Medical and Health Journal
Volume 5, Issue 1, 2025, pp. 35-40
e-ISSN: 2807-3541
Open Access: https://jos.unsoed.ac.id/index.php/mhj

Carpal Tunnel Syndrome Risk: Impact of Work Duration on Farmers

Nendyah Roestijawati[1*], Mohammad Fakih[2], Massita Dwi Yuliani[3], Rizma Haidif Firinda[4], Ahmad Fawwaz Dafaulhaq[5]

[1] Department of Public Health and Community Medicine, Medical Faculty Jendral Soedirman University, Purwokerto, Indonesia
[2] Department of Neurology, Medical Faculty Jendral Soedirman University, Purwokerto, Indonesia
[3] Deparment of Physical Medicine and Rehabilitation, Medical Faculty Jendral Soedirman University, Purwokerto, Indonesia
[4] Deparment of Parasitology, Medical Faculty Jendral Soedirman University, Purwokerto, Indonesia
[5] Medical Faculty Jendral Soedirman University, Purwokerto, Indonesia

ARTICLE INFO

Article history:
Received January 24, 2025
Revised February 25, 2025
Accepted May 9, 2025
Available online August 2, 2025

Keywords:
carpal tunnel syndrome, work duration, farmers

ABSTRACT

Farmers, as an informal work group, are at high risk of occupational diseases, including Carpal Tunnel Syndrome (CTS). This study analyzes the relationship between work duration and suspected CTS incidence among farmers in Linggasari Village, Kembaran District, Banyumas Regency.An observational study was conducted on 72 farmers using interview methods, physical examinations, and CTS provocation tests. Data were analyzed bivariately using Chi-Square statistical testing. Of 72 respondents, 26 (36.11%) were suspected of having CTS, with 16 (61.54%) having work duration exceeding 52,320 hours. Among 46 respondents not suspected of CTS, 13 (28.26%) had work duration less than 52,230 hours. Statistical analysis revealed a p-value of 0.006 (p < 0.05), indicating a significant relationship between work duration and suspected CTS incidence. A statistically significant correlation exists between work duration and suspected CTS among farmers.

1. INTRODUCTION

Agriculture is a fundamental sector in Indonesia, with data from the Central Bureau of Statistics (2023) showing that there are 29,342,202 Individual Agricultural Enterprises, of which 53.75% are located in the food crop sector. As an informal work group, farmers are highly vulnerable to work-related diseases, particularly musculoskeletal disorders such as Carpal Tunnel Syndrome (CTS) caused by repetitive work activities and non-ergonomic positions (Maulana, 2017).

Carpal Tunnel Syndrome (CTS) is a neurological condition that occurs due to compression of the median nerve in the wrist, where the narrow space (carpal tunnel) experiences swelling or structural changes that cause nerve compression. The mechanism of CTS involves an increase in pressure within the carpal tunnel, which normally ranges from 2-10 mmHg, where repetitive flexion and extension movements can raise the pressure by 8-10 times, resulting in disturbances in endoneuria blood flow, changes in the blood-nerve barrier, edema, axonal degeneration, and median nerve neuritis that disrupts nerve conduction (Sevy et al., 2023). The prevalence of CTS in the general population ranges from 1-5% with 329 cases per 100,000 people per year, more commonly experienced in adults aged 40-60 years with a female-to-male ratio of 3-5:1(Putra et al., 2021).

Previous research in Indonesia on rice farmers detected that 48.6% of respondents experienced CTS (Maulana, 2017). This condition is exacerbated by the use of traditional, non-ergonomic tools and repetitive movements such as fertilizing, planting seeds, and hoeing, which can increase pressure on the carpal tunnel by 8-10 times the normal condition (Sevy et al., 2023).

*Corresponding author
E-mail addresses: nendyahroes@gmail.com (Nendyah Roestijawati)

Although several studies have explored CTS in farmers, it is still important to conduct research on the specific relationship between work duration and the occurrence of CTS, especially in rural areas of Indonesia. According to a systematic review and meta-analysis research by Shivakumar et al. about musculoskeletal disorders and pain in agricultural workers in Low-and Middle-Income Countries, further research is necessary to examine pain and its prognosis in individuals with musculoskeletal problems, cause the study did not provide enough information to examine factors linked to pain (Shivakumar et al., 2024). Therefore, this study aims to analyze the relationship between work duration and the incidence of suspected Carpal Tunnel Syndrome among farmers in Linggasari Village, Kembaran District, Banyumas Regency, in order to provide empirical contributions to understanding occupational health risks in the farming community.

2. METHOD

The research was conducted from June to August 2024 in Linggasari Village, Sumbang District. The type of research is quantitative with an observational analytical design using a cross-sectional design. The research sample was taken using purposive sampling of 72 people with the inclusion criterion that respondents were present during data collection and the exclusion criterion that respondents had previously experienced wrist trauma. The variables in this study consist of independent variables in the form of work duration, dependent variables in the form of suspected Carpal Tunnel Syndrome, and suspected confounding variables in the form of age, gender, and Body Mass Index (BMI). Data were collected through interviews using questionnaires, physical examinations, and CTS provocation tests such as Phalen's test, Tinel's sign, and Flick sign. Analysis was conducted using the Chi Square test and logistic regression test.

3. RESULT AND DISCUSSION

Result

The research was conducted on 72 farmers from Linggasari Village, Kembaran District, with characteristics as shown in Table 1.

Table 1. Respondent characteristics

No.	Characteristics	Frequency	%
1.	Age (years)		
	< 30	1	1,4
	≥ 30	71	98,6
2.	Gender		
	Men	59	81,9
	Women	13	18,1
3.	Body Mass Index (BMI)		
	Not Normal (< 18,5 dan > 25,0)	26	8,1
	Normal (18,5 - 25,0)	46	63,9

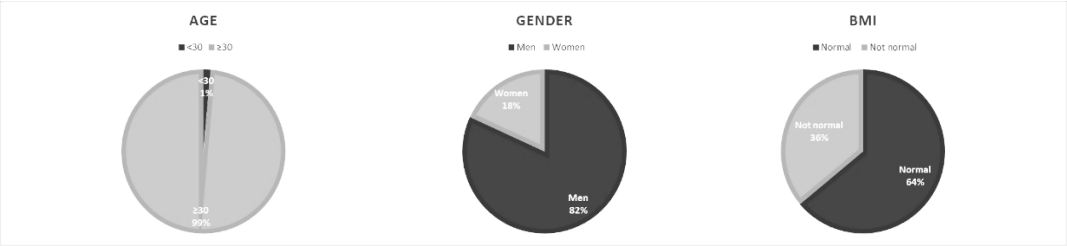

Fig.1 Respondent characteristics

Table 1 shows the distribution of research subjects based on age, gender, and BMI. Of the total 72 research respondents, most were aged ≥ 30 years (98.6%), 59 men (81.9%), and had a normal BMI (63.9%).

The research results found that 36.1% of respondents were suspected of CTS, with a work duration above the average (52,320 hours) being 40.3%, as shown in Table 2.

Table 2. Work duration and suspected of CTS distribution

No.	Variable	Frequency	%
1.	Work duration		
	Effective (≤ 52.320 jam)	43	59,7
	Not effective (> 52.320 jam)	29	40,3
2.	Suspected of CTS		
	No	46	63,9
	Yes	26	36,1

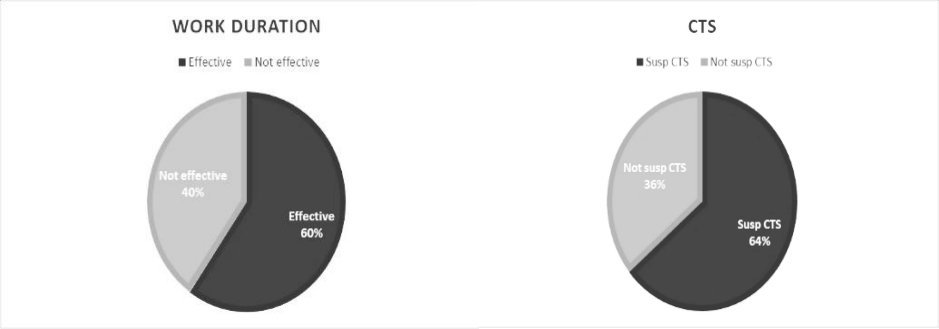

Fig. 2 Work duration and CTS distribution

Work duration is the amount of time spent working at the workplace measured in hours, calculated from the work duration in hours per day multiplied by the number of work periods in one year multiplied by the number of years worked. The effective work duration is obtained from the average number of working hours of all respondents. Suspect CTS is the suspected condition caused by pressure on the median nerve, resulting in the characteristic symptoms of CTS and supported by provocative tests such as Phalen's test, Tinel's sign, and Flick sign.

To determine the relationship between work duration and CTS suspects, a Chi Square test was conducted, and the analysis results can be seen in Table 3.

Table 3. Work duration and suspected of CTS relationship

No.	Work duration	Suspected of CTS		Total	*p-value*	r
		Ya	Tidak			
1.	Not effective	16	13	29	0,006*	0,310
2.	Effective	10	33	43		

*signifikan p 0.05

Based on Table 3, in this study, 26 respondents are suspected of experiencing CTS and 46 respondents are suspected of not experiencing CTS. Of the 26 respondents suspected of having CTS, 16 respondents had ineffective work durations. Meanwhile, 46 respondents are suspected not to have CTS, consisting of 33 respondents with effective work duration. The analysis results show a relationship between work duration and the incidence of suspected Carpal Tunnel Syndrome among farmers in Linggasari Village, Kembaran District, Banyumas Regency, with a correlation coefficient value of 0.310 (low). and there are external variables that influence the relationship between the work duration variable and the occurrence of suspected CTS.

The analysis continued with a logistic regression test to determine whether other variables have an influence on the relationship between work duration and suspected CTS. Previously, an analysis of the relationship between other variables, namely age, gender, and BMI, with suspected CTS was conducted. The results of the analysis can be seen in Table 4.

Table 4. Age, gender, BMI and suspected of CTS relationship

No.	Variabel	*p-value*
1.	Age	1,000
2.	Gender	0,115
3.	BMI	0,843

Based on the analysis results in table 4, the variable included in the logistic regression test is gender (p<0.25). The results of the logistic regression analysis can be seen in Table 5.

Table 5. Work duartion and suspected of CTS

Tahap	Variabel	*p-value*	Exp (B)	95% CI for EXP (B)
Step 1[a]	Gender	0,180	0,324	0,062 - 1,682
	Work duration	0,013	3,720	1,323 - 10,458
Step 2[a]	Work duration	0,007	4,062	1,468 - 11,240

In the first step of the logistic regression test, the gender and work duration variables were obtained with a p-value for gender of p = 0.180 and for work duration of p = 0.013. Because the p-value of the gender variable is the largest, gender was not included in the next testing step. In the second step of the logistic regression test, the value of the work duration variable was obtained at p = 0.007 (p < 0.05), indicating that there is a relationship between the independent variable and the dependent variable in the multivariate test. The Exp(B) result for the work duration variable shows a value of 4.062 (95% CI = 1.468-11.240), meaning that a person with ineffective work duration has a 4.062 times greater risk of experiencing CTS compared to someone with effective work duration.

Discussion

Carpal Tunnel Syndrome (CTS) is a medical condition that occurs due to pressure on the median nerve in the wrist, causing symptoms such as tingling, pain, and weakness in the hand. In this study, it was found that 36.1% of rice farmers are suspected to suffer from CTS. This result is lower than the study on rubber tree tapper farmers in Karang Manik Village, South Sumatra, which showed that 47.2% of respondents experienced two to five complaints related to CTS. Longer work periods, extended daily work durations, non-ergonomic hand postures, and high frequencies of repetitive movements also contribute to an increased risk of CTS (Selviyati et al., 2016).

Research on Carpal Tunnel Syndrome (CTS) in rice farmers is still limited. However, several studies have examined musculoskeletal complaints among rice farmers that may be related to CTS. A study in Neglasari Village, Purabaya District, Sukabumi Regency, examined factors related to musculoskeletal complaints among rice farmers. Although the main focus is not CTS, complaints about the wrists and hands experienced by rice farmers may be related to the risk of CTS. Factors such as working hours, work posture, and workload have been found to be related to these complaints. Additionally, another study on rice farmers in Ahuhu Village, Meluhu District, showed that 67.7% of farmers experienced musculoskeletal disorders, including CTS (Utami et al., 2017).

There are several mechanisms that can cause the median nerve to be compressed along this pathway. The two main compression sites are at the tunnel exit under the flexor retinaculum roof and at the hamulus hamate. Compression can arise from increased compartment pressure in the carpal tunnel, and the most common mechanism for this is hypertrophy of the synovial tissue surrounding the extrinsic forearm tendons. This hypertrophy is an inflammatory response to extensive use, wrist trauma, or underlying inflammatory processes such as arthritis (Joshi et al., 2022).

In farmers, the occurrence of CTS is caused by excessive use of the wrist in the wrong position. When hoeing, respondents with a high risk are in a standing position with one leg bent at an angle of 30° - 60°. The position of the back while hoeing is bent >60° accompanied by the

head bending >20° towards the object being hoed. The upper arm while hoeing is in a flexion position of 45° - 90° and an extension of 20º, while the lower arm experiences a flexion of 100°+. The position of the upper and lower arms follows the hoeing movement. The wrist while hoeing is in a load-bearing position (hoe) with a flexion position of 15° (Pramana & Cahyani, 2022).

Meanwhile, in rice planting activities, 75% of farmers are at high risk, and 25% are at very high risk. The position of rice planting based on the measurement of the farmer's body angles includes an average neck angle of 29°, back 79°, knee 62°, upper arm 96°, lower arm 21°, and wrist flexion angle 22° (Ardhi et al., 2023).

Meta-analysis of 9,270 CTS patients from a population of 1,051,707 workers across 17 studies revealed evidence of an association between CTS and high repetition exposure (hazard ratio [HR] 1.87, 95% CI 1.42-2.46), force intensity (HR 1.84, 95% CI 1.22-2.79), arm exposure exceeding activity level thresholds according to ACGIH (HR 1.75, 95% CI 1.40-2.17), and Strain Index >10 (HR 1.58, 95% CI 1.09-2.30) (Hassan et al., 2022). This supports that repeated exposure exceeding normal activity limits on the wrist over a long period can cause CTS.

Besides body position, CTS in farmers can also be caused by other factors. Research in France shows a relationship between CTS and exposure to biomechanical wrist stressors in agricultural workers and chemical exposure. However, this requires prospective research with an objective assessment of outcomes and exposures before drawing conclusions about the possible synergistic effects of mechanical and chemical stressors on median nerve damage (Roquelaure et al., 2019).

The exact pathophysiology of CTS still requires clarification. The genetic predisposition to CTS is reinforced by various gene variants. However, the etiology of CTS itself can include various risk factors such as wrist movement, injury, and certain conditions (e.g., age, body mass index, gender, and cardiovascular conditions) (Malakootian et al., 2023). In this study, age, gender, and BMI are not associated with the incidence of CTS in farmers.

The limitations of the study need to be acknowledged, such as variations in individual working conditions and comorbidity factors that may influence the occurrence of CTS. Nevertheless, this study makes an important contribution to understanding the relationship between work duration and the risk of CTS in the farming population, providing a foundation for more comprehensive and targeted health interventions in the future.

4. CONCLUSION

This study concludes that there is a significant relationship between work duration and the occurrence of suspected Carpal Tunnel Syndrome (CTS) among farmers in Linggasari Village, Kembaran District, Banyumas Regency. This relationship is not influenced by individual factors of the farmers such as age, gender, and BMI. Next, longitudinal studies can be conducted to observe the development of CTS in farmers over a longer period and investigate other risk factors that may potentially influence the occurrence of CTS, such as genetic variations, systemic health conditions, and psychosocial factors. Comparative studies with different regions or groups of farmers also need to be conducted to validate and generalize the research findings. Prevention of CTS in farmers can be achieved through increasing knowledge about ergonomic work positions. For policymakers, planning CTS prevention activities for farmers can be carried out through counseling and health screening.

5. ACKNOWLEDGE

Thank you to the Research and Community Service Institute of Jenderal Soedirman University for providing financial support to conduct this research. Thanks are also extended to all the residents of Linggasari Village, Kembaran District, the research team of lecturers and students, and the clinical skills laboratory of the Faculty of Medicine, Jenderal Soedirman University.

6. REFERENCES

Ardhi, M. N., Kristanto, A., & Hariyono, W. (2023). Analisis Postur Tubuh Petani Pada Aktivitas Penanaman Padi Menggunakan Metode Rapid Entire Body Assessment (REBA). *Jurnal Teknik Industri*, *13*(1).

Hassan, A., Beumer, A., Kuijer, P. P. F. M., & Molen, H. F. van der. (2022). Work-relatedness of carpal tunnel syndrome: Systematic review including meta-analysis and GRADE. *Health Sci Rep*, *5*(6).

Joshi, A., Patel, K., Mohamed, A., Oak, S., Zhang, M. H., Hsiung, H., Zhang, A., & Patel, U. K. (2022). Carpal Tunnel Syndrome: Pathophysiology and Comprehensive Guidelines for Clinical Evaluation and Treatment. *Cureus*, *14*(7).

Malakootian, M., Soveizi, M., Gholipour, A., & Oveisee, M. (2023). Pathophysiology, Diagnosis, Treatment, and Genetics of Carpal Tunnel Syndrome: A Review. *Cell Mol Neurobiol*, *43*(5), 1817–1831.

Maulana, Y. (2017). *Hubungan intensitas kerja dengan carpal tunnel syndrome pada petani padi*. Trisakti.

Pramana, A. N., & Cahyani, M. T. (2022). Analisis Postur Kerja Dengan Metode Rapid Entire Body Assessment (Reba) dan Keluhan Subjektif Muskuloskeletal pada Petani Bawang Merah di Probolinggo. *Ndonesian Journal of Health Community*, *3*(1), 30–38.

Putra, D. K., Setyawan, A., & Zainal, A. U. (2021). Faktor Yang Berhubungan Dengan Gejala Carpal Tunnel Synrome (CTS) Pada Pekerja Komputer Bagian Editing Di Pt.X Tahun 2021. *Environmental Occupational Health and Safety Journal*, *2*(1).

Roquelaure, Y., Jégo, S., Geoffroy-Perez, B., Chazelle, E., Descatha, A., Evanoff, B., Garlantézec, R., & Bodin, J. (2019). Carpal Tunnel Syndrome Among Male French Farmers and Agricultural Workers: Is It Only Associated With Physical Exposure? *Saf Health Work*, *11*(1), 33–40.

Selviyati, V., Camelia, A., & Sunarsih, E. (2016). Analisis Determinan Kejadian Carpal Tunnel Syndrome (CTS) pada Petani Penyadap Pohon Karet di Desa Karang Manik Kecamatan Belitang II Kabupaten Oku Timur. *Jurnal Ilmu Kesehatan Masyarakat*, *7*(3), 198–208.

Sevy, J. O., Sina, R. E., & Varacallo, M. A. (2023). *Carpal Tunnel Syndrome*. StatPearls Publishiing.

Shivakumar, M., Welsh, V., Bajpai, R., Helliwell, T., Mallen, C., Robinson, M., & Shepherd, T. (2024). Musculoskeletal disorders and pain in agricultural workers in Low- and Middle-Income Countries: a systematic review and meta-analysis. *Rheumatology International*, *44*, 235–237.

Utami, U., Karimuna, S. R., & Jufri, N. (2017). Hubungan Lama Kerja, Sikap Kerja dan Beban Kerja dengan Muskuloskeletal Disorders (MSDs) pada Petani Padi di Desa Ahuhu Kecamatan Meluhu Kabupaten Konawe Tahun 2017. *Jimkesmas*, *2*(6), 1–10.