

ANALISIS DETERMINAN KEJADIAN CTS (CARPAL TUNNEL SYNDROME) DAN PEMERIKSAAN PHALEN'S TEST PADA PEKERJA SORTASI TEMBAKAU DI KABUPATEN JEMBER

DETERMINANT ANALYSIS OF CARPAL TUNNEL SYNDROME AND PHALEN'S TEST EXAMINATION OF TOBACCO SORTING WORKERS IN JEMBER

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Abstrak

Pekerja sortasi tembakau di Kabupaten Jember masih melakukan pemilahan daun tembakau secara manual menggunakan otot tangan yang dapat menimbulkan keluhan Musculoskeletal Disorders (MSDs) salah satunya adalah CTS (Carpal Tunnel Syndrome) yang merupakan kelainan akibat kompresi saraf medianus pada carpal tunnel di pergelangan tangan. Penelitian ini bertujuan untuk mengetahui faktor-faktor yang mempengaruhi kejadian CTS pada pekerja sortasi tembakau di Kabupaten Jember. Penelitian ini dilakukan dengan menggunakan desain cross sectional survey di PTPN A dan PT B Kabupaten Jember dengan perhitungan sampel menggunakan rumus slovin dan diperoleh 246 responden. Variabel bebas pada penelitian ini adalah pendidikan, usia, riwayat penyakit, riwayat sakit tangan keluarga dan riwayat sakit tangan responden, sedangkan variabel dependent penelitian ini adalah CTS (Carpal Tunnel Syndrome), BCTQ – SSS (Symptom Severity Scale), BCTQ – FSS (Functional Status Scale), Pemeriksaan Phalen's Test. Teknik analisis data yang digunakan adalah regresi logistik. Hasil penelitian menunjukkan bahwa pendidikan memiliki pengaruh terhadap skala keparahan gejala ($p=0,025$), usia memiliki pengaruh terhadap skala keparahan gejala ($p=0,000$), usia memiliki pengaruh terhadap skala status fungsional ($p=0,005$) dan usia memiliki pengaruh terhadap pemeriksaan Phalen's test ($p=0,012$). Penelitian ini menyimpulkan usia adalah faktor dominan yang mempengaruhi skala keparahan gejala, skala status fungsional dan keparahan gejala pada Phalen's test.

Kata Kunci: CTS (Carpal Tunnel Syndrome), BCTQ (Boston Carpal Tunnel Questionnaire), SSS (Symptom Severity Scale), FSS (Functional Status Scale), Phalen's Test

Abstract

Tobacco sorting workers in Jember Regency still sort tobacco leaves manually using hand muscles, which can cause complaints of Musculoskeletal Disorders (MSDs), one of which is CTS (Carpal Tunnel Syndrome), which is a disorder caused by compression of the median nerve in the carpal tunnel in the wrist. This research was conducted using a cross-sectional survey design at PTPN A and PT B, Jember Regency, with a sample calculation using the Slovin formula, and 246 respondents were obtained. The independent variables in this study were education, age, history of illness, family history of hand pain, and history of hand pain of the respondent, while the dependent variables in this study were CTS (Carpal Tunnel Syndrome), BCTQ – SSS (Symptom Severity Scale), BCTQ – FSS (Functional Status Scale), Phalen's Test. The data analysis technique used was univariate SPSS analysis of frequency distribution, bivariate Chi-Square analysis, and SEM PLS multivariate analysis. research results show that education had an effect on the symptom severity scale, age had an influence on the symptom severity scale, age had an effect on the functional status scale and age had an influence on the Phalen's



test. Conclusion: Age is the dominant factor affecting the symptom severity scale, functional status scale and Phalen's test.

Keywords: CTS (Carpal Tunnel Syndrome), BCTQ (Boston Carpal Tunnel Questionnaire), SSS (Symptom Severity Scale), FSS (Functional Status Scale), Phalen's Test

Introduction

Many jobs in the industrial world are still done manually with heavy physical demands and pressures. Jember Regency as the largest tobacco plantation center in East Java makes tobacco a superior commodity (Ardhiarisca, Muspita and Kustiasari, 2016). Based on data from the Central Bureau of Statistics for Jember Regency, tobacco (Na Oogst, Voor Oogst Kasturi and Voor Oogst Rajang) is the third largest plantation product after coconut and sugarcane. Jember Regency tobacco production in 2020 was recorded at 1,993.87 tons (Central Bureau of Statistics for Jember Regency, 2021).

Tobacco industry labor absorption in Jember is relatively high and many still use manual labor. One of the consequences of working manually can increase the occurrence of complaints to workers. If the muscles receive loads continuously and last for a long duration, this can cause complaints in the form of damage to joints, ligaments and tendons which are called musculoskeletal disorders (MSDs) (Scalise, 2021).

One type of work in a tobacco company is sorting tobacco which puts repeated pressure on the wrists for a long time. MSDs registered at the ILO, one of which is Carpal Tunnel Syndrome (CTS) (Hosseini, 2019). CTS can cause disability in workers and can even cause paralysis. A job has a risk of accidents and occupational diseases (PAK). PAK in classification II based on the target organ system includes respiratory tract diseases, skin diseases and musculoskeletal diseases. One of the muscle and skeletal diseases mentioned is Carpal Tunnel Syndrome (CTS). Carpal Tunnel Syndrome (CTS) is a disorder of the bones caused by repeated long-term movements in a static position so that the blood supply to the wrists, hands and nerves is disrupted (Utamy, Kurniawan and Wahyuni, 2020).

Based on the preliminary study conducted, it was found that there were 525 tobacco sorting workers at PTPN A and 112 tobacco sorting workers at PT B. All of the tobacco sorting workers were female. The process of sorting tobacco leaves involves repeated movements of the wrist. CTS can develop as a result of using vibration instruments, frequent hand flexion and extension, and vigorous wrist movements (Enes, 2018). Sorting work is one of the jobs with a high average CTS prevalence because it requires precision and thoroughness. The prevalence of CTS in the general population has been estimated to be 0.6% for males and 5% for females. The incidence of CTS is more common in women than men, with an age range of 25-64 years (Larasati, 2022).

Research on high-risk jobs on the wrist and hand get CTS (Carpal Tunnel Syndrome) between 5.6% - 14.8% (Farhan, 2018). Previous research on complaints using the Carpal Tunnel Syndrome Questionnaire and Carpal Tunnel Syndrome Diagrams on tobacco leaf sorting workers at Restu I TTN Jember Warehouse found that 81.7% of workers experienced Carpal

Tunnel Syndrome (CTS) complaints with 55% experienced by workers aged over 40 years (Nadhifah, Hartanti and Indrayani, 2018).

Methods

Research design

This research is a quantitative research with a cross sectional survey design. Based on the data collection method, this research is included in observational research because it does not provide special treatment to the research object. Apart from that, this research is included in analytical research because it aims to analyze the influence of age, length of work and side job factor on the incidence of CTS (Carpal Tunnel Syndrome) in tobacco sorting workers.

Study subjects

This research was conducted at PTPN A and B Tobacco in Jember Regency from February to March 2023. The research population was 637 tobacco sorting workers consisting of 525 workers at PTPN A Tobacco and 112 workers at PT B

Sample size determination

The research sample was 246 workers. Sampling uses the Slovin Formula with an error limit of 5% and an accuracy rate of 95%

Intervention

Physical examination is carried out to examine the motor, sensory and autonomic functions of the hand. Some examinations and provocation tests that can help confirm the diagnosis of CTS are Flick's sign, Thenar wasting, Wrist extension test, Phalen's test, Torniquet test and Tinel sign. In the Phalen's test, the patient flexes the hand maximally, if within 1 minute the parasthesia becomes more severe then this examination supports the diagnosis.

Measurements

This study used a subjective examination with the BCTQ (Boston Carpal Tunnel Questionnaire) which was strengthened by an objective examination (Phalen's Test) on the incidence of CTS (Carpal Tunnel Syndrome) in tobacco sorting workers in Jember Regency.

Statistical analysis

The collected data is then processed by the application. Univariate analysis to determine the frequency distribution of each variable was processed using SPSS while bivariate analysis used cross tabulation with the Chi Square test. Multivariate analysis to determine the factors that most influence the incidence of CTS using the PLS-SEM (Partial Least Square - Structural Equation Modeling) method in smart PLS software.

This research is included in the analytic descriptive research. This research has passed an ethical test at the Faculty of Dentistry, University of Jember with Number 1859/UN25.8/KEPK/DL/2023.

Results

Worker Characteristics

Table 1 shows that the distribution of frequency and percentage characteristics of the most tobacco sorting workers has a history of elementary school education (81.7%), the age of the workers is mostly aged between 36-45 years and all employees, namely 246 people, have worked more than four years. This happens because there are no documents or real data regarding the length of time employees have worked at the company. Meanwhile the

Following are the results of the distribution of frequency and percentage of worker characteristics consisting of worker characteristics, history of disease and hand pain, as well as the distribution and frequency of CTS examinations. The distribution of frequency and percentage of worker characteristics, namely education, age, and length of work is shown in table 1.

frequency and proportion of respondents' medical history and

Table 2 shows that 86.6% of respondents did not have a history of disease, 87.4% of respondents did not have a history of hand pain in their family members and 53.0% of respondents did not have a history of hand pain. Meanwhile the frequency distribution and percentage of CTS examinations are shown in Table 3.

Table 1. Characteristics of tobacco sorting workers in March 2023

Characteristics	Frequency	percentage (%)
Education		
No School	18	7.3
Elementary school	201	81.7
Junior high school	21	8.5
Senior High School	6	2.4
Age		
17-25 year	3	1.2
26-35 year	11	4.5
36-45 year	120	48.8
46-55 year	99	40.2
56-65 year	13	5.3
Length of working		
0-1 years	246	100
1 – 4 years	0	0
> 4 year	246	100

Table 2. Frequency distribution and percentage characteristic history of disease and disease of the hand

Characteristics	Frequency	percentage (%)
Disease history		
The isn't any	213	86.6
HT	22	8.9
DM	3	1.2
Cholesterol	5	2
Gout	3	1.2
Total	246	100
Family history of hand pain		
There isn't any	215	87.4
There is	31	12.6
Total	246	100
history of hand pain		
There isn't any	131	53.0
There is	115	47.0
Total	246	100

Table 3 shows that the SSS in the highest respondents is at a mild level (72%), the highest FSS is at the asymptomatic level or without symptoms with 53.3% and the results of the Phalen's test (+) with paraesthesia symptoms totaling 17 respondents (6.91%).

Characteristics of CTS (Symptom Severity Scale, Functional Status Scale, Phalen's test)

The Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) is a CTS-specific questionnaire which is divided into two parts, namely the Symptom Severity Scale (SSS) and the Functional

Status Scale (FSS). The 11 questions in the SSS evaluate the symptoms of CTS namely pain, weakness, numbness, tingling and nocturnal symptoms such as awakening at night due to pain or tingling. The FSS evaluates functional impairment consisting of 8 questions regarding daily activities. Each question has a score of 1 to 5, the higher the score, the more severe or disrupted the activity. SSS total scores were categorized into asymptomatic (11), mild (12-22), moderate (23-33), severe (34-44) and very severe (45-55). The total FSS score can be grouped into asymptomatic (8), mild (9-16), moderate (17-24), severe (25-32) and very severe (33-40).

Table 3. Frequency distribution and percentage CTS Examination

Characteristics	Frequency	percentage (%)
Symptom Severity Scale (SSS)		
Asimptomatik	10	4.1
Light	177	72
Currently	58	23.6
Critical	1	0.4
Functional Status Scale (FSS)		
Asimptomatik	131	53.3
Light	108	43.9
Currently	7	2.8
Phalen's test		
Phalen's test Negatif		
Asimptomatik	20	8.13
Tingling	1	0.41
Finger/shoulder pain /wrist	208	84.55
Finger weakness	0	0
Phalen's test positive		
Parastesi	17	6.91

Table 4. Characteristics of CTS(SSS, FSS, Phalen's test)

Characteristic Variables	CTS (+)						Phalen's Test (+)
	SSS (+)			FSS (+)			
	Light	Currently	Critical	Light	Currently	Critical	
Age							
17-25 year	0						1
26-35 year	7	1		1			1
36-45 year	97	19	1	43	3		12
46-55 year	67	31		57	2		3
56-65 year	6	7		7	2		0
Education							
No School	11	7		10	2		0
Elementary school	144	43		96	5		16
Junior high school	19	2		7			1
Disease history							
The isn't any	155	47	1	32	7		17
HT	4	1		2			0
DM	16	6		8			0
Cholesterol	2		1	2			0
Gout	2			3			0
Family history of hand pain							
There isn't any	157	48		85	6		14
There is	20	8		55	4		6
history of hand pain							
There isn't any	88	34	4	57	3		11
There is	89	24		55	4		6

Table 5. Relationship between characteristics of respondents and SSS, FSS, and Phalen tests

Independent Variables	CTS (+)		
	SSS (+)	FSS (+)	Phalen's Test (+)
Education	0.025*	0.108	0.062
Age	0.000*	0.005*	0.012*
Disease History	0.296	0.569	0.570
Family history of hand pain	0.678	0.939	1.000
History of hand pain	0.119	0.858	0.161

(*) pValue: significant < 0,05

Table 6. PLS-SEM to determine factors dominant

Variable	t-statistik
Analysis of influence on SSS	
Education-> SSS	1.783
Age-> SSS	3.795
Disease History -> SSS	1.070
Family history of hand pain -> SSS	0.937
History of hand pain -> SSS	1.832
Analysis of influence on FSS	
Education-> FSS	0.566
Age -> FSS	4.107
Disease History -> FSS	0.393
Family history of hand pain -> FSS	0.283
History of hand pain -> FSS	1.107
Analysis of influence on Phalen's Test	
Education->Phalen's Test	0.486
Age ->Phalen's Test	3.030
Disease History ->Phalen's Test	0.287
Family history of hand pain ->Phalen's Test	0.029
History of hand pain ->Phalen's Test	1.100

Relationship between education, age, medical history, family history of hand pain, hand pain history of respondents with SSS, FSS, and phalen's test.

Based on the results of data analysis in table 5 regarding the relationship of respondent characteristics to SSS, FSS and Phalen's test, it is known that education and age have a relationship with SSS, age has a significant relationship with FSS ($p=0.005$) and age has a significant relationship with Phalen's test ($p=0.012$).

Table 6 shows that the results of the analysis of the most dominant factor affecting the severity of symptoms is the age factor with the highest T Statistics score (3.795), the most dominant factor affecting functional status is the age

factor with the highest T Statistics value (4,107) and the most dominant factor Dominant influence is the age factor with the highest T Statistics value (3.030).

Discussion

Based on the results of research where all tobacco sorting workers in Jember district were women, namely 246 people (100%). This happens because sorting work requires more thorough expertise so that it becomes one of the workplace

considerations why all workers are women. Tobacco sorting workers are dominated by women because it is related to the level of color blindness where in this work besides relying on fingers or hands they also rely on color. These results indicate conformity with the results of previous studies. According to research conducted by dewanto, et al (2009). There is a 3-10 times higher risk in women than men, a Dutch study showed that the prevalence of CTS cases was 92.6% experienced by female workers.

This is in line with research conducted by which states that the risk of developing CTS in women is 1.57 times compared to men. CTS is at greater risk in women than men because the size of the carpal tunnel in women is smaller than in men, which can create a narrower and fuller space where the nerve has to straighten so that the pressure on the median nerve will be greater in women (Selviyati et al., 2008; Warda., 2018).

The research results obtained by the researchers showed the prevalence and characteristics of carpal tunnel syndrome in tobacco sorting workers in Jember Regency. Based on age characteristics, the highest number was in the age range above 36-45 years, with 120 people (48.8%). These results are similar to previous studies where the highest cases of CTS were in the age range of 35-45 years. 6 The increase in cases of CTS related to age is still difficult to ascertain the cause but is thought to be related to the biological effects of the aging process or the duration of exposure related to daily work. -

days resulting in synovial thickening due to stretching and pulling thereby increasing pressure on the carpal tunnel (Tamba, 2008), besides that, as you get older, the elasticity of the bones, muscles and tendons decreases so that the damping of vibrations that travel to the body decreases.

This can also be influenced by the physical abilities possessed by workers at a young age which are more optimal so that they can work more quickly and agilely so that the movements carried out by these workers affect the increased risk of CTS events. Especially when compared to workers with an older age because of decreased physical abilities. Rempel, et al (2008) stated that a person's physical ability is achieved when he is between 25-30 years old, and a person's physiological capacity will decrease 1% per year after the peak condition is exceeded.

Bone degeneration begins at the age of 30 years. This condition will cause a decrease in the stability of tissue, bone and muscle followed by tissue damage, tissue reduction and tissue turnover into scar tissue which can increase the risk of CTS (Basuki et al., 2015; Wardana et al., 2018). Getting older also leads to loss of muscle mass, especially in the wrists (Bahrudin et al., 2016). Shrinking muscle mass will reduce muscle strength so that it is easier to experience interference, especially if there is pressure on that part and this happens repeatedly.

The results of this study are not in accordance with research haghightat, et al (2012) which states that CTS increases at the age of over 55 years. In patients over 65 years of age with moderate and severe CTS, disease progression was negatively correlated with increasing age (Moschovos et al, 2019). Another study found that the older you are, the more likely you are to develop CTS symptoms. For all degrees of CTS, it is more common in the older age group (75–90 years) (Liong et al, 2020).

Based on the characteristics of length of work, the highest number was with a length of service of more than 4 years with 246 people (100%). These results are also similar to previous studies where the highest cases of CTS were in workers with more than four years of service. Based on research conducted by Darno stated that the working period of CTS is more than 4 years with an average of 4 years where the working period is one of the supporting factors for the emergence of musculoskeletal disorders caused by work (Darno, 2017).

From this study it can be seen that the duration of work for more than 4 years has a risk of developing CTS cases due to the increasing duration of pressure on the median nerve so that it can increase the incidence of CTS (Anies, 2005). This theory is also supported by research that has been conducted where there is a significant relationship between working hours of more than 4 years and above and the incidence of CTS (Agustin, 2016).

The length of work for tobacco sorting employees is more than 4 years. This is because there is no real data held by the company regarding the length of work of each employee. The company's work system is that if there is a reduction in tobacco yields, employees will be reduced and if there is an increase in harvest yields, additional employees will be added.

Work period is a risk factor that affects the increased risk of

CTS, especially in jobs that use large hand strength. The longer the working period, the greater the risk/exposure to hazards in the workplace. This is in accordance with the research that has been done Permatasari, V. F, (2016) which states that there is a significant relationship between years of service and carpal tunnel syndrome (Darno, 2017).

Respondents who have worked for more than 4 years have a risk of 3.3 times experiencing CTS complaints compared to respondents who have worked for less than 4 years. CTS Research by Selviyati, et al (2016) OR value = 1.431 was also obtained for rubber tree tapping farmers, which means that farmers with a working period of more than 4 years have a 1.431 times greater risk of experiencing CTS events compared to farmers who have a working period of less than 4 years. Based on the statement Rohmah (2006) stated that there was a proportional increase between the increase in length of service and the increase in the occurrence of CTS.

In this study, it was found that all cases of CTS in tobacco sorting workers in Jember district, 208 samples (84.5%) showed symptoms of CTS on the fingers/shoulders/wrists. Tobacco sorting is a type of work that has repetitive motions in the process, which is based on previous research. Research conducted by Pusparini types of work related to repetitive movements can increase the emphasis on the median nerve so that it can increase the incidence of CTS. 9 Based on research conducted by Harsono and Rempel work as a seamstress is one of the jobs that can increase the frequency of CTS occurrence.

Based on the characteristics of subjective complaints where the most complaints related to CTS cases were symptoms of finger/shoulder/wrist pain that appeared or continuously, as many as 208 people (84.55%). These results are in accordance with previous studies where the result of mechanical compression from the subject's work can cause pressure on the median nerve or trauma due to work that can cause ischemia (blockage to the blood supply) or damage to the nerve mucosa due to repetitive movements. carried out during work so that manifestations of complaints such as tingling, numbness or pain appear (Rambe, 2014)

In previous studies it has been stated that the phalen test is one of the examinations to establish the diagnosis of CTS by flexing it for 60 seconds. This test can be used to make a diagnosis of CTS because it has a sensitivity of up to 88% and a specificity of 80% so that it can be a method for diagnosing CTS. (Basuki et al., 2015; Wardana et al.,2018).

Symptom Severity Scale (SSS)

Based on the results of the study, the results of the SSS questionnaire were 10 (4.1%) respondents with a score of 11 which means asymptomatic (no complaints or CTS symptoms), while the majority of SSS scores were 177 (72%) respondents in the mild category and 58 (23.6%) respondents in the mild category. currently. The SSS score in the severe category was only found in 1 respondent who had high complaints or symptoms of CTS during the day and at night and there were no respondents with a total score in the very severe category.

This is in line with research conducted by Shiri et al (2015) which stated that jobs requiring high strength hand grips had an increased prevalence of CTS. Where CTS can be at risk of

being exposed to high-strength hand grips and the use of vibrating tools, high-strength hand grips and repetitive hand or wrist movements.

A positive SSS score based on the total score of symptomatic complaints (mild/moderate/severe) was also assessed based on the distribution of the variable characteristics of age, education, medical history, history of the respondent's hand pain and family history of hand pain. The majority of positive SSS (mild, moderate and severe categories) were complained of in the productive age group aged 36-45 (117 respondents) and the age group 46-55 years (98 respondents). The education of the majority (187 respondents) who complained of positive SSS was the level of education or elementary school (SD) graduates. The respondent's medical history that was suspected to be related to the pain asked in the questionnaire included a history of cholesterol, hypertension (HT), Diabetes Mellitus (DM) and gout.

This is in line with the results of research which states that 72% of workers aged between 40-50 years have a risk for CTS. A lower level of education is a factor in the occurrence of CTS due to the low knowledge they get (Valentina, 2021)

Based on the results of the questionnaire, the majority (203 respondents) admitted that they had no history of the disease because they had never checked their health condition at a health facility, only a small proportion knew a history of hypertension (22 respondents), cholesterol (5 respondents), Diabetes Mellitus (3 respondents) and uric acid (2 respondents). As many as 114 respondents claimed to have a history of hand pain that led to CTS symptoms, while a history of hand pain in the family (father or mother) as a hereditary factor that allowed support as a trigger for CTS symptoms was only complained of by 28 respondents.

Functional Status Scale (FSS)

This shows that the majority of tobacco sorting workers complained of CTS symptoms from the results of the SSS questionnaire, but after continuing with the FSS questionnaire it turned out that the majority of tobacco sorting workers did not feel any complaints and some tobacco sorting workers felt mild category complaints or disturbances in carrying out their daily functions. The results of the FSS questionnaire in the moderate category were only experienced by 7 respondents with complaints of disturbance or difficulty in doing household chores such as holding a broom, frying pan, when washing dishes the plate often fell or slipped from their grip and felt stiff hands when waking up in the morning.

This is in line with research conducted by Miranda (2015) which states that the prevalence of CTS may increase with increasing duration of exposure to work tasks that require high-strength handrails or vibrating tools.

CTS Sign with Phalen's Test Examination

Based on the results of the Phalen's test assisted by general practitioners with Hiperkes certification, the results obtained were only 20 respondents who did not feel any complaints (asymptomatic), while the majority of respondents namely 226 respondents felt complaints (symptomatic). Complaints of finger, wrist and shoulder pain were felt or complained of by the majority of respondents, namely 208 (84.55%)

respondents when they were being examined until the end of the Phalen's test, while paraesthesia complaints were felt by 17 (6.91) respondents and only 1 (0.41%) respondents who complained of tingling or a sensation like an electric current in the fingers or wrist that radiated to the shoulder area.

The results of the Phalen's test were positive for 17 respondents based on paraesthesia complaints that appeared after the examination experienced by the majority of the 36-45 year old group (12 respondents), elementary school education level (16 respondents), no history of disease, no history of hand pain in respondent and family. The Phalen's test was positive only in 17 respondents who experienced complaints or symptoms of paraesthesia/tingling/numb feeling in the fingers innervated by the median nerve to the wrist. Examination of Phalen's test which is an objective examination is expected to further narrow the results of subjective examinations (BCTQ questionnaire consisting of SSS and FSS), although there are still supporting examinations (radiological or electromyography / ENMG) to help establish the diagnosis of CTS.

The results of research conducted by Bruskes (2002) found that the phalen test is considered a classic diagnostic test for CTS where the sensitivity of this test ranges from 42 to 85%. The researcher chose an objective examination, namely the Phalen's test with the assumption that the examination is simple and easy to do without the help of tools, also supported by this examination having high sensitivity and specificity for diagnosing CTS.

Determinant CTS

The length of exposure in the work environment can be shown through years of service (Bahrudin, M., Resi Lystianto Putro., Sultana., 2016). Several articles have different reference standards in using the limit of working period, but significantly the average working period > 4 years affects CTS (Lauren, 2023). Researchers also got the results that all respondents in the research sample were respondents who had worked for more than 4 years in the tobacco sorting section.

One of the CTS factors classified as non-occupational is age. The age of most respondents with CTS was approximately 30-50 years, similarly in this study, CTS symptoms and Phalen's test results were also experienced by the 36-45 year age group. This is influenced by bone degeneration which results in reduced stability of muscles and bones such as tissue damage, scar tissue changes and fluid reduction (Nadhifah, Hartanti and Indrayani, 2019).

Several articles examining the effect of gender on the incidence of CTS revealed that female workers are more at risk than male workers. This is because women have a narrow carpal space for tendons and nerves to pass through (Selviyati, V., Camelia., 2016), besides that hormonal changes during menopause and pregnancy make women more at risk of contracting CTS (Setyawan, 2017). In this study all respondents were women and were not currently pregnant.

Factors of smoking history and medical history are also non-occupational factors that cause CTS which are disclosed in several articles (Utamy, Kurniawan and Wahyuni, 2020). Smoking habits can add to muscle complaints that arise

because of the nicotine content. Nicotine can worsen clogged blood capillaries and increase the narrowing of blood vessels (James and Edward, 2022). However, all respondents in this study did not have smoking habits.

History of diseases mentioned to affect CTS include diabetes mellitus, arthritis, injuries/fractures and hypothyroidism. Diabetics when experiencing uncontrolled hyperglycemia can cause stiffness and thickening of the tendon protein in the carpal tunnel. Synovial invasion of the normal space in the carpal tunnel results in carpal tunnel stenosis which causes entrapment of the median nerve in arthritis sufferers. Hyperplastic fibrous connective tissue can fill the carpal tunnel due to the proliferation of fibrous connective tissue during the healing process after injury. Abnormal thyroid secretion results in spurious mucin deposits on the surface of the median nerve (Guan, 2018). Respondents in this study did not find a lot of disease history data because the majority respondents did not carry out their health checks.

About forty-six tobacco companies (local and export quality tobacco) spread across Jember Regency covering an area of 3,293 km² based on data from the Ministry of Industry of the Republic of Indonesia, mostly in the Ajung and Jenggawah sub-districts. So the researchers limited their research to export quality tobacco companies with large production representing the Ajung and Jenggawah sub-districts

Conclusion

This study concluded that there was a significant relationship between education and the symptom severity scale, there was a significant relationship between age and the symptom severity scale, the functional status scale and the Phalen's test. Based on the results of the analysis it was concluded that age is the dominant factor influencing the symptom severity scale, functional status scale and Phalen's test.

Conflict of Interest

No potential competing interest was reported by the authors.

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Author contribution

P.S.E compile a research design, data collection, data analysis, data interpretation, prepare the manuscript. M.S drafting a concept, data interpretation, prepare the manuscript, revising. And H.R drafting a concept, prepare the manuscript, revising the final manuscript for publication, final approval of the version to be published the final manuscript for publication, final approval of the version to be published

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