

Original Research

Work Period as one of The Risk Factors of Suspected Carpal Tunnel Syndrome (CTS) among Worker in the “X” Furniture Manufacturing, Gresik-East Java 2018

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ABSTRACT

Background: Carpal Tunnel Syndrome (CTS) is a nerve disorder where an entrapped median nerve in the carpal tunnel causes pain and numbness in the hand. Prolonged condition of CTS will decrease someone’s productivity in daily life that requires hand.

Aim: This study aimed to analyze age, sex, and work period as the risk factors that can increase the incidence of suspected CTS in workers at the “X” Furniture Manufacturing, Gresik, East Java.

Material and Methods: An analytic observational cross-sectional study, was conducted in August 2018. A number 47 worker of “X” furniture manufacturing in Gresik, East java, counted as samples obtained by consecutive sampling technique. The data were taken by questionnaires and checked by using the Phalen test. The correlation between the risk factors of age, sex, and work period with suspected Carpal Tunnel Syndrome (CTS) were analyzed using chi-square and Fisher exact test.

Results: Based on the research, as many as 15 respondents had suspected CTS. Based on the chi-square test, the significance value between suspected CTS with the risk factor of age are $p=0.659$, sex are $p=0.70$, and Fisher exact test resulted in the significance value between suspected CTS with work period are $p=0.020$.

Conclusion: There was a significant difference between suspected Carpal Tunnel Syndrome (CTS) with work period ($p<0.05$) and there were no significant difference between suspected Carpal Tunnel Syndrome (CTS) with age and sex ($p>0.05$).

Keywords: CTS, Health risks, Industry worker, Median nerve, Risk factors, Work periode.

Introduction

Carpal Tunnel Syndrome (CTS) is one of the musculoskeletal disorders in the hand in the form of suppression of the median nerve caused by inflammation or thickening of the structure in the wrist that passes through the carpal tunnel.¹ The symptoms of CTS that patients mostly complain about are pain and tingling in the wrist spreading to the fingers. In addition, the frequently complained of subjective symptoms are "nocturnal acroparesthesia" in the form of a tingling sensation that can disrupt the patient's sleep quality at night. Carpal tunnel syndrome is more common among women and individual over the age of 30 and 76% of them usually become symptomatic at the age of 40-60 years.² The difference incidence of CTS between women and men can occur due to occupational factors, hormone factor, or non-occupational factors such as household exercises.³

The causes of CTS are multifactorial. Various theories were put forward to describe the pathophysiology of CTS such as the theory of mechanical pressure, microvascular disorders, and vibration.² Carpal tunnel syndrome is included in Cumulative Trauma Disorder (CTD), which is the fastest to cause symptoms and still a particular concern. Some studies suggest that there are several risk factors that can increase the incidence of CTS such as age, sex, rheumatoid arthritis, diabetes mellitus, trauma, fracture, duration of work, work period, and hand activity while working in the form of repetitive movements or vibrational effects on the hand.^{1,2,4-15}

Carpal tunnel syndrome's diagnosis is requires a series of patient's history, physical examination, and additional diagnostic test. The various simple physical examinations that can be done in the first place are phalen test with a sensitivity of 80%, specificity of 92% and positive predictive value 86%, tinell's test, flick's sign, tourniquet test, and wrist extension test.^{2,16-18} Additional diagnostic test in the form of ultrasound (USG), X-ray, Magnetic resonance imaging (MRI), Nerve Conduction Study (NCS), or

electromyography (EMG) can help strengthen the diagnosis.^{2,7,17,19}

Carpal tunnel syndrome is often associated with work-related disease because it is generally found in certain occupations that require hand activity such as repetitive movements, heavy pressure, and vibration effect from the work instruments.²⁰ Nowadays, to prevent the occurrence of work-related disease especially CTS is really important to giving more attention to the application of occupational safety and health (OSH) in a work environment dominated by movement on the hand.

Meanwhile in Indonesia, the incidence of CTS is still quite high, especially for workers with repetitive movement activities. The factor of informal industry which is still widespread and has not applied the principle of OSH and the absence of health services in the work environment has resulted in workers being at risk of CTS. We found all these risk factors in the "X" furniture manufacturing.^{13,21}

Several studies in Indonesia reported that workers with more than 4 years of working period had a greater risk of developing CTS than workers with less than 4 years of work.^{22,23} Another study reported that the incidence of CTS mostly occurred in the group of workers with more than 5 years of working.^{24,25} Meanwhile, some studies reported that there is no relationship between work period and the incidence of CTS.²⁶⁻²⁸ Aside from working period, several studies have also reported that individual characteristics such as age and gender can be suspected as risk factors for CTS.^{3,27}

Based on the background above, the researcher was interested in conducting research about the relationship between sex, age, and work period with the incidence of suspected carpal tunnel syndrome (CTS) in worker at the "X" furniture manufacturing, Gresik, East Java.

Material and Methods

This was an analytic observational study using cross-sectional design. The study was

conducted at the "X" furniture manufacturing, Gresik-East Java on August 2018. The population was all the workers of the "X" furniture manufacturing. The samples studied were all the workers of the "X" furniture manufacturing who conform the inclusion criteria. The sample size of this research was 52 samples. Sampling technique used a consecutive sampling method.²⁹

The criteria for inclusion in the study were that the subject agreed to participate, productive age and not sick during the study. The exclusion criteria in this study are the subjects of having diabetes mellitus, rheumatoid arthritis, and having history of trauma or fracture in hand.

This study obtained data from a questionnaire by Karnath and Stothard which were used as initial CTS complaints screening tools with a sensitivity value of 85% and specificity of 90%.³⁰ Then a simple test is done by a phalen test to further enforce the CTS suspicion.

Data was analyzed with presented in frequency distribution tables and analytic statistics. Statistical analysis of age and sex variables was done by Chi-square test while statistical analysis of work period was done by Fisher exact test because they did not fulfill the requirements of the Chi square test. The data was analyzed by using SPSS

version 16.0. This study has obtained approval of ethical clearance from ethics commission of Faculty of Medicine, Airlangga University No. 263/EC/KEPK/FKUA/2018.

Results

Initially, there are 52 respondents in this research, but the 5 of them were excluded because of some circumstances such as history of trauma on the hand, having sick leave, having comorbid, and not willing to sign an informed consent. As much as 47 respondents were divided into two groups 15 cases (31.9%) had a tendency towards to the suspected of carpal tunnel syndrome and 32 cases (68.0%) did not.

The variables are shown in table 1, 26 respondents (55.3%) of the study population were in the age group ≥ 35 years old and the correlation between age and the incidence of suspected CTS which resulted not statistically significant with $P = 0.659$ (Chi square significant value). The distribution of sex group is dominated by male as much as 30 respondents (63.8%) and the correlation between sex and the incidence of suspected CTS which resulted not statistically significant with $P = 0.708$ (Chi square significant value).

Table 1. Correlation between the Variables of the Respondents and the Suspected of CTS

Variables	Suspected of CTS		p-value
	Yes n (%)	No n (%)	
Age			
<35	6 (40.0)	15 (46.9)	0.659
≥ 35	9 (60.0)	17 (53.1)	
Sex			
Male	9 (60.0)	21 (65.6)	0.708
Female	6 (40.0)	11 (34.4)	
Work Period (years)			
<5	1 (6.7)	13 (40.6)	0.020
≥ 5	14 (93.3)	19 (59.4)	

Discussion

The "X" furniture manufacturing is the one of industrial factories in Domas village, Gresik, East Java. The factory is focused on producing bedroom furniture. The work time in normal day is 8 hours with

break time during 12-13 p.m. Meanwhile, in busy days with increased demand, the work time can add up to 10 hours, with additional break time at 17-19 p.m. In a month, there will be at least 500 furnitures produced by the factory. The "X" furniture manufacturing

has not fully utilized technologies, which is prone to cause work-related disease, especially diseases that caused by repetitive hand movements.

The work position of workers at the "X" furniture manufacturing are varied, such as standing, sitting with chairs, and sitting on the floor. The workplace for each division is not well organized, causing all workers exposed to the same risks, leading to difficulty in classifying each risk factor in a specific way. There are 5 divisions that are consist of adjusting, sanding, painting, assembling, and packing. Workers in all of the divisions are working manually by their hands, which can possibly causing repetitive movement and heavy burden on their hands. The examples of such movements are (1) in the adjusting division: lifting the wood and cutting it into the appropriate size and shape, (2) in the sanding division: repetitive flexion and extension movements of the wrist while sanding woods, (3) in the painting division: using an airbrush machine and lifting the product to a higher place for drying the furniture, (4) in the assembling division: heavy pressure and vibration on the wrist when using air nailer and hand grinder to cut the steel, and (5) in packing division: heavy burden when lifting products, using the stapler, and repetitive flexion extension movements on the wrist when attaching the wrapping.

The results of this research showed that there were 15 respondents who had suspected CTS and in line with the research which states that industrial workers have a high risk of experiencing musculoskeletal symptoms especially cases of CTS.¹ Symptoms that lead to the possibility of CTS can occur due to an unnatural body position during work. Workers who work more than 8 hours a day or 40 hours a week will be at greater risk of developing occupational disease, including CTS. The differences in symptoms of suspected CTS can vary depending on the characteristics of the respondents themselves.

In this study, the age and sex of the respondent were not significantly correlated to the suspected CTS. This is inline with the research that there is no relationship between sex and age of respondents with carpal tunnel syndrome in the clothing

industry in Bandung.²⁸ It may happen because there was unequal distribution of sex and age of the respondents. The cause of age itself is also difficult to ascertain because it is influenced by several factors such as biological effects and different lengths of exposure in each individual, which in this study were not further investigated for other risk factors outside the main occupation as a worker in furniture manufacturing that can affect the occurrence of CTS.^{6,28}

Based on the results of the study, there was a relationship between the work period and the suspected CTS. This is in line with the research that there was a relationship between the length of work with incident of CTS on loom manual craftsmen.⁹ This result is also supported by research which states that there was a relationship between work period and the incident of CTS on batik craftsmen.²² In addition, this study is also in line with the research on cracker maker in Sungailiat, Bangka Belitung which reported that prolonged length of work can lead to a tendency to fatigue and health problem related to work including CTS. This may happen because the longer the working period, the longer exposure to repetitive movements, pressure, and vibration when using the tools on the hands continuously can increase stress and trauma to the tissue especially around the carpal tunnel then can be accompanied by persistent nerve disorders.^{22,23}

Conclusion

Based on the study, there was a fact about the tendency of the suspected incidence of carpal tunnel syndrome (CTS) as many as 15 workers in the "X" furniture manufacturing, Gresik, East Java. There was a significant difference between work period with suspected Carpal Tunnel Syndrome (CTS). The work period has an important role in the existence of suspected CTS because the longer exposure to the risk factors, the more a person will experience the incidence of the suspected CTS.²³ The diagnosis of CTS is clinical with typical symptoms, physical examination findings include the provocation test, and adjunctive test sometimes needed to confirm the diagnostic such as nerve conduction test

(NCT) and ultrasound (USG) possibly useful in CTS diagnosis although there is no gold standard in diagnosing CTS.^{2,31} In the future study, it is better if the samples and variables come from several furniture manufactures so that the final results are more representative and avoid biases.

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