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Research Article

The Relationship Between Work Duration and Carpal Tunnel Syndrome in Cigarette Rolling Workers

Fisabili Firdaus[1]* | Murwani Yekti Prihatin[2] | Romadhoni Romadhoni[3] | Muhammad Riza Setiawan[4]

[1,2,3,4]Fakultas Kedokteran Universitas Muhammadiyah Semarang, Central Java, Indonesia

***contact**

Fisabilifirdaus57@gmail.com

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Abstract

Aims: This study aimed to identify the correlation between the length and the period of Work correlated with the incidence of carpal tunnel syndrome among cigarette rolling workers at the Breadfruit Factory.
Methods: This is an analytic observational study with a cross-sectional method. It utilizes the sample selection method of purposive sampling. The information collection tool consists of questions covering personal information, length of service, and physical examination sheets. Statistical test implemented with Chi-square.
Results: The number of cigarette rolling workers used as the sample for this study was 103 people. The statistical test results applying chi-square work duration obtained p-value = 0.005 (p ≤0.05), a p-value of 0.000 (p ≤0.05) was obtained for years of service, indicating a correlation between length of Work and working time with the possible occurrence of Carpal Tunnel Syndrome (CTS) in workers.
Conclusion: There is a significant correlation between length of Work and duration of Work on the emergence of CTS symptoms. As a form of prevention, occupational health and safety nurses can provide adequate education to cigarette companies to pay attention to employee conditions and the possibility of health problems occurring for their employees.

Keywords:
Carpal tunnel syndrome, cigarette rolling workers, duration of work, years of service

INTRODUCTION

A rapid increase was observed in Indonesia's industrial development, both in the formal and informal business sectors. In 2016, it was estimated that around 78.6 million individuals were working in the formal business sector in Indonesia. The number of workers in the formal business sector in Kudus Regency is around 77.3%, most of which are dominated by women (1).

For cigarette-making workers, the hand is a body part that has an important function when carrying out work activities, such as holding or using a tool. Therefore, if the hands experience difficulties, this will hinder the ability to carry out work tasks. Carpal Tunnel Syndrome is one of several medical conditions often recorded by employment statistics agencies in developed countries as a common disorder that occurs in workers in the industrial sector (2,3). Carpal Tunnel Syndrome arises because it is related to cigarette manufacturing workers caused by inflammation of the tenosynovial tissue in the carpal tunnel. This medical condition results from putting pressure on the median nerve in the carpal canal located in the wrist, producing symptoms such as tingling, feeling of stiffness, burning sensation, numbness, and pain in the palms (4,5).

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One of several risk elements that can trigger carpal tunnel syndrome symptoms is the duration or length of Work per day. It was stated that certain factors increased the chances of carpal tunnel syndrome in workers, such as lack of time to rest for at least 15% of the total daily work time, repetitive hand activity, repetition of finger movements, and flexion. Or wrist extension that exceeds 2/3 of the total daily working time, as well as the use of tools for more than 20 hours per week with working hours between 4-8 hours, resulting in a higher risk, amounting to 24.5 times higher than working hours which is less than 4 hours (6).

Research shows a correlation between work duration and CTS symptoms in most workers who do rock breaking Work, with most of them working for a duration exceeding 4 hours. The workers start work activities in the morning, then rest at home, and then continue their work assignments from noon to evening. But some individuals carry out work activities from morning to late afternoon. Workers who work hours for ≥ 4 hours have the possibility of experiencing CTS symptoms. The possibility of CTS Syndrome increases with the increase in working hours [13]. This phenomenon arises because of the increasing duration of Work. There will be continuous repetition of movements on the fingers for a long time. This allows the emergence of pressure on the tissue around the carpal canal.

METHODS

This type of study is an observational analysis using a cross-sectional or cross-sectional research design. In this study series, the sample was taken through a purposive sampling procedure. The samples taken were cigarette rolling workers throughout Indonesia as the target population. Respondent data were 103 patients.

RESULTS

Table 1. Sample Frequency Distribution Based on Age

No	Age	Frequency	Percentage
1	25	13	12,6
2	26	6	5,8
3	27	11	10,7
4	28	12	11,7
5	29	12	11,7
6	30	15	14,6
7	31	7	6,8
8	32	7	6,8
9	33	11	10,7
10	34	7	6,8
11	35	1	1.0
12	37	1	1.0
	Total	103	100.0

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Table 2. Description Subject Study Based on Duration Work

No	Duration Work	Frequency	Percentage
1	2-4 O'clock	5	4,9
2	4-8 O'clock	98	95,1
	Total	103	100.0

Explain _ distribution frequency sample study based on work duration. The majority of cigarette rolling workers at the factory Holy breadfruit has a working duration of 4 to 8 hours per day with amount 98 people with percentage 95.15 percent.

Table 3. Description Subject Study Based on Period Work

No	Period Work	Frequency	Percentage
1	1-2 Year	26	25,2
2	>2 Year	77	74.8
	Total	103	100.0

Explain _ distribution frequency sample study based on working time. The majority of cigarette rolling workers at the factory holy breadfruit has duration of Work which exceeds 2 years by sum frequency 77 with a percentage of 74.8 percent.

Table 4. Description Subject Study Based on CTS

No	CTS	Frequency	Percentage
1	No	16	15.54
2	**Yes**	87	84.46
	Total	103	100.0

Table 4.4 expose distribution frequency sample study based on the incidence of carpal tunnel syndrome. The majority of rolling workers Cigarettes in the breadfruit factory experience carpal tunnel syndromewith number of frequencies 87 person with presentation 84.5 percent.

Table 5. Bivariate Analysis of Duration of Action with Carpal Occurrence Tunnels Syndrome

No	Duration Work	CTS		Total	P=value
		Yes	No		
1	2-4	2	3	5	0.005(p<0.05)
2	4-8	85	13	98	
	Total	87	16	103	

Table 5 describes the resultant of the bivariate analysis of the duration of action with the incidence of carpal tunnel syndrome. During the duration of action, which was up to 2 to 4 hours, it was found that 2 out of 5 respondents had carpal tunnel syndrome, and the remaining three did not have carpal tunnel syndrome. At a duration of 4 to 8 O'clock, 85 out of 98 respondents experienced carpal tunnel syndrome. The remaining 13 did not have carpal tunnel syndrome. On the chi-square test on the work duration variable, it reaches a p-value of 0.005 <0.05 or has means that the duration of Work of cigarette rolling workers at the breadfruit factory have a Significance of correlation with the occurrence of carpal tunnel syndrome in worker holy breadfruit factory.

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Table 6. Analysis Bivarat Period Work Work with IncidentCarpals Tunnel Syndrome

No	Duration Work	CTS		Total	P=value
		Yes	No		
1	1-2	16	10	26	0.000(p<0.05)
2	>2	71	6	77	
Total		87	16	103	

M shows results from analysis of the bivariate period. Work with events carpal tunnel syndrome. At work 1 to 2 years, it was found that 16 out of 27 respondents had carpal tunnel syndrome. Then, the Rest did not experience carpal tunnel syndrome. At Work for more than two years, 71 out of 77 respondents experienced carpal tunnel syndrome, And six of the Rest did not experience carpal tunnel syndrome. The chi-square test by the working duration variable yielded a p-value of 0.00 <0.05. This means the working period of cigarette rolling workers at the Breadfruit Factory has a significant correlation with carpal tunnel syndrome on worker holy breadfruit factory.

DISCUSSION

Based on the characteristics of the respondents in this study, it was detected that 86.3% of respondents belong to the early adult age group (26-35 years), and they experience CTS incidents as much as 84.46%. This early adult age group refers to the productive period, which indicates that in this working age, work activities tend to increase, and at the same time, the risk of CTS also increases. CTS is a health condition affected by various factors that arise from interactions between these factors. Age is considered one of the possible triggers for CTS. However, in several studies that researchers have carried out over the last ten years, it has not been identified—a significant correlation between age and increasing CTS symptoms.

Based on a study conducted by Wulandari and his colleagues in 2016 (7), previous studies indicated that the age group most susceptible to CTS was between 41-50 years (38.2%) and 51-60 years (35.3%). Allegations regarding the impact of this age factor are based on the biological impact of the ageing process or a particular duration of exposure. With age, synovial development occurs due to repetitive wrist movements that result in stretching and tension. This can cause increased pressure in the carpal tunnel (8,9).

In her journal, a study conducted by Rohimah concluded that there is a correlation between the productive age for Work and the incidence of CTS. The analysis of this study illustrates that the multiple logistic regression test produces a P value > 0.1 (Sig. = 0.141), indicating no significant correlation between age and CTS. However, based on risk estimates (OR), it was found that exp (B) = 2.771 (0.879-8.734), which indicates that workers aged over 35 years have a 2.771 times higher risk of suffering from CTS than labourers aged 35 and under.

In this study, all respondents were women, with a proportion of 84 (81.55%) experiencing CTS complaints. Gender factor has an impact on the risk of CTS disease. This finding is consistent with the findings of several previous studies, which indicated that women have a higher risk of developing CTS than men. The level of susceptibility to risk factors for CTS tends to be higher in women than men, including the impact of hormones due to menopause and pregnancy. Based on a study by Mattioli in 2008, it was revealed that the risk of CTS is higher in women, with a ratio of 3.6 times higher than men. This is due to the differentiation of variations in the anatomical structure of the wrist bones,

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where naturally, the bones in women have smaller sizes, resulting in narrower areas or spaces where tendons and nerves are required to run straight.

In Ashworth's journal entitled "Clinical Evidence Carpal Tunnel Syndrome", it was revealed that men show a gradual increase in the incidence of CTS with age. In contrast, in women, the increase occurs after menopause.

This study also revealed that only CTS complaints were experienced by cigarette rolling workers who had worked for more than two years. One of the factors that triggers the occurrence of CTS is the working period of individuals involved in rhythmically repetitive Work, such as that carried out by cigarette rolling workers. In a study conducted on workers at the Sukun Cigarette Factory, Kudus Regency, it was found that the participants who had worked for more than two years have the possibility of facing 18 times higher risk of suffering from CTS than individuals with 1 to 2 years of work experience (10,11).

The conclusions from this study are in line with the findings in the Kairupan Village, Tasikmalaya City, where it was stated that a p value of 0.000 indicates p <α (0.005). This allows us to conclude that there is a correlation between length of service and the incidence of CTS by computer rental keeper Similar findings were found in research conducted by Pangestuti in 2014 on grinding workers at PT DOK and Shipping Surabaya, where evidence indicated a significant correlation between length of work and CTS symptoms. In that study, it was explained that from the group of respondents with the duration of the job more than 10 years, totaling 29 out of 34 respondents faced CTS symptoms. These two studies present that the working period affects potentially against the risk of developing CTS. In the context of research at the Kudus Breadfruit Factory and at PT DOK and Shipping Surabaya, an increase in working duration contributes to an increase in the likelihood of CTS symptoms appearing. These findings provide broader insights into the role of the work period factor in associating Work with CTS symptoms. Thus, this study makes an important contribution to the understanding of risk factors that can affect workers' well-being in work environments that involve repetitive hand movements (12,13).

Correlation Duration Work To Incident Carpals Tunnels Syndrome On Worker Pinting Kudus Breadfruit Factory Cigarettes.

From the basis of the results of applied studies to 103 respondents got the results (p value (0.005) < α (0.05)) significant there is a significant correlation between the duration of Work on incident Carpal Tunnel Syndrome on worker roller cigarettes at the Kudus Breadfruit Factory.

The findings from this study indicate that the duration Work Which long on worker roller cigarette factory breadfruit holy influence happening incident carpal tunnel syndrome on worker roller cigarette, especially in positions or tasks that require repetitive and forceful use on the hands and wrists, can increase the risk of occurrence carpal tunnel syndrome. Worker Which involved in activity work Which involve repetition of movement on wrist hand they, more may experience CTS symptoms if they continue to do so activity the in duration time Which long every day. Duration Work refers to the length of time a person spends working in one particular session or period, such as in a day, a week, or month. Working hours may vary depending on company regulations, agreement work, or regulation Which apply in a country.

Duration of Work involves understanding aspects of time and individual Work. An important element in this concept is working hours, which play a role in measuring how long a person is involved in work activities. Working hours cover the periods during which individuals perform work tasks, and an understanding of effective working hours is critical in managing productivity and the balance

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between Work and leisure.

The risk of CTS tends to increase in line with increasing length of Work (duration of Work). The increase going on because as time goes by at Work, the repetition of movements on the fingers will increase continuously over a long period of time, thereby causing pressure on the tissue around the carpal tunnel.

The findings from this study are in line with the results of research conducted by Uci in 2021. Uci shows that there is a correlation between the frequency of using a computer every day for more than 4 hours and the risk of various health problems, including carpal tunnel syndrome, computer vision syndrome, stress syndrome computers, and musculoskeletal disorders. In Uci's research, it was highlighted that the duration of Work can also affect the incidence of carpal tunnel syndrome, even in the context of different occupations (14).

This suggests that prolonged exposure to computer use, especially more than 4 hours per day, can contribute to various health problems, including carpal tunnel syndrome. Although there may be differences in the context of Work, the harmony between this study and Uci's research emphasizes the importance of paying attention to the duration and intensity of exposure to computer activity in an effort to maintain worker health.

In 2012, Suherman and his colleagues conducted a study of computer rental custodians in Kahuripan Village, Tasikmalaya City. The results of this study reveal the emergence of a correlation between length of Work and the incidence of Carpal Tunnel Syndrome (CTS) in this population. The findings show that the percentage of officers who experience CTS is higher in those who work 4-8 hours per day (94.9%), than those who work less than or equal to 4 hours per day (27.3%) (15).

The results of the statistical analysis showed a value of p = 0.000, which indicated that p <α (0.05), represented a significant correlation between the duration of Work and the incidence of CTS. From these findings, it can be concluded that computer rental workers with a working duration of 4-8 hours have a 24.5 times higher risk of experiencing CTS than those with a job of less than or equal to 4 hours. This study suggests that there is a significant correlation between the duration of Work and the incidence of CTS. With reference to the findings from the study of Suherman and his colleagues, it can be concluded that longer duration of Work has higher implications for the risk of developing CTS (16).

Matter This happen Because l the length of time spent can have an impact on the quality and results of Work, and carrying out activities for a prolonged period has the risk of causing potential disruptions health, fatigue disease and dissatisfaction or accidents.

As the duration of action increases, the longer the pressure is applied to the median nerve, which has the potential to increase the incidence of CTS. With increasing length of service, this reflects the presence of repetitive tasks that are continuously performed by the hand over a significant span of time, which in turn increases the risk of developing carpal tunnel syndrome.

Research conducted by Evanli Ken Resky yielded a p-value of 0.058 (p > 0.05), which implies that there was no significant association between work duration and CTS symptoms in typists in Malalayang District, Manado City. Even though this value is at the borderline of 31, there is no relationship that can be stated as significant. These findings differ from the results of this study which show a correlation between work duration and the incidence of CTS in cigarette rolling workers at the Breadfruit Factory in Kudus. The results of this study are in line with the findings found in a study conducted by Pangestuti in 2014. In that research, Spearman's statistical test on 34 respondents yielded a significance value (sig.) of 0.388, which is greater than the

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value of α (0.05). This indicates that there is no significant correlation between length of Work and CTS complaints in grinding workers at PT DOK and Shipping Surabaya. These findings support the conclusion that the relationship between length of Work and CTS symptoms may differ in various work contexts.

Overall, the results of this study provide deeper insight into the role of tenure in linking occupational factors with CTS symptoms. Although several studies have yielded different results, careful analysis of the factors that might have influenced the results of the study is critical in delineating the relationship between duration of Work and the occurrence of CTS.

Correlation of Working Time to Carpal Tunnel Syndrome Incidence On Worker Pinting Kudus Breadfruit Factory Cigarettes. The research results show the results of the *chi square test* on variables years of service obtained a p-value of 0.00 <0.05, namely 0.000 which means years of service cigarette rolling workers at the breadfruit factory have a significant correlation with incident carpal tunnel syndrome by labor factory breadfruit holy. This shows long hours of Work as one of the many risks happening carpal tunnel syndrome. Working time refers on the total year or time period Which spent somebody in world Work, Good in a manner whole or in something work or profession certain. Draft period Work involve measurement of how long a person is engaged in productive activities at Work. 4,7,13.

In one study, it was revealed that the proportion of workers who experienced a positive CTS event was higher for those who worked for >4 years (92.0%) than those who had a working period of 1-4 years (88.2%). In this context, it can be concluded that workers who have worked > 4 years have a greater risk of experiencing CTS, which is 18.096 times that of workers who have worked 1-4 years. Therefore, someone who spends longer working hours may have a higher potential risk of developing CTS.

Results study This appropriate with study in Ward Kairupan City Tasikmalaya Also found that with a value of p = 0.000, it can be concluded that p <α (0.005), indicating that there is a correlation between length of service and the incidence of CTS in computer rental officers. Based on a study conducted by Pangestuti in 2014 on grinding workers at PT DOK and Shipping Surabaya, it was revealed that there was a significant correlation between years of service and CTS complaints. The results of this study in Surabaya also revealed that of the group of respondents who had worked for more than 10 years, 29 out of 34 respondents experienced CTS complaints. [14]

Supported by a study conducted by Elsye Yurike in 2020, results were found by linking years of service and Carpal Tunnel Syndrome (CTS) among workers in the non-formal sector in Solor Village, Kupang City. The results of statistical testing by applying the Fisher Exact Test showed a value of p = 0.025 (p <0.05), which indicated that the alternative hypothesis was accepted. This shows that there is a significant correlation between duration of Work and CTS in this population. The findings from this analysis reveal that respondents with longer working tenure, which is more than 4 years, have more complaints of CTS events than individuals with less than 4 years of working duration. This finding is in line with previous research conducted by Juliatika in 2017. Juliatika also stated that workers with more than 4 years of service are more likely to experience CTS complaints than those who work less than 4 years.

Further statistical results show that seamstresses who have worked for 4 years or more are at risk Most suffer from CTS which is 5.367 times higher than those who work in a shorter period of time. This study indicates that duration of action plays an important role in triggering CTS events . An increase in length of Work by hand signaled its occurrence repetitive activities carried out by the hand over a long period of time,

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which in turn can cause excessive pressure on the carpal tunnel. Thus, the longer the duration of a person's Work, the greater their risk of suffering from CTS. This research provides further insight into the importance of managing CTS risks related to tenure. The implications of these findings could assist in designing appropriate interventions to protect workers' health, especially in work sectors that involve repetitive hand movements.

In this context, in sewing activities, the body adopts a position that is limited by the movement of the hands to adjust the stitch pattern. The risk of CTS experienced by tailors can come from work allocation that is not ergonomic, movement, vibration exposure, and mechanical demands on the body [29,30] . Research indicates that the most crucial phase in sewing progress is when running the sewing machine control in order to knit fabric. Characteristics of this sewing process include repetitive tasks and pressure applied to the hands, wrists, and fingers [31.] While sewing, there are possible movements such as flexion and extension of the wrist, ulnar and radial deviation, and supination and pronation. If these movements are continuously performed over a long period of time, it is a cause CTS events [34]. In a study conducted on tailors in Solor Kelurahan, Kupang City in 2019, it was found that they still use conventional sewing machines with limited facilities, this can increase the risk of exposure to disease at Work. The research findings explained that around 68.3% of tailors found CTS events in themselves. Meanwhile, the Rest are tailors who do not have CTS.

According to research conducted by Uci in 2021, there is an identified correlation between length of Work and length of Work with the incidence of Carpal Tunnel Syndrome (CTS). However, in this study no significant association was observed between the position of hand extension used while using the computer and the incidence of CTS observed for correlation, as shown by the value of p=0.263 (17).

In the group of subjects who had work experience for 3 years, 39 out of 42 subjects (92.9%) had CTS. In contrast, in the group of subjects who worked for 4000 hours, it was noted that 7 out of 8 subjects (88%) experienced CTS. These findings indicate that there is a correlation between length of service and the incidence of CTS, with the prevalence appearing to be higher in the group with longer work experience. Although no significant correlation was seen between hand extension position while operating the computer and CTS, these results highlight the important role of other factors in the emergence of CTS. This research provides insight into how tenure and length of Work can affect the risk of developing CTS, and the implications for managing the health of workers who are exposed to repetitive activities on the hands.

Based on matter the and connected with theory so researchers assume that working period is one of the factors that contribute to the emergence of work-related musculoskeletal disorders. The proportion of CTS is more significant in respondents who have worked for more than 4 years. This is influenced by the fact that the longer the work period, the repetition of finger movements occurs continuously without pause for a long duration results in pressure on the tissue around the carpal tunnel. The longer the length of time working also causes increased pressure on the median nerve, which in turn increases the risk of developing CTS. In this study there is also a repetitive movement carried out by workers rolling cigarettes at the Kudus Breadfruit Factory in the long run time or period Work Which long that is more from 2 year or If in count in a minimum of 2920 hours per year, as well as worker characteristics a cigarette roller whose job is repetitive. An increase in the duration of Work on the hand indicates a repetitive task performed by the hand over a long period of time, while an increase in the number of years worked represents a higher risk of CTS events.

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Connected with this, when involved in the process of making cigarettes, the hand movements used to direct the rolling tool limit the position of the body. The threat of Carpal Tunnel Syndrome (CTS) to workers involved in assembling cigarettes can arise due to a less ergonomic work environment, repetitive actions, the impact of vibrations experienced, and also mechanical influences on the body.

CONCLUSION

There is correlation between duration Work to incident *carpal tunnelsyndrome* by worker roller Cigarettes of the Kudus Breadfruit Factory, There correlation between period Work to incident *carpal tunnelsyndrome* by worker roller Cigarettes from the Kudus Breadfruit Factory. As a form of prevention, occupational health and safety nurses can provide adequate education to cigarette companies to pay attention to employee conditions and the possibility of health problems occurring for their employees.

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