employment (month)	131.3 (81.37)	140.1 (100.58) <sup>a</sup>	8.9 (-30.26, 47.96)	0.45 (93)	0.654
Use of dental Instruments (year)	9.8 (6.97)	10.0 (8.22)	0.2 (-3.05, 3.43)	0.12 (93)	0.908
Use of dental instruments per day (hours)	4.1 (2.90)	5.1 (2.80)	1.0 (-0.10, 2.30)	1.82 (93)	0.730
Take a rest during work					
≤ 50 minutes	23 (42.6) <sup>d</sup>	31 (57.4) <sup>d</sup>	1		
>50 minutes	14 (34.1) <sup>d</sup>	27 (65.9) <sup>d</sup>	0.7 (0.30, 1.62) <sup>e</sup>	0.70 <sup>f</sup> (1)	0.402 <sup>g</sup>

<sup>d</sup> n (%)<sup>e</sup> Crude OR (95% CI)<sup>f</sup> X<sup>2</sup>-stat (df),<sup>g</sup> simple logistic regression**Table 4** The association between psychosocial factors and probable CTS among clinical dental support staff in HUSM

Variables	Probable CTS n=37 Mean (SD)	Non-Probable CTS n=58 Mean (SD)	Mean difference (95% CI)	t- stat (df)	p-value
Skill discretion	31.2 (4.03)	31.0 (3.50)	0.3 (-1.83, 1.28)	0.360 (93)	0.723
Decision authority	14.9 (2.14)	15.3 (1.66)	0.4 (-0.33, 1.22)	1.140 (93)	0.257
Decision latitude	46.1 (4.83)	46.3 (4.23)	0.2 (-1.70, 2.04)	0.170 (93)	0.859
Psychological job demand	15.6 (2.66)	15.4 (2.77)	0.2 (-1.34, 0.94)	0.349 (93)	0.728
Coworker support	9.1 (0.96)	9.4 (1.50)	0.3 (-0.23, 0.77)	1.070 (93)	0.289
Supervisor support	5.8 (1.12)	6.1 (1.14)	0.3 (-0.16, 0.78)	1.310 (93)	0.192
Social support	15.0 (1.67)	15.5 (2.19)	0.6 (-0.21, 1.37)	1.460 (90)	0.147

**Table 5** Coping strategies toward probable CTS among clinical dental support staff in HUSM according to job categories

Coping Strategies	Job Categories				
	Dental Nurse Mean (SD)	Dental Technologist Mean (SD)	Dental Surgery Assistant Mean (SD)	Healthcare Assistant Mean (SD)	Total Mean (SD)
Emotional Support	4.9 (2.03)	5.7 (1.62)	5.4 (0.74)	3.7 (1.53)	5.2 (1.48)
Denial	4.0 (1.20)	4.3 (1.68)	4.3 (1.53)	4.3 (0.58)	4.2 (1.42)
Behavioral Disengagement	3.1 (1.25)	3.5 (1.13)	3.9 (1.22)	2.7 (1.15)	3.5 (1.22)
Self-distraction	5.4 (1.06)	6.2 (1.40)	6.1 (1.87)	5.7 (0.58)	5.9 (1.50)
Venting	4.9 (1.46)	5.0 (0.77)	3.9 (1.22)	5.0 (2.65)	5.0 (1.21)
Instrumental Support	6.1 (1.64)	5.7 (1.56)	5.9 (1.10)	4.7 (2.31)	5.8 (1.45)
Positive Reframing	6.3 (1.75)	6.4 (1.21)	6.8 (1.01)	6.3 (1.15)	6.5 (1.24)
Active Coping	6.0 (1.41)	6.5 (0.93)	6.6 (1.12)	5.3 (2.52)	6.3 (1.27)
Substance Use	2.0 (0.00)	2.0 (0.00)	2.3 (1.03)	2.0 (0.00)	2.1 (0.66)
Planning	6.1 (1.81)	6.5 (1.21)	6.5 (1.06)	5.7 (2.52)	6.3 (1.38)
Acceptance	5.8 (1.91)	6.5 (1.13)	6.3 (1.22)	5.7 (2.08)	6.2 (1.40)
Humor	5.0 (0.76)	4.9 (1.04)	5.3 (1.05)	3.7 (1.53)	5.0 (1.08)
Religion	6.9 (0.99)	7.0 (1.00)	7.5 (0.74)	6.3 (2.89)	7.1 (1.13)
Self-blame	2.4 (0.52)	3.9 (1.51)	3.7 (1.80)	2.7 (1.15)	3.4 (1.55)

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