Journal of Vocational Health Studies

www.e-journal.unair.ac.id/index.php/JVHS

CARPAL TUNNEL SYNDROME (CTS) FOR WORKERS USING COMPUTER IN THE FINANCE DIVISION OF PROPERTY INDUSTRY

CARPAL TUNNEL SYNDROME (CTS) PADA PEKERJA MENGGUNAKAN KOMPUTER DI BIDANG KEUANGAN INDUSTRI PROPERTI

Research Report
Penelitian

Nevi Sulistika, Putri Handayani, Decy Situngkir, Taufik Rendi Anggara , Devi Angeliana Kusumaningtiar*

Department of Public Health, Faculty of Health Sciences, Universitas Esa Unggul, Indonesia

A B S T R A C T

Background: *One of the occupational diseases is Carpal Tunnel Syndrome (CTS). CTS is a condition in which the hand feels tingling, numb, painful, or weak. This syndrome occurs when the nerves inside the wrist are squeezed or compressed. Jobs that are at risk of CTS involve doing repetitive movements, working with awkward postures, working in a motorized vehicle production or working using computers.* ***Purpose:*** *To determine the factors associated with the incidence of CTS in workers that used computers in the finance division of Property Industry.* ***Method:*** *This research used quantitative research with cross-sectional design with a total sample of 34 respondents who worked in the finance division. The data were obtained through secondary data and questionnaires with direct observation and variables including gender, age, length of service, working period and awkward hand postures. The analysis carried out includes univariate and bivariate analyses using the chi-square test.* ***Result:*** *The univariate analysis of the respondents indicated there were 22 people (68.8%) experiencing CTS. Further, there were 22 people (75.5%) at risk from gender proportion, 22 people (68.8%) from age, 26 people (81.3%) from length of service, 22 people (68.8%) from long working period, and 24 people (74.0%) from awkward postures.* ***Conclusion:*** *There is a relationship between length of service, posture and the incidence of CTS on the workers using computers from the financial division of Property Industry.*

A R T I C L E I N F O

Received 21 November 2021
Revised 03 February 2022
Accepted 30 September 2022
Online 01 November 2022

Correspondence:
Devi Angelina Kusumaningtiar

E-mail :
deviangeliana@esaunggul.ac.id

Keywords:
Ergonomics, Occupational health, Carpal tunnel syndrome

A B S T R A K

Latar belakang: Salah satu penyakit akibat kerja adalah *Carpal Tunnel Syndrome* (CTS). CTS adalah suatu kondisi di mana tangan terasa kesemutan, mati rasa, nyeri, atau lemah. Sindrom ini terjadi ketika saraf di dalam pergelangan tangan terjepit atau tertekan. Pekerjaan yang berisiko terkena CTS adalah gerakan yang berulang-ulang, bekerja dengan postur tubuh yang canggung, bekerja di produksi kendaraan bermotor atau bekerja menggunakan komputer. **Tujuan:** Untuk mengetahui faktor-faktor yang berhubungan dengan kejadian CTS pada pekerja yang menggunakan komputer pada bagian keuangan di Industri Properti. **Metode:** Penelitian ini menggunakan penelitian kuantitatif desain *cross-sectional* dengan jumlah sampel 34 responden yang bekerja di bagian keuangan. Data diperoleh melalui data sekunder dan pengisian kuesioner dengan observasi langsung dan variabel yang meliputi jenis kelamin, usia, masa kerja, lama kerja, dan postur tangan yang ganjil. Analisis yang dilakukan meliputi analisis univariat dan analisis bivariat menggunakan uji *chi-square*. **Hasil:** Hasil analisis univariat responden yang mengalami CTS sebanyak 22 orang (68,8%). Proporsi jenis kelamin sebanyak 22 orang (75,5%), umur sebanyak 22 orang (68,8%), masa kerja sebanyak 26 orang (81,3%), lama kerja beresiko sebanyak 22 orang (68,8%), postur janggal sebanyak sebanyak 24 orang (74,0%). **Kesimpulan:** Ada hubungan antara masa kerja, postur dengan kejadian CTS pada pekerja yang menggunakan komputer didivisi keuangan Industri Properti.

Kata kunci:
Ergonomi, Kesehatan kerja, *Carpal tunnel syndrome*

Journal of Vocational Health Studies p-ISSN: 2580–7161; e-ISSN: 2580–717x
DOI: 10.20473/jvhs.V6.I3.2022.142-150

INTRODUCTION

Occupational health readily becomes a global issue from one country to another. Economic development brings not only positive impacts, but also negative impacts if it is not accompanied by global controls to reduce them. There are several risks that are responsible for causing occupational diseases; one of them is *Carpal Tunnel Syndrome* (CTS) (Swarjana, 2015).

The data obtained by the *California Dapartement of Public Health* (CDPH) which claimed workers compensation for CTS in California during 2007-2014 indicated that the overall number was 6.3 per 10.000 workers per part of the time where female workers and workers in industries that produced apparel, processed food, and did administrative work were at the highest risk for CTS. The highest rates of CTS include telephone operators, cafeterias, food concessions, and coffee shop counter attendants and electrical, electronic, and electromechanical assemblers (Jackson *et al*., 2018). An estimated 4% to 5% of people suffer from CTS worldwide, with the most susceptible population being elderly individuals aged between 40 and 60 years (Chammas *et al*., 2014).

According to the data from the National Institute for *Occupational Safety and Health* (NIOSH), during 2011-2014, there were 139.336 possible CTS cases. Among the 20 industries with rates six times higher than the average rate of CTS are textiles, fabric finishing, and upholstery of clothing accessories and other apparel manufacturing, and animal slaughtering with the largest number of CTS complaint claims in administration. There were 8.713 cases coming from public sectors, 4.836 cases from insurance operators, 4.630 cases from grocery stores, 3.412 cases from wired and wireless immunization, and 2.763 cases from employment services (Jackson *et al*., 2018).

According to the Central Bureau of Statistics in 2016, the prevalence of CTS is 5.6% -14.8% of all occupational diseases. In this case, occupational diseases are a part of health problems related to one's job and are influenced by various surrounding factors. One of the risk factors is the design of the workplace that is not ergonomic, which is not in accordance with human physiology and anatomy. Besides that, the work tools are not suitable and the work method requires a lot of abnormal positions carried out for a long time or repetitively.

Repetitive movements of the wrist are often done by office workers whose main job is sitting in front of a computer, where the hand is one of the organs that is used for a long time (such as holding a mouse and typing) and generally uses a combination of strength and repetition of finger movements such use of fingers and hands, over a long period of time, can be one reason why CTS is now starting to be suffered by many office workers (Bahrudin, 2011).

Based on Hartanti *et al.* (2018) research on factors associated with suspected CTS on the secretariat computer operator at the Inspectorate General of the Ministry of Public Works in 2012, there is a relationship between several variables, namely age, length of service, odd positions and the CTS incidence. Research conducted by Nafasa *et al*. (2019) on the relationship between tenure and complaints of CTS in employees who were computer users at the Subang branch of BJB bank in 2018 showed a significant relationship between tenure and complaints of CTS in BJB bank employees who used computer where the results of the study group whose length of service ≥4 years had a greater proportion of CTS than the group whose length of service <4 years. The CTS effects include numbness that occurs in the thumb, index finger, middle finger, and semicircle of the ring finger. This numbness often occurs at night, and is thought to occur in association with bending the wrist during sleep. CTS over a long period of time can result in permanent nerve damage with symptoms of persistent numbness, muscle atrophy at the base of the thumb, and difficulty moving the thumb. The only treatment that is scientifically proven to treat this disease is a surgery to cut the carpal cross ligaments (Tarwaka, 2008).

Property Industry is a member of the Agung Podomoro and Priamanaya Group. Agung Podomoro Group has been in the property development business for more than 40 years. The group has a substantial interest in real estate and property development including residential buildings (housing, apartments, townhouses), commercial buildings (malls, trade centers, shop houses), offices and innovative superblocks. In the course of its growth, Agung Podomoro Group has developed more than 500 hectares of land into residential areas, warehouses and industrial estates. Since the early 1990s, it has expanded its business to other areas in Jakarta, Bandung, Bogor, Kerawang, Balikpapan, and Bali. As a company that has progressed quite rapidly along with the development of modern times, technology is increasingly needed. One such is computer technology which many people in the world use for their daily needs. Property Industry, the presence of computer networks is very beneficial for all aspects in the company. The finance division is responsible for all financial activities, from management, receipts, transactions, recording and reporting. It demands accuracy and honesty in carrying out its duties because it has the authority over the management, recording, revenue and expenditure of company finances. The increasing target and job requirements in the finance division are in line with the increasing use of computers for employees, especially for typing and doing other mouse activities. The average computer usage in a day for the finance division workers is 4 - 6 hours.

Based on the results of a preliminary study conducted at Property Industry in the finance division of 10 workers, there were six people who experienced CTS where at the time of the Phalen's test they felt tingling, numbness or pain on the fingers or palms. The awkward posture when using a computer was discovered from the researchers' direct observation, namely extensio typing (natural posture) using the correct keyboard

with both hands straightening the joints from the fingers to the wrists. There were seven workers who used computers and worked with odd postures, and three workers who worked with normal postures. The awkward posture was found out when the workers used a mouse while bending their wrists, which may cause to be at risk of CTS. Moreover, CTS at Property Industry can cause losses due to decreased productivity, where there are delays in preparing monthly financial reports and medical expenses as well as eight claims for compensation received during 2018 related to wrist disorders that included CTS. Based on the above background, there are complaints of CTS in workers who use computers at Property Industry, so the researchers are interested in conducting a study on "Factors related to the incidence of Carpal Tunnel Syndrome in workers who use computers in the finance division of Property Industry."

MATERIAL AND METHOD

The research design used was a *cross-sectional* study with a quantitative approach. The population of this study amounted to 32 people. Respondents in this study were 32 people derived from a simple total sampling technique by filling out questionnaires and joining direct observation. The research variable consisted of CTS, gender, age, length of service, working period, and awkward posture. The measurement of CTS was carried out by using Phalen's test where the respondents were asked to perform maximum flexion of the wrist with the back of the hand touching for 60 seconds and it was calculated using a stopwatch. Then the Phalen's results were recorded by filling in the observation sheet. The age of the respondents was calculated from the respondent's birth to the time this study was conducted. This calculation was done based on the data derived from the questionnaire filled out by the respondents. Information about gender, length of service, working period, and awkward hand posture was also obtained from the questionnaire. Further, the measurement of the awkward posture on the respondents' hand was carried out by a direct observation. In this case, a photo was taken, and it was measured with a protractor carrying a check-list sheet where there was an image showing the hand's position when using a mouse or a keyboard.

Data analysis used *chi-square* statistical test with α=0.05. The respondents were interviewed using a questionnaire and a direct observation with the Phalen test. It aims to determine the factors associated with the incidence of CTS in workers who used computers in the finance division at Property Industry. After the data were obtained from direct interviews and observation, they were processed using SPSS. This study has also passed the research ethics review with the number of 0013-20.020/DPKE-KEP/FINAL-EA/UEU/2020.

RESULT

Data on the CTS variables were obtained through direct observation that used Phalen's test in which the respondents were asked to flex or touch both of their wrists downwards for 60 seconds while analyzing several risk factors including age, length of service, working period, and awkward hand postures (Table 1).

Based on Table 1, the results of the study of 32 respondents showed that there were 22 respondents (68.8%) having CTS, whereas 10 respondents (31.4%) had

Tabel 1. Distribution of frequency, gender, age, length of service, working period and odd posture in the hands of the employees who were computer users at the finance division of Property Industry

Variable		Frequency	Percentage
		32	**100%**
Carpal Tunnel Syndrome	CTS	22	68.8
	Not CTS	10	31.2
Gender	Women	24	75.0
	Male	8	25.0
Age	It's risky	22	68.2
	No risk	10	31.2
Length of service	Long	26	81.2
	New	6	18.8
Working period	It's risk	10	31.2
	No risk	22	68.8
Awkward posture	It's strange	24	75.0
	It's not unusual	8	25.0

no CTS. In terms of gender, it was discovered that there were 24 (75.0%) female respondents and eight (31.2%) male respondents. In terms of age, there were 22 (68.2%) respondents who were >36 years old, and eight (31.2%) respondents who were <36 years old. Meanwhile, from the length of service, there are 26 (81.4%) respondents who have long length of service and six (18.8%) who have a new length of service. Meanwhile, from the working period, there are 10 (31.2%) respondents who have a risk working period and 22 (68.8%) who have a no risk working period. Meanwhile, from the awkward posture, there are 24 (75.0%) respondents who have strange awkward posture and eight (25.0%) who have no unusual awkward posture. The results of the bivariate analysis were tested with *chi-square* on five variables in Table 2.

Tabel 2. The relationship of CTS with gender, age, length of service and odd posture for workers who use computers in the finance division of Property Industry

Variable	Category	Carpal tunnel syndrome				n	%	*p-value*	(95% CI)
		Yes		Not					
		n	%	n	%				
Gender	Women	16	72.7	8	27.3	24	100	1.000	0.889 (0.545 - 1.451)
	Male	6	80.0	2	20.0	8	100		
Age	It's risky	13	59.1	9	40.9	22	100	0.114	0.657 (0.438 - 0.984)
	No risk	9	90.0	1	10.0	10	100		
Length of service	Long	18	69.2	8	30.8	26	100	1.000	1.038 (0.558 - 1.933)
	New	4	66.7	2	33.3	6			
Working period	It's risky	4	40.0	6	60.0	10	100	0.037	0.489 (0.223 - 1.071)
	No risk	18	81.8	4	18.2	22	100		
Awkward posture	It's strange	20	83.3	4	16.7	24	100	0.005	3.333 (0.991 - 11.217)
	It's not unusual	2	25.0	6	75.0	8	100		

Based on the *chi-square* test by showing a *p-value* of=1.000 (*p-value*> 0.05), it can be concluded that there is no relationship between gender and the incidence of CTS in workers who use computers in the finance division of Property Industry. The *Prevalence Ratio* (PR)=0.889 with a 95% CI (0.545 - 1.451) means that male is less at risk of experiencing CTS than women.

Based on the *chi-square* test showing the *p-value* of=0.114 (*p-value*>0.05), it can be concluded that there is no relationship between age and the incidence of CTS in workers using computers in the finance division of Property Industry. The age PR=0.657 with a 95% CI (0.438 - 0.984) means that workers who are not at risk and <36 years old have a 1.522 greater risk of experiencing CTS compared to workers who are at risk and >36 years old.

Based on the *chi-square* test showing the *p-value* of=1.000 (*p-value*> 0.05), it can be concluded that there is no relationship between tenure and the incidence of CTS in workers who use computers in the finance division of Property Industry. The PR=1.038 with 95% CI (1.969 - 3.786) means that workers with long working tenure are at risk of 1.038 times for experiencing CTS compared to workers with new tenure.

Based on the *chi-square* test, the *p-value* of=0.037 (*p-value*<0.05), it can be concluded that there is a relationship between length of work and the incidence of CTS in workers who use computers in the finance division of Property Industry. The PR=0.489 with a 95% CI (0.177 - 0.947) means workers who work for <5 hours/day have a risk of 2.044 experiencing CTS compared to workers with a length of work >5 hours/day.

Based on the *chi-square* test by showing a *p-value* of=0.005 (*p-value*<0.005), it can be concluded that there is a significant relationship between awkward postures on the hands and the incidence of CTS in workers using computers in the finance division of Property Industry. The PR=3.333, with a 95% CI (0.991 - 11,217) means that workers with odd postures on their hands are 3.333 times more likely to experience CTS compared to workers with an odd posture on hand.

DISCUSSION

An overview of the incidence of CTS in workers using computers in the finance division of Property Industry

Based on the results of the study in the finance division of Property Industry on 32 respondents derived from direct observation where the Phalen's test was employed in 60 seconds indicated that they felt pain, tingling, and numbness with the highest proportion of respondents experiencing CTS for as many as 22 people (68.8%). The results of a study on Tea Leaf Picking Workers showed that the incidence of CTS on tea leaf

pickers was found in 56 people (65.9%) (Bahrudin *et al*., 2015). This is in line with Hartanti's *et al*. (2018) study that indicated that most computer operators had complaints of CTS for as many as 70% of the computer users. On average, about 3.8% of people complain about pain, unresponsiveness, and itching on the hands, which are in line with the symptoms of CTS (Ibrahim *et al*., 2012; Jenkins *et al*., 2012) . CTS occurs when the median nerve is pinched or compressed as it travels through the wrist. Risk factors for CTS include obesity, monotonous wrist activity, pregnancy, genetic inheritance, and rheumatoid inflammation (Skandalakis *et al*., 2014). The results of this study show that, of the 64 respondents who worked with repetitive movements, it was found that there were 58 respondents (90.6%) in the positive category of CTS (Sekarsari *et al*., 2017).

Based on the results of observations made in the finance division of Property Industry, the results showed the highest proportion of respondents experiencing CTS when Phalen's test was performed in 60 seconds. In this circumstance, the ones experiencing pain, tingling and numbness were 68.8% due to the high activity of using computers in the finance division related to the job responsibilities. Responsible for all financial activities including management, receipts, transactions, records and reports, the finance division demands accuracy in carrying out its duties because it has the authority over the management, recording, revenue and expenditure of the company finances. There is no CTS prevention program such as stretching exercises before and after working using a computer and there is no examination related to CTS complaints. The treatment that has been carried out so far by Property Industry is to administer Neurobion tablets for anyone who feels pain, tingling, and numbness within 60 seconds. The increasing target and job requirements in the finance division are increasing the use of computers for employees, especially for typing and mouse activities. Finance division workers should take advantage of their rest time to the maximum extent possible by resting their wrists not to use the keyboard and mouse at all. Patients should be referred for surgical treatment if the symptoms persist, if there is no improvement in their health, or if the motor or sensory deficit is progressive (Burke *et al*., 2003; Burton *et al*., 2014). During the normal range of wrist motion, the width of the tunnel decreases considerably, with the carpal bones moving relative to each other because of the bony walls of the tunnel being flaccid (Ghasemi-Rad *et al*., 2014; Jenkins *et al*., 2012).

Description of gender on workers who use computers in the finance division at Property Industry

Based on the results of the study on 32 respondents of the finance division of Property Industry in 2019, it is discovered that the highest proportion of workers who use computers were 24 women (75.0%) . The results of this study are in line with a study conducted by Juniari and Wahyudi (2015) that showed there were nearly 45% of female employees who worked using computers in the finance department compared to male employees. According to the results of the Indonesian Employment Report (2017), female workers who work in the jobs are more vulnerable (61.8%) compared to men (54.9%). Based on gender, working women as a professional/ space in 2016 has increased (40.3%). Even in 2006 the proportion of working women as a professional was also higher. Women have better leadership skills, business decision-making, governance, and company management (Ketenagakerjaan Indonesia, 2017).

Based on the research results on the finance division workers, it is found out that the highest proportion in the finance division at Property Industry is 24 women (75.0%). This is because they are related to being responsible for all financial activities including management, revenue, transactions, records and reports in this case, the finance division demands accuracy and honesty in carrying out its duties because it has the authority over the management, recording, revenue and expenditure of company finances.

Age description of workers who use computers in the finance division of Property Industry

Based on the results of the study on 32 respondents from the finance division of Property Industry, it is discovered that the highest proportion of being at-risk aged ≥36 years old is 22 people (68.8%). The results of this study are in line with a study conducted by Hartanti *et al*. (2018) on computer operators at the Secretariat Section of the Inspectorate General of the Ministry of Public Works. The results of the study indicated that the respondents aged ≥36 years old were 73 people (71.6%) and the rest were the respondents aged <36 years old as many as 29 people (28.4%). There were 33 (78.68%) of 42 respondents working with repetitive movements for 30 times per minute. While there were nine (21.42%) respondents with repetitive movements every minute (Lazuardi *et al*., 2016). The results of the study stated that there was a relationship between the age variable and the incidence of CTS, with a significance level of 0.001 (Wardana *et al*., 2018).

Age is the length of a person's life starting from birth until now. Uisa can be said as a unit of time that measures the time of existence of an object or a creature, both living and non-living (Suma'mur, 2009). According to Rusmayani (2002), the age that is considered productive is 30 - 38 years old. This is because at that age employees usually have had career paths and sufficient work experience. Employees of that age are usually already seniors and even some have been trusted to manage a division.

Based on the results of the questionnaire for the finance division workers, it is discovered that the highest proportion of workers in the finance division of Property Industry who is ≥36 years old are 22 people (68.8%). Human Resource Department of Property Industry states that spatial management requires a productive age to record space from management, receiving,

transactions, recording and reporting, making charts and graphs, using computer worksheets, explaining technical reports and reporting investment decisions with the group and analyzing spatial information to estimate business or economic conditions. Companies should carry out an administrative control for workers who are at risk of experiencing CTS, for example, making a policy that requires workers to perform wrist movements or exercises that need to be done by workers who use computers or use a support on the hand or wrist splint.

An overview of the working years for workers who use computers in the finance division of Property Industry

Based on the results of the study on 32 respondents from the finance division of Property Industry, it was found out that the highest proportion of working tenure ≥4 years was 26 people (81.3%). This is in line with the study of Juniari and Triwahyudi (2015) on female employees at the Dhyana Pura University campus who work using computers. The results of the study were the highest proportion of respondents who had the length of service of ≥4 years as many as 53.8%.

The working period is the span of time that a person has passed in carrying out their working activities. Working period and a person's experience in a job will affect a person's level of performance. This is because the greater a person's experience in his work, the more efficient his work performance. Workers who have increased working period will do repetitive movements on the fingers and hands continuously for a long period. Length of service >5 years can cause stress around the network of carpal tunnel and will cause CTS (Tarwaka, 2015).

Based on the results of the questionnaire filled out by the finance division workers, it is unveiled that the highest proportion of work tenure in the finance division at PT X is ≥4 years as many as 26 people (68.8%). This is due to the guaranteed level of welfare and high incentives. In hiring employees Property Industry Human Resource Department states that the finance department is a worker who already has work experience because, in financial management, work experience is needed. The results of the study stated that there was a relationship between length of service and the incidence of CTS in workers (Purwandari *and* Agustin, 2012).

An overview of the length of service for workers who use computers in the finance division of Property Industry

Based on the results of the study on 32 respondents from the finance division of Property Industry, there were 22 people (68.8%) whose working period <5 hours/day. This is in line with Suherman's *et al*. (2012) study on computer rental officers in Kahuripan District, Tasikmalaya City where the proportion of computer rental officers' working period of 4 - 8 hours was 94.9%. Working period is the duration used for working. Working using a computer that takes longer time will be risky. A large UK national survey found out that the keyboard used for more than five hours per day increased the risk of *musculoskeletal* symptoms in the hand and wrists (Spellman, 2015).

The results of the study on the 32 respondents from the finance division of Property Industry indicated that the highest proportion of the respondents whose working period was <5 hours/day was 22 people (68.8%). This is because the respondents perform various tasks such as carrying out financial records from management, receipts, transactions, recording and monthly reports, making charts and graphs, and using computer worksheets. Those activities were done at the end of each month starting from the 25th day onwards because the final deadline for reporting is every second day of the following month. In this case, observation on the respondents was carried out on the second week when the workers had not recorded and reported monthly reports, and used computers at an average rate.

An overview of the odd posture on the hands of workers who use computers in the finance division of Property Industry

Based on the results of the questionnaire filled out by the finance division workers, it is revealed that the highest proportion of awkward postures in the finance division of Property Industry is caused by hyperextension found in 26 people (68.8%). This is because, when the workers work, the hands' position is too bent so that there is an emphasis on the carpal part and the odd position of the bent hand when typing using the keyboard (hyperextension typing) causes the blood circulation not to run smoothly in the hand area, and causes the wrist to tire quickly. In addition, the position of the worker makes the muscles of the wrist contract, which creates the risk of bad posture. Working using computers must be considered very carefully especially by workers who do not understand the work risks well. Wrist posture is to form an angle between 150 above and 150 down. Awkward posture on the hand is wrist extension where the wrist is bent toward the back of the hand. Repetitive movements on the hands are affected by the type of work, e.g. typing and length of work which later were identified as factors that caused the awkward position of the hand (Bridger, 2003). Awkward posture on hand and wrist is visible when holding objects in a pinch (pinch grip), pressuring on the finger against an object (finger press), gripping firmly (power grip), flexing and extending wrist position with an angle >150 up to 450 (Butterworth, 2004).

Gender relationship with the incidence of CTS in workers using computers in the finance division of Property Industry

Based on the results of the analysis of the relationship between gender and the incidence of CTS, it can be seen that the highest proportion of respondents out of 24 female respondents who experienced CTS was 16 respondents (66.7%). While the highest proportion of respondents out of eight male respondents who experienced CTS was six respondents (75.0%). This is in line with a study conducted by Nisa *et al*. (2018) indicating that most of the respondents who were diagnosed with CTS were female respondents (52.9%).

Women have a greater risk for CTS than men because they have smaller carpal tunnel compared to men. Further, menopausal women also tend to have CTS (Bahrudin, 2011). Occurrence of CTS in women peaks after menopause; it is generally consistent with the concept that in women there may be a hormonal component (Ashworth, 2009). In this study, there was no relationship between gender and the incidence of CTS due to the work on the finance division in relation with other factors such as working period in using a computer every day. Based on the results of the stratification with the length of work, it is discovered that there were 61.4% of female respondents whose working period is >5 hours per day experiencing CTS, and 39.6% of male respondents experiencing CTS.

Based on the results of the *chi-square* test, there is no relationship between gender and the incidence of CTS. This is in line with a study conducted by Febriana (2009) finding out that there is no relationship between gender variables and the risk of CTS In the present study there was no relationship between gender and the incidence of CTS due to other factors such as length of work. Based on the results of the stratification with the length of work, it is discovered that with the length of work of >5 hours, there were 73.6% female respondents experiencing the incidence of CTS, while the length of work and women with CTS have the highest proportion as much as 64.5%. With this, it can be concluded that gender (either men or women) is not related to the incidence of CTS for workers who use computers in the finance division of Property Industry.

Analysis of the relationship between age and the incidence of CTS in workers using computers in the finance division of Property Industry

Based on the results of the analysis of the relationship between age and the incidence of CTS, it can be seen that the highest proportion of respondents with age at risk ≥36 is 16 respondents (66.7%) who also experience CTS, while the highest proportion of respondents who is not at risk (<36 years old) of CTS was nine respondents (90.0%). This is in accordance with a study conducted by Nisa *et al*. (2018) showing that most of the respondents who were diagnosed with positive CTS have an age of >37.5 years (55.5%).

Based on the *chi-square* test, it shows that there is no relationship between age and the incidence of CTS in workers who use computers in the finance division of Property Industry. This is in line with Hartanti's *et al*. (2018) study indicating that there is no relationship between age and CTS. In the present study, the results show that there is no relationship between age and CTS. In this case, there is no difference in workload between workers aged ≥36 years old and workers aged <36 years old in the finance division whose responsibility includes all financial activities including management, receipts, transactions, records and reports as well as maintaining the accuracy and honesty in carrying out their duties due to the authority over the management, recording, revenue and expenditure of company finances. Based on the stratification results with awkward postures, it is discovered that those with awkward postures are at risk with the highest proportion of CTS for 44.5%. With this, it can be concluded that the period is related to incidence of CTS for workers who use computers in the finance division of Property Industry.

Analysis of the relationship between working tenure and the incidence of CTS in workers who use computers in the finance division of Property Industry

Based on the results of the study on 32 workers using computers in the finance division of PT. X, it is discovered that the highest proportion of workers who have a risky working period of ≥4 years experiencing CTS is 18 people (69.2%). Meanwhile, the highest proportion of new tenure workers who are at risk of CTS with a length of service <4 years is four people (66.7%). This is in line with a study conducted by Nisa and Anwar (2018) indicating that respondents who were diagnosed with CTS had a length of service of >6 years (57.1%).

Based on the *chi-square* test, it shows that there is no relationship between work tenure and the incidence of CTS in workers who use computers in the finance division of Property Industry. The PR value of 1.038 means that workers with a long service period of ≥4 years are at risk of 1 .038 times for CTS compared with workers whose length of service is <4 years. In the present study, it shows that the sudden relationship between working tenure and CTS is due to the absence of differences in workload between workers with a long working period and many years of service in relation with repetitive hand movements causing a sudden relationship between working and CTS in workers who use computers in the finance division of Property Industry.

Based on the results of the stratification with the length of work it is known that for the length of work that is >5 hours among female respondents, the incidence of CTS is 73.6%, while combining the length of work and the respondents being female with CTS has the highest proportion as much as 64.5%. With this, it can be concluded that gender (men and women) is not related to the incidence of CTS for workers who use computers in the finance division of Property Industry.

The relationship between length of work with the incidence of CTS in workers who use computers in the finance division of Property Industry

Based on the results of the analysis of 32 respondents, it is discovered that the highest proportion of workers with long working hours of <5 hours/day found in 18 people (81.8%) is not at risk of experiencing CTS. This is in line with a study conducted by Suherman *et al*. (2012) on computer rental officers in Kahuripan District, Tasikmalaya City where they found that the proportion of CTS was more prevalent in rental officers with 4 - 8 hours of work (94.9%) compared to ≤4 hours per day (27.3%) who experienced carpal CTS.

Based on the *chi-square* test, it shows that there is a relationship between length of work and the incidence of CTS on the workers' hands. The PR value in this analysis is the PR value of the length of work with the incidence of CTS of 2.044 with a large 95% CI (0.177 - 0.947), meaning that workers who work longer than five hours/day are at risk of experiencing CTS compared to workers with shorter working period (<5 hours/day). This is in line with a study conducted by Pasaribu (2017) regarding the relationship between length of work and typing activities with the risk of CTS in postal employees (policy operation service) at PT. Avrist Assurance in 2016. The results of this study showed a relationship between length of work and the risk of CTS. This study is also in line with another study conducted on computer rental officers in Kahuripan District, Tasikmalaya City.

In the present study, there is a significant relationship between the working period and the incidence of CTS, at which the risk of CTS increases along with the increasing length of work. This happens because the longer the working time, the higher the risk of increasing repetitive movements of the finger(s) continuously in the long run, so that it can cause stress on the network around the carpal tunnel.

The relationship between the hands' awkward postures and the incidence of CTS in workers using computers in the finance division of Property Industry

Based on the results of the data obtained from the 32 respondents, it is discovered that the proportion of workers with hand awkward postures experiencing CTS is found in 20 people (83.3%), while the highest proportion of workers with an awkward posture on their hands but not experiencing CTS is found in six people (75.0%). This is in line with the results of Wardana *et al*. (2018) research showing that awkward posture on wrist was found in 44.1% of the X office computer workers in Semarang City in which the awkward posture showed up when using tools while doing work.

Based on the *chi-square* test showing the *p-value* of=0.005 (*p-value*<0.05), it can be concluded that there is a relationship between awkward posture on the hands and the incidence of CTS in the hands of workers who use computers in the finance division of Property Industry. The PR value in this analysis is 3.333, meaning that workers with an awkward posture on the hands are 3.333 times more likely to experience CTS compared to workers with an awkward posture on the hands. This is in line with the research conducted by Septiawati *et al*. (2013) regarding ergonomic risk factors when typing in employees of Sumatra Morning Daily. The study indicated there was a significant relationship between hand posture and the incidence of CTS it added that the pressure on the median nerve and over a long period of time could cause permanent CTS and muscle weakness. Based on the observations made during the study, when the respondent uses the keyboard with his left hand, the respondent does an odd posture, namely pressing on the wrist and typing using two fingers even using only one hand.

CONCLUSION

Based on the results of the study conducted, there are still many workers experiencing CTS as many as 22 (68.8%) respondents and there is a relationship between length of work and awkward postures on the hands with the incidence of CTS in workers who use computers in the finance division of Property Industry. Finance division workers should take advantage of the break time as much as possible to rest their wrists in order not to use the keyboard and mouse while resting.

ACKNOWLEDGMENTS

The author would like to thank the respondents, the construction company and all parties who contributed to this study. The author declares no competing interests with respect to the research, authorship, and/or publication of this article.

REFERENCE

Ashworth, 2009. Clinical Evidence Carpal Tunnel Syndrome. Associate Profesor University of Alberta, Edmonton Canada.

Bahrudin, M., 2011. Carpal Tunnel Syndrome. SAINTIKA Med. J. Ilmu Kesehat. dan Kedokt. Kel. Vol. 7(14), Pp. 78-87.

Bahrudin, M., Perdana, R.L.P., Sultana, H.F.A., 2015. Hubungan Masa Kerja Dengan Kejadian CTS pada Pekerja Pemetik Daun Teh. SAINTIKA Med. J. Ilmu Kesehat. dan Kedokt. Kel. Vol. 11(2), Pp. 114-118.

Bridger R.S, 2003. Introduction to Ergonomics. Taylor & Francis., London.

Burke, F.D., Ellis, J., McKenna, H., Bradley, M.J., 2003. Primary Care Management of Carpal Tunnel Syndrome. Postgrad. Med. J. Vol. 79(93), Pp. 433-437.

Burton, C., Chesterton, L.S., Davenport, G., 2014. Diagnosing and Managing Carpal Tunnel Syndrome in Primary Care. Br. J. Gen. Pract. Vol.64(622), Pp. 262-263.

Butterworth H, 2004. Ergonomics and the Management of Musculoskeletal Disorders. Elsevier Health Sciences, London, United Kingdom.

Chammas, M., Boretto, J., Burmann, L.M., Ramos, R.M., Neto, F.C. dos S., Silvac, J.B., 2014. Carpal Tunnel Syndrome - Part I (Anatomy, Physiology, Etiology and Diagnosis). Rev. Bras. Ortop. Vol. 49(5), Pp. 429-436.

Ghasemi-Rad, M., Nosair, E., Vegh, A., Mohammadi, A., 2014. A Handy Review of Carpal Tunnel Syndrome: From Anatomy to Diagnosis and Treatment. World J. Radiol. Vol. 6(6), Pp. 1-17.

Hartanti, H.F., Asnifatima, A., Fatimah, A., 2018. Faktor Risiko yang Berhubungan dengan Keluhan Carpal Tunnel Syndrome pada Pekerja Operator Komputer Bagian Redaksi di Harian Metropolitan Bogor Tahun 2018. Promot. J. Mhs. Kesehat. Masy. Vol. 1(1), Pp. 68-73.

Ibrahim, I., Khan, W.S., Goddard, N., Smitham, P., 2012. Carpal Tunnel Syndrome: A Review of The Recent Literature. Open Orthop. J. Vol. 6, Pp. 69-76.

Jackson, R., Beckman, J., Frederick, M., Musolin, K., Harrison, R., 2018. Rates of Carpal Tunnel Syndrome in a State Workers' Compensation Information System, by Industry and Occupation — California, 2007–2014. MMWR Morb. Mortal. Wkly. Rep. Vol. 67(39), Pp. 1094–1097.

Jenkins, P.J., Watts, A.C., Duckworth, A.D., McEachan, J.E., 2012. Socioeconomic Deprivation and The Epidemiology of Carpal Tunnel Syndrome. J. Hand Surg. European. Vol. 37(2), Pp. 123–129.

Febriana, K., 2009. Gambaran Faktor-Faktor Risiko CTS di PT. ASTRA International Tbk-Head Office Sunter II. Universitas Indonesia.

Juniari, G.A.R., Triwahyudi, A., 2015. Hubungan Antara Masa Kerja Terhadap Keluhan Carpal Tunnel Syndrome (CTS) pada Pegawai Perempuan di Kampus Universitas Dhyana Pura yang Bekerja Menggunakan Komputer. VIRGIN J. Ilm. Kesehat. Dan Sains Vol. 1(2), Pp. 162-168.

Ketenagakerjaan Indonesia, 2017. Memanfaatkan Teknologi untuk Pertumbuhan dan Penciptaan Lapangan Kerja/Organisasi. Jakarta.

Lazuardi, A.I., Ma, I., Hartanti, R.I., Kalimantan, J., 2016. Determinan Gejala Carpal Tunnel Syndrome (CTS) pada Pekerja Pemecah Batu (Studi pada Pekerja Pemecah Batu di Kecamatan Sumbersari dan Sukowono Kabupaten Jember) Determinants of Carpal Tunnel Syndrome (CTS) Symptoms on Rock-Breaking Workers (Study o. UNEJ Press.

Nafasa, K., Yuniarti, Y., Nurimaba, N., Tresnasari, C., Wagiono, C., 2019. Hubungan Masa Kerja Dengan Keluhan Carpal Tunnel Syndrome Pada Karyawan Pengguna Komputer di Bank BJB Cabang Subang. J. Integr. Kesehat. dan Sains Vol. 1(1), Pp. 40-44.

Nisa, N., Anwar, M.M., 2018. Gambaran Faktor Risiko Carpal Tunnel Syndrome (CTS) pada Karyawan bagian Redaksi di Kantor X Jakarta Tahun 2018. Ber. Kedokt. Masy. Vol. 34(5).

Pasaribu, D.M., 2017. Hubungan Durasi Kerja, Lama Kerja dan Aktivitas Mengetik dengan Risiko Carpal Tunnel Syndrome pada Karyawan Bagian Pos (Policy Operation Service) di Pt. Avrist Assurance Tahun 2016. Universitas Esa Unggul.

Purwandari, C., Agustin, M., 2012. Masa Kerja, Sikap Kerja dan Kejadian Sindrom Karpal pada Pembatik. KEMAS J. Kesehat. Masy. Vol. 7(2), Pp. 170–176.

Rusmayani., R., 2002. Gambaran Keluhan Subjektif Carpal Tunnel Syndrome (CTS) akibat Penggunaan Komputer pada Pekerja Data Entry di Arsip Nasional Republik Indonesia. Universitas Indonesia.

Sekarsari, D., Pratiwi, A.D., Farzan, A., 2017. Hubungan Lama Kerja, Gerakan Repetitif dan Postur Janggal pada Tangan dengan Keluhan Carpal Tunnel Syndrome (CTS) pada Pekerja Pemecah Batu di Kecamatan Moramo Utara Kabupaten Konawe Selatan Tahun 2016. J. Ilm. Mhs. Kesehat. Masy. Unsyiah Vol. 2(6), Pp. 1-9.

Septiawati, D., Hasyim, H., Najmah, N., 2013. Faktor Risiko Ergonomi saat Mengetik dan Hubungannya. JIKM (Jurnal Kesehat. Ilmi Masyarakat) Vol. 4(3), Pp. 237-244.

Skandalakis, L.J., Skandalakis, J.E., Skandalakis, P.N., 2014. Carpal Tunnel. In: Surgical Anatomyand Technique A Pocket Manual. Springer Science Business Media, USA. Pp. 703–714.

Spellman, F.R., 2015. Occupational Safety and Health Simplified for the Industrial Workplace. Bernan Press.

Suherman, B., Maywati, S., Faturrahman, Y., 2012. Beberapa Faktor Kerja yang Berhubungan dengan Kejadian Carpal Tunnel Syndrome (CTS) pada Petugas Rental Komputer di Kelurahan Kahuripan Kota Tasikmalaya. Universitas Siliwangi.

Suma'mur, 2009. Hiegiene Perusahaan dan Keselamatan Kerja. CV Sagung Seto, Jakarta.

Swarjana, K.I., 2015. Metodologi Penelitian Kesehatan (Ed. Revisi). Andi Offset.

Tarwaka, 2008. Occupational Safety and Health Management and Implementation of Occupational Health and Safety at Work. Harapan Press, Surakarta.

Tarwaka, 2015. Keselamatan dan Kesehatan Kerja. Harapan Press, Surakarta.

Wardana, E.R., Wijayanti, S., Ekawati, E., 2018. Faktor-Faktor yang Berhubungan dengan Kejadian Carpal Tunnel Syndrome (CTS) pada Pekerja Unit Assembling Pt X Kota Semarang Tahun 2018. J. Kesehat. Masy. Vol. 6(5), Pp. 502-509.