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FACTORS RELATED TO CARPAL TUNNEL SYNDROME COMPLAINTS AMONG COMPUTER OPERATORS

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ABSTRACT
The use of static electronic devices for a long time, especially computers, can affect the musculoskeletal system of office workers due to incorrect hand positions when using a mouse or keyboard and repetitive work. Computer operators at PT. X can spend time working in front of a computer for around 7-8 hours a day, even if they are facing a work deadline, they can spend more than 12 hours working in front of a computer. In general, the body part that is used most often in doing work is the hand where the fingers are repeatedly used for a long period of time when pressing keyboard buttons and operating the mouse. This has the potential to cause Carpal Tunnel Syndrome (CTS) complaints. This study aims to determine the relationship between work period, length of work, and awkward hand positions with Carpal Tunnel Syndrome (CTS) complaints in computer operators at PT. X, Kendari City. The design of this study is cross-sectional. The sampling technique uses total sampling where the sample is all 35 computer operators. A questionnaire is used to determine the characteristics of the respondents. To determine the awkward position of the hand while working, an observation sheet is used. Phalen's test is a test performed to identify if there is CTS in workers. Based on the results of bivariate analysis, it is known that the length of service is related to CTS complaints with a p value = 0.005. Length of service is related to CTS complaints with a p value = 0.004). Awkward hand positions are related to Carpal Tunnel Syndrome complaints with a p value = 0.001. In this study, it was found that the variables that had a relationship with CTS complaints in computer operators at PT. X, Kendari City were work period, length of work, and awkward hand positions were factors.

Keywords: carpal tunnel syndrome; length of work; odd hand position; work period

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INTRODUCTION

The widespread use of computers and laptops has raised concerns about their potential role as a risk factor for developing carpal tunnel syndrome (CTS). High stress and pressure in the carpal tunnel, exacerbated by repetitive hand movements and prolonged use of these devices, may contribute to the development of CTS (Agrawal, 2018). Carpal Tunnel Syndrome (CTS) is the most common entrapment neuropathy is caused by chronic compression of the median nerve at the wrist. Risk factors include female gender, obesity, work-related factors, and medical conditions such as hypothyroidism and pregnancy (Harinesan et al 2024). CTS is a dysfunction of the median nerve that occurs due to an increase in the carpal tunnel. The symptoms that arise can vary, including pain, paresthesia, numbness, a pricking sensation, and are generally felt in the radial parts of the ring finger, middle finger, index finger, and thumb. This health disorder is not limited to ethnicity, gender, age, occupational factors, but more to mechanical factors, local diseases, and systemic diseases (Basuki, R et.al, 2015). CTS is a condition where there is pressure on the carpal tunnel, repeated extension and flexion.

Pressure on the median nerve in the carpal tunnel area is a mismatch between the relative size and volume of the canal contents (Saerang, Kembuan and Karema, 2015).

Work activities using hands with high intensity and long duration have the potential to cause CTS complaints. This is related to the characteristics of work that uses a combination of repetitive movements of the fingers and strength over a long period of time (Barcenilla et al., 2012; Nissa, Widjasena and Suroto, 2015). In general, CTS occurs gradually in the palm, wrist, index finger, thumb, middle finger, and part of the outer side of the ring finger (Nissa, Widjasena and Suroto, 2015). The relationship between CTS and computer use has been investigated repeatedly by various researchers with significant results. A cross-sectional study conducted in a sample of 648 computer professionals found a higher risk for CTS with higher computer work exposure. In another study, a predictive model of CTS among computer users found a higher probability of CTS with increasing computer use (Bhanderi et al., 2017).

PT. X is a company that uses computer technology. Workers who work in several fields usually work for quite a long time using computers. Workers can spend time in front of the computer for a maximum of 7 - 8 hours per day, even if there is a deadline they can spend more than 12 hours working in front of the computer. This has the potential to cause CTS complaints to computer operators at PT. X, Kendari City. CTS causes complaints in the form of pain and limitations in the function of the wrist and hand, thus affecting performance in carrying out daily work. On the other hand, CTS can cause various losses, including decreased productivity, increased medical expenses, and compensation for damages if there is a disability or limitation in workers. The purpose of this study was to determine the relationship between work period factors, length of work, and awkward hand positions with CTS complaints in computer operators at PT. X, Kendari City.

METHOD

The type of research is observational analytic with a cross sectional approach where this research studies the relationship between risk factors and the effects caused at one time (point time approach). This research was conducted at PT. X Kendari City. The population in this study amounted to 35 people, all of whom were computer operators at PT. X Kendari City. The sampling technique used the total sampling method technique. The total sampling method is a sampling method where researchers use the entire population as a sample (Sugiyono, 2012). This method is used because the population is less than 100 people, so the sample size is 35 people.

In this study, the questionnaire instrument was used to determine the individual characteristics of respondents, work period, and length of work. The validity and reliability of the questionnaire used in this study are based on previous research by Suherman, Maywati, and Faturrahman (2012) and Nurqotimah (2010). The instrument has been used in similar contexts to measure respondent characteristics, work period, and working hours in studies related to occupational characteristics involving computer usage. The consistency and accuracy of the questionnaire in previous studies indicate that it is a valid and reliable instrument for capturing data on these variables.The variable of work period is the unit of time spent by respondents while doing their work using a computer. The variable of work period is grouped into two categories, namely workers with a work period of ≥ 4 years and workers with a work period of < 4 years (Suherman, Maywati and Faturrahman, 2012). Working hours are the daily duration of workers when operating a computer from the start of work to completion. This variable is divided into two categories, namely ≥ 8 hours and < 8 hours (Nurqotimah, 2010).

Observation sheets are used to find out the odd position of the hand where this sheet contains a list of types of work to be observed. Neutral hand position if the use of the keyboard and mouse is shown in numbers 5 and 6 on the observation sheet. While the odd hand position if the use of the keyboard and mouse is shown in numbers 1, 2, 3 and 4 (Nurqotimah, 2010). To calculate the duration of time when performing the Phalen's test, a stopwatch is used. Phalen's test is a test conducted to determine the symptoms of CTS disease by asking workers to perform a flexion movement bending the palm of the hand for 60 seconds. Workers are identified as having CTS if the results of the Phalen's Test show one or more symptoms. The symptoms in question are pain/numbness/numbness in the hands. Data is displayed in the form of a frequency distribution table for each variable. Then a cross-tabulation is presented between the independent and dependent variables using the chi square test with a 95% confidence level using the SPSS data processing application.

RESULT

Table 1.
Distribution of Respondents Based on Individual Characteristics of Computer Operators

Variables	f	%
Age Group (Year)		
≤ 30	21	60
31-40	8	22,9
41-50	5	14,3
51-60	1	2,9
Gender		
Man	24	68,6
Woman	11	31,4
Carpal Tunnel Syndrome		
Positive	19	54,3
Negative	16	45,7
Work Period (Hour)		
≥ 4	29	82,9
< 4	6	17,1
Length of work (Jam)		
≥ 8	19	54,3
< 8	16	45,7
Awkward Hand Positions		
Neutral	13	37,1
Awkward	22	62,9

Based on research conducted on 35 computer operators at PT. X Kendari City in 2019, there were 19 people (54.3%) identified as complaining of Carpal Tunnel Syndrome and 16 people (45.7%) did not complain of Carpal Tunnel Syndrome. The age group of respondents was dominated by the age group ≤ 30 as many as 21 people (60%). The number of male respondents was 24 people (68.6%) and female respondents were 11 people (31.4%). Respondents with a work period of ≥ 4 years were 29 people (82.9%) while 6 respondents (17.1%) had a work period of <4 years. Respondents with a work period of ≥ 8 hours per day were 19 respondents (54.3%) and 16 respondents (45.7%) with a work period of <8 hours per day. Respondents with an odd hand position numbered 22 respondents (62.9%), while 13 respondents (37.1%) had a neutral hand position.

Table 2.
Relationship between variables of work period, length of work, and awkward hand position with CTS complaints in computer operators

	CTS				Total		p value
	(+)		(-)				
Work Period	f	%	f	%	f	%	
≥ 4 Years	19	54,3	10	28,6	29	82,9	0,005
< 4 Years	0	0	6	17,1	6	17,1	
Length of work							
≥ 8 jam	15	42,9	4	11,4	19	54,3	0,004
< 8 jam	4	11,4	12	34,3	16	45,7	
Posisi Janggal Pada Tangan							
Neutral	2	5,7	11	31,4	13	37,1	0,001
Awkward	17	48,6	5	14,3	22	62,9	

The table shows a significant association between work period, length of work, and awkward hand positions with the incidence of Carpal Tunnel Syndrome (CTS). Respondents with a work period of ≥ 4 years had a higher percentage of CTS-positive cases (54.3%) compared to those with < 4 years (0%), with a p-value of 0.005. For the length of work variable, respondents working ≥ 8 hours per day had a higher incidence of CTS (42.9%) than those working < 8 hours (11.4%), with a p-value of 0.004. Additionally, respondents who worked with awkward hand positions showed a much higher percentage of CTS-positive cases (48.6%) compared to those with a neutral position (5.7%), with a p-value of 0.001.

DISCUSSION

CTS Complaints on Computer Operators

Carpal Tunnel Syndrome (CTS) is a condition caused by compression of the median nerve in the wrist, which causes symptoms such as pain, numbness, and tingling in the affected hand, along with decreased grip strength (Fariqhan, 2022). Carpal Tunnel Syndrome (CTS) is a functional disorder of the median nerve caused by increased pressure on the carpal tunnel. The symptoms that arise can vary, including pain, paresthesia, numbness, pricking sensations, and are generally felt in the radial parts of the ring finger, middle finger, index finger, and thumb. This health disorder is not limited to ethnicity, gender, age, occupational factors, but more to mechanical factors, local diseases, and systemic diseases (Basuki, R et.al, 2015). In addition, CTS can be caused by repetitive movements over a long period of time and with high intensity on the wrist (Salawati and Syahrul, 2014).

CTS complaints are assessed through Phalen's test where respondents are asked to perform flexion movements for 60 seconds and then respondents are asked to respond whether there is one or more symptoms such as pain in the hand, paraesthesia, or numbness. The results of the study showed that workers who use computers generally feel pain in the wrist after work and often feel numbness in the hand at night. CTS complaints can also interfere with daily activities, because they can cause difficulty in holding an object. In addition, the most common symptom experienced by workers is tingling that lasts quite a long time or continuously on various occasions.

Working Period and CTS Complaints on Computer Operators

The results showed a significant relationship between CTS and work period. factors such as work period and awkward posture, with a significant prevalence among female workers and those with longer work periods. This study highlights the importance of ergonomic workplace design to reduce the risks associated with prolonged computer use (Sulistika et al, 2022). Repetitive work activities on the hands carried out over a long period of time, as indicated by

the number of years of work, are a causal factor in the occurrence of CTS in workers (Selviyati, Camelia and Sunarsih, 2016). Most of the computer operators at PT. X who experienced CTS complaints had a work period of ≥ 4 years. Accumulative trauma to the hand accompanied by excessive movement of the fingers causes CTS complaints. This is due to inflammation of the ligaments or muscles due to blockage and pressure on the carpal tunnel. Symptoms of CTS generally appear in the form of pain, numbness or tingling in the fingers, especially the index finger, middle finger, and thumb. These symptoms can get worse at night or after prolonged flexion (Juniari and Triwahyudi, 2015).

The proportion of CTS complaints in respondents with a work period of ≥ 4 years is greater than respondents with a work period of < 4 years. This is in line with research conducted by Suherman, et al (2012) showing that workers with a work period of > 4 years have a risk of 18.09 times higher than those with a work period of < 4 years. Long work periods in computer operators indicate that the worker has performed repetitive movements over a long period of time, allowing the tissue around the carpal tunnel to experience pressure or stress (Suherman, Maywati and Faturrahman, 2012). Another study that is in line with this study was conducted by Nafasa, et.al (2019) with the research subjects being computer user workers at a bank where the proportion of CTS complaints was greater in the group of workers with a work period of ≥4 years compared to the group of workers with a work period of <4 years (Nafasa et al., 2019).

Length of Work and CTS Complaints on Computer Operators

The duration of working hours which is exacerbated by a lack of rest time, especially relaxation of the wrist, can cause CTS in the form of tingling and pain or aches which occur quite frequently (Selviyati, Camelia and Sunarsih, 2016). In this study, it shows that most workers who use computers work ≥ 8 hours a day. Workers who operate computers can spend 7 - 8 hours a day, even if there is a deadline they can spend 24 hours in front of the computer. CTS is a work-related health disorder that may be experienced by someone who works more than 8 hours a day doing repetitive hand movements to use a computer as the main tool in doing their work (Nisa, et.al, 2018). Pressure on the median nerve for a long time due to long work duration can increase the incidence of CTS (Ali and Sathiyasekaran, 2006). A report submitted by the Accident Compensation Corporation in 2014 showed an increased risk of CTS complaints in certain jobs, one of which is typists, is repetitive hand and finger activities, wrists extended or flexed more than 2/3 of the working time in a day, minimal relaxation time of at least 15% of daily working time, and mouse use > 20 hours a week (Stephenson and Barry, 2014; Lisay, Polii and Doda, 2016). Study from Werner, et.al. (2011) on computer user employees stated that CTS symptoms appeared after 17 months, but were significantly higher after 70 months. This study also showed a significant effect of years and hours per day with computer use that the longer the computer is used, the greater the risk of experiencing CTS (Werner et al., 2011).

Awkward Hand Positions and CTS Complaints in Computer Operators

Non-ergonomic arm, wrist and shoulder positions for long periods of time have the potential to cause inflammation of muscle and nerve tissue (Selviyati, Camelia and Sunarsih, 2016). In this study, most respondents worked in radial, ulnar, flexion, and extension wrist positions. Postures that are at risk for CTS include movements away from the thumb (ulnar deviation), movements approaching the thumb (radial deviation), bending or bending the wrist (flexion), and straightening movements (extension). Research conducted by Setiawan, et. al (2017) which examines the position of the wrist in relation to the risk of CTS when typing, shows that work posture is related to the risk of CTS. An unergonomic position when typing is very

risky to cause a disease in the wrist called Carpal Tunnel Syndrome (CTS). Work using a computer must be considered very carefully, because in employees who do not understand the understanding of work risks, it can cause an awkward position in the wrist and if doing a lot of work continuously can be related to the occurrence of Carpal Tunnel Syndrome (Setiawan, Winaya and Muliarta, 2017). Implementation of non-ergonomic work postures can cause someone to experience a decrease in musculoskeletal function with reduced muscle tension. In computer operators, reduced muscle electrical activity can also reduce musculoskeletal complaints. CTS usually occurs when the wrist is in an extreme position starting from pressure and tension on the median nerve in the wrist (Setiawan, Winaya and Muliarta, 2017).

Ulnar deviation posture (movement away from the thumb), radial deviation (movement towards the thumb), wrist flexion (bending or flexing movement), extension (straightening movement) are postures that are at risk for CTS (Aroori and Spence, 2008; Sitompul, 2019). Therefore, when using a keyboard or mouse, it is better to be in an ergonomic position. When using a keyboard, try to keep your hands parallel. When using a mouse, try to keep your wrists parallel and not hanging or slightly above the table to avoid a continuous bent position on your hand (Harrington, 2016). Treatment of diseases or conditions that cause CTS needs to be done, because if not done it can cause relapse. Prevention or adjustments to repetitive hand movements, reducing stiff wrist positions, designing work tools to maintain a natural hand position during work, Modifying the layout to facilitate various work times, modifying the work system with work rotation and occasional short breaks during work, Increasing worker knowledge so that they can recognize early symptoms of CTS (Huldani, 2013).

CONCLUSION

In this study, it was found that the variables that had a relationship with CTS complaints in computer operators at PT. X, Kendari City were work period, length of work, and awkward hand positions were factors. Promotional efforts are needed in companies in the form of creating illustrated stickers or posters regarding the right way to relax to avoid CTS. It is hoped that workers can synchronize work time and rest time and minimize excessive hand activity. Avoid awkward/extreme or non-ergonomic hand positions when using the keyboard and mouse. Beside that it is hoped that further researchers will be able to add various variables to be able to explain the causes of CTS comprehensively.

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