PUBLIC HEALTH RESEARCH

Occupational Risk Factors for Carpal Tunnel Syndrome among Nurses in Medical

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ABSTRACT

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Introduction Carpal tunnel syndrome (CTS) is a hand disorder which indicates the presence of symptoms such as pain, numbness, and muscle weakness among the patient. CTS is an occupational related disorder which can occur in any profession. However, it can be prevented and managed. The aims of the research were to determine the prevalence of acquiring CTS among nurses who worked in the wards and occupational risk factors involving the upper limbs during nursing tasks performance. The specific aims were to determine the relationship between the prevalence of acquiring CTS and individual factors (age, gender, race, educational level, duration of work and medical history), relationship between the prevalence of acquiring CTS and occupational risk factors in nursing tasks. Nurses profession was chosen as they are performing multitask involving upper limbs especially the wrist joints.

Methods Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) was used to determine the level of severity in CTS. Occupational risk factors were assessed by using the Rapid Upper Limb Assessment (RULA). This research was a cross sectional mode which was carried out at a government university medical centre from November through December 2010.

Results Eighty nurses were involved in the research. The respondents were required to fill in the socio-demographic information sheet. Those having CTS were required to fill in the BCTQ. Assessments were performed by observing of the job activity through RULA. The results showed that the prevalence for nurses acquiring CTS is 7.5%. The RULA assessment also indicated that the risk factor was in the highest level with a score of 7. No relationship was shown between the prevalence of CTS and race, gender, educational level and medical history. Significant relationship was indicated by the prevalence of CTS and occupational risk factors.

Conclusions In conclusion, a significant prevalence of CTS related to age of more than 30 years old, Malay races compared to Indian, working experience of more than 10 years and respondents with right hand dominant. Occupational risk factors also indicated among the active nurses. Therefore, it is important for us to modify the work environment, work flow, work methodology and ergonomic factors in order to prevent the nurses from acquiring CTS. Furthermore,

education about the condition of CTS should be implemented and reinforced especially among the higher risk nurses.

Keywords Carpal tunnel syndrome - Boston Carpal Tunnel Syndrome Questionnaire - Rapid Upper Limb Assessment - Occupational risk factors

INTRODUCTION

Nursing profession is the largest portion in the health care service due to its inception in the field. According to the Malaysia Ministry of Health (2006), the number of nurses in Malaysia is around 4040. The average period of service in nursing is about 33 years.[1] The intensity within the nursing profession tasks exposes the nurses to a variety of disorder such as Carpal Tunnel Syndrome. Females nurse anesthetists may face greater occupational risks for developing left hand and bilateral carpel tunnel syndrome than female operating room nurses.[4] Carpal tunnel syndrome (CTS) is one of the hand disorders which presented with marked symptoms of pain, numbness and muscle weakness. CTS are difficult to be managed as many patients are still having the symptoms despite underwent treatment for several years. The risk factors which significantly contribute to CTS are exposure to activity with highly repetitive hand movement like extending the wrist during working such as wound dressing procedure and pushing in catheters or exposure to vibrating items. The factors that are related to work include age, race, gender, diabetes and arthritis.[2] This research was conducted to determine the oocupational risk factors which contribute to CTS in the nursing practice.

MATERIAL AND PROCEDURE

Study population

This research involving 80 nurses who worked in the medical ward at the government university medical centers, Kuala Lumpur. All the nurses involved came from different discipline of service in the wards and understood either English or Malay. The nurses who have been excluded from this research were those who pregnant, having physical or mentally handicapped and having other hand disorders except CTS.

Procedure

Respondents were chosen by using simple random sampling with the sampling table introduced by Daniel WW. [3] The selected nurses were required to fill in the socio-demographic form which consist the information like age, gender, race, education level, period of service and medical history. For those who had been diagnosed as carpal tunnel syndrome, they were required to fill in Boston Carpal Tunnel Syndrome Questionnaire due to the symptoms experienced in the period of 24 hours for the last 2 weeks. After that, the job activity done by the respondents would be analyzed by using Rapid Upper Limb Assessment by the researcher.

Boston Carpal Tunnel Syndrome Questionnaire

Original version of Boston Carpal Tunnel Syndrome Questionnaire was used in this research. Boston Carpal Tunnel Syndrome Questionnaire is a self applied questionnaire that was used to evaluate the severity of the symptoms and the functional level in the daily living with CTS. The questionnaire consists of 11 questions for symptoms severity and 8 questions for functional level in daily living activities. For the questionnaires of symptoms severity, each question has 5 answers which were graded from 1 to 5 with increasing order of symptoms severity. One means no symptom, 2-mild symptoms, 3-moderate symptoms, 4-severe symptoms and 5-very severe symptoms. Each question in the component of functional level in daily living also has 5 graded answers with increasing order of difficulty in daily living. One means no difficulty, 2-mild difficulty, 3-moderate difficulty, 4-means severe difficulty and 5-cannot do at all.[4]

Rapid Upper Limb Assessment (RULA)

Rapid Upper Limb Assessment (RULA) was used to assess the risks factors in daily nursing task like preparing intravenous drip and transferring the patient which are the independent variables in this research. RULA was administered by the researchers. Diagram of the position of body and 3 scoring table in the assessment form were used throughout the whole process. No special equipment was required to assess the postures of the neck, trunk and upper limbs along with muscle function and the external loads experienced by the body. There are 2 components in this RULA, firstly arm and wrist analysis and secondly neck, trunk and leg analysis. In each of the components, position, muscle use and load were scored with the table provided. Marks from each of the components were contributed to a total score. The scorings of the RULA are defined as below.[5]

i. Score 1 or 2 means the person is working under acceptable posture and no modification is required.
ii. Score 3 or 4 means that the person is working in a posture that is presenting some risk of injury from the work. Further investigation is required.
iii. Score 5 or 6 means that the person is working in a risky posture which can contribute to injury. Investigation and modification are required in the future.
iv. Score 7 or 8 means that the person is working in a worst posture which can directly bring the injury to the person. Immediate investigation and modification are required.

Stastical Analysis

Collected data, scoring for Boston Carpal Tunnel Syndrome Questionnaire and RULA were analyzed by using Statistical Package for the Social Sciences (SPSS) version 16. Descriptive analysis that was

done in this research namely determines the prevalence, average, maximum and minimum for the scoring in the Boston Carpal Tunnel Syndrome Questionnaire and RULA. Fisher exact test was used in determining the relationship between the prevalence and individual factors (age, gender, race, education level, period of service and medical history).

RESULT

Figure 1 shows that 7.5% prevalence of carpal tunnel syndrome among the 80 nurses working in the medical ward studied. Whereas another 92.5% respondents are not having CTS.

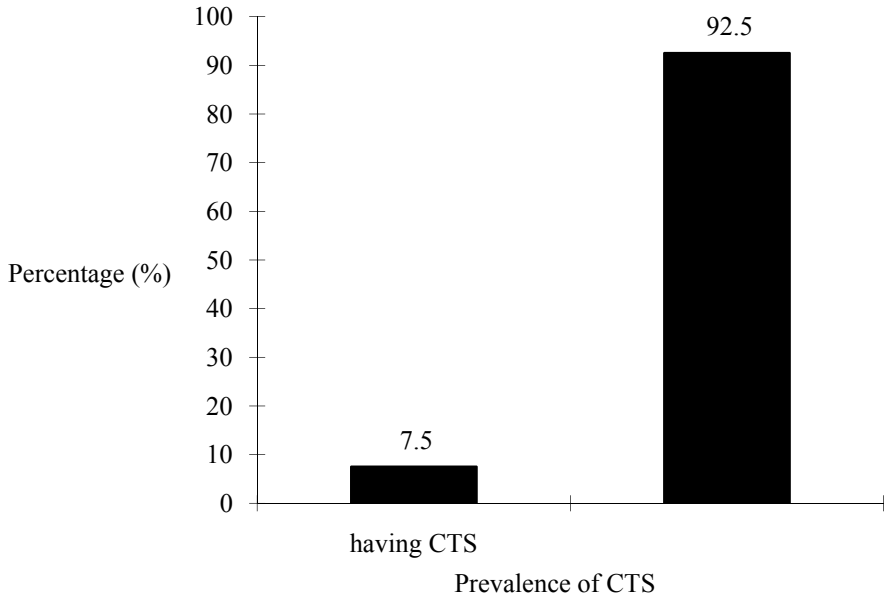

Figure 1 Prevalence of carpal tunnel syndrome.

Table 1 shows the socio-demographic distribution among the nurses who were having CTS. Higher prevalence was shown in respondents who were more than 30 years old (25.0%) compared to below age of 30 years old (3.2%). The result of the research showed that higher prevalence in Malay, followed by Indian. Those respondents who have been working for more than 10 years showed higher CTS prevalence compared to respondents with working experiences 10 years and below.

Table 1 Prevalence of CTS among the nurses

Data demographic	N	**Carpal Tunnel Syndrome**	
		Yes n (%)	No n (%)
Age			
≤ 30 years old	64	2 (3.2)	62 (96.8)
> 30 years old	16	4 (25.0)	12 (75.0)
Gender			
Female	74	6 (8.1)	68(91.9)
Male	6	0 (0.0)	0 (0.0)
Race			
Malay	65	4 (6.2)	61 (93.8)
Chinese	7	0 (0.0)	0 (0.0)
India	8	2 (25.0)	6 (75.0)
Others	0	0 (0.0)	(0.0)
Educational level			
Diploma and above	78	6 (7.7)	72 (92.3)
Below Diploma	2	0 (0.0)	(0.0)
Duration of service			

≤ 10 years	65	2 (3.1)	63 (96.9)
> 10 years	15	4 (26.7)	11 (73.3)
Medical history			
Having disease	12	1 (8.3)	11 (91.7)
Do not have disease	68	5 (7.3)	63 (92.7)

Table 2 showed the result of RULA assessment for the nursing job. Highest prevalence was shown in level 7 for both assessments of left and right upper arm. Table 3 showed the relationship between prevalence of CTS and individual factors. Significant relationship was shown between prevalence of CTS and age. Significant relationship was showed between prevalence of CTS and duration of service with p>0.05 in Fisher Exact Test.

Table 2 Total score of RULA in nursing job assessment

Task/Job	RULA Assessment	
	Score for left upper arm, n (%)	Score for right upper arm, n (%)
1 or 2	0 (0.0)	0 (0.0)
3 or 4	1 (16.7)	0 (0.0)
5 or 6	2 (33.3)	2 (33.3)
7	3 (50.0)	4 (66.7)

Table 3 Relationship between prevalence of CTS and individual factors

Individual factors	Prevalence of CTS		Total	P value
	Having CTS N=6	Didn't have CTS N=74		
Age				
≤ 30 years old	2(3.1%)	62(96.9%)	64	0.01*
> 30 years old	4(25.0%)	12(75.0%)	16	
Race				
Malay	4(6.2%)	61(93.8%)	65	0.31
Non Malay	2(13.3%)	13(86.7%)	15	
Educational level				
Above Diploma	6(7.9%)	70(92.1%)	76	1.00
Below Diploma	0 (0.0%)	4(100.0%)	4	
Duration of service				
≤10 years	2(3.1%)	63(96.9%)	65	0.01*
>10 years	4(26.7%)	11(73.3%)	15	
Medical history				
Having disease	4(5.9%)	64(94.1%)	68	0.30
Didn't have disease	2(16.7%)	10(83.3%)	12	

Fisher Exact Test, Significant is *p<0.05.

DISCUSSION

Prevalence of carpal tunnel syndrome

The previous studies had shown a lower prevalence compared to this study which account for 7.5% from total of 80 respondents. Manktelow et al[6] found that the prevalence of health service providers in getting compensation due to CTS was 2%. In the study done by Hamann et al[7], it showed that the percentage of dentists in acquiring CTS was only 2.9%.

This study also comparing the relation between the socio-demographic factors and the nurses with CTS. Higher prevalence was shown in respondents who were more than 30 years old. Franklin[8] found that the cases of CTS were most frequently happened among the active workers with the age of 25 to 45 regardless of the gender. This study found that the Malays had higher prevalence of having CTS with result of 66.7%. Low

prevalence was shown among the respondents who had diseases. However, Becker et al[9] explained that systemic diseases like diabetes, rheumatoid arthritis and hypothyroidism can contribute to CTS. High prevalence was shown among the respondents with dominant hand of right. However, according to the study done by James HD[10], anaesthetic nurses who had the left dominant hand were at 2 times higher risk in acquiring CTS compared to the right dominant hand and both hands. Most of the respondents with CTS were not getting any treatments neither medication nor rehabilitation. The feedbacks received from the respondents were CTS was a mild disease and the symptoms may resolve in a short period of time. The treatment especially rehabilitation session was time consuming for them.

Risk factors in nursing job

RULA assessment has shown the highest prevalence of having CTS involving the both arm in level 7. The activities which exposed the respondents to level 7 were patient's transferring, bed pulling and documentation work. These activities involved force load between 2 to 10kg at upper arm, muscle use with static posture longer than 1 minute or repeatedly occurred 4 times per minute, twisting of wrist more than 0 degree from the centre line and bending of trunk more than 0 degree. Occupation risk factor in nursing job is higher compared to the occupation of bartender.[12]

Relationship between prevalence of CTS and individual factors

Prevalence of getting CTS increased as 1.01 times for every increase in years of age since 18 years old.[13] The exact aetiology regarding the process of aging towards CTS was still remained unknown.[14] This study also showed a significant relationship between CTS and individual factors like age and duration of service as in Table 3. However, there are some studies which reject this relationship.[15,16,17]

No significant relationship was showed between prevalence of CTS and gender due to the presence of attention bias. The relationship between the prevalence of CTS and race was not significant although biological factors like genetic, race and age shown that they contributed 2 times of risk factors in acquiring CTS compared to risk factors in work.[18] No significant relationship was showed between the prevalence of CTS and educational level. However, according to the study done in Israel, educational level can affect the understanding and awareness of risk factors in CTS.[19] No significant relationship was showed between the prevalence of CTS and presence of disease. However, some studies had shown that systemic disease can expose ones to a higher risk in getting nerve injury.[20]

Relationship between prevalence of CTS and occupational risk factors

Prevalence of CTS was higher in the right hand compared to the left hand. At the same time, the percentage of right hand getting level 7 in the assessment of RULA was also higher than left hand. Hadler NM[22] claimed that there is a physiological limit in musculoskeletal usage whereby it enables the repetitive movement done without pressure. However, in reality, there are certain jobs which worked against this physiological limit. Flexion and extension of wrist can reduce the size of carpal tunnel and thus increase the pressure on flexor tendon.

CONCLUSIONS

The high prevalence of CTS among the nurses reviewed reflected the importance of implementing education and preventive measures among them. High risk factors in the nursing job like repetitive extending movement on wrist and heavy load handling for example in transferring bedridden patient, exposed the nurses to other occupational related disease(s) like Trigger Finger and DeQuervain's disease. It is important to the nursing department to review the ergonomic and work flow in the ward in order to improve the working environment and benefit of similar early preventive measures to nurses. This may involve in applying the correct technique to mobilise the patient and creating tools to reduce the patient's load in transferring bedridden patients.

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