



Relationship Between Working Hours And Shoulder Pain Incidence Among Female Workers At The Trubus Alami Cigarette

ARTICLE INFORMATION

Tien Aminah^{a*} | Silvy
Audini^b | Maulana Arif M^c

^{a,b,c} Departmen of Nursing, ITSK
RS dr. Soepraoen Kesdam V
Brawijaya Malang

***Correspondence:**

[tienaminah@itsk-
soepraoen.ac.id](mailto:tienaminah@itsk-soepraoen.ac.id)

Volume 8(2), 799-809
©The Author(s) 2026
[https://doi.org/10.54832/phj.v8i2.
1434](https://doi.org/10.54832/phj.v8i2.1434)

e-ISSN 2715-6249

Received : January 27, 2026
Revised : May 18, 2026
Accepted : August 31, 2026



This is an **Open Access** article
Distributed under the terms of the
[Creative Commons Attribution 4.0
International License](https://creativecommons.org/licenses/by/4.0/).

ABSTRACT

Background: Shoulder pain is one of the most common work-related musculoskeletal disorders among industrial workers, particularly in occupations involving repetitive movements and prolonged static working hours. Female workers in the cigarette manufacturing industry are considered vulnerable to shoulder pain due to repetitive hand activities and long working hours. However, studies examining the relationship between working hours and shoulder pain among female cigarette factory workers in Indonesia are still limited and show inconsistent findings. **Objective:** This study aimed to analyze the relationship between working hours and the incidence of shoulder pain among female workers in a cigarette factory. **Methods:** This analytical observational study used a cross-sectional design. A total of 100 female production workers were selected using purposive sampling based on inclusion and exclusion criteria. Data were collected using respondent characteristic questionnaires and the Indonesian version of the Shoulder Pain and Disability Index (SPADI). Data were analyzed using univariate and bivariate analysis with the Chi-Square test at a significance level of $p < 0.05$. **Results:** The results showed that most respondents had long working hours and experienced shoulder pain complaints. Statistical analysis using the Chi-Square test showed that working hours were not significantly associated with shoulder pain incidence among female cigarette factory workers ($\chi^2 = 0.613$; $p = 0.433$). **Conclusion:** Working hours were not significantly associated with shoulder pain incidence among female cigarette factory workers. These findings suggest that shoulder pain may be influenced not only by working hours but also by other ergonomic factors such as work posture, repetitive movement, rest patterns, and stretching habits. This study contributes to occupational nursing knowledge by emphasizing the importance of comprehensive ergonomic assessment in preventing musculoskeletal disorders among industrial workers.

Introduction

Shoulder pain is one of the most common work-related musculoskeletal disorders (WMSDs) experienced by industrial workers, especially among workers who perform repetitive movements and prolonged static postures during work activities. Musculoskeletal disorders in the shoulder area may reduce work productivity, increase absenteeism, and negatively affect workers' quality of life (Chen et al., 2022). The World Health Organization (WHO) reported that musculoskeletal disorders affect more than 1.7 billion people worldwide and remain one of the leading causes of disability related to occupational activities (WHO, 2021). In Indonesia, musculoskeletal complaints are also frequently reported among manufacturing workers, particularly in labor-intensive industries involving repetitive manual activities and prolonged sitting postures. (WHO, 2021; Alfianty et al., 2023). Work-related musculoskeletal disorders remain a major occupational health problem worldwide, particularly among manufacturing

workers exposed to repetitive activities and prolonged static postures (World Health Organization & International Labour Organization, 2021; Oakman et al., 2021)

Working hours refer to the amount of time spent by workers performing tasks in the work environment, either in a single day or cumulatively over a week (Firdaus et al., 2023). Tobacco industry workers, especially those in production, are at high risk of shoulder pain due to the demands of continuous work with long working hours. Prolonged exposure to long working hours without adequate rest periods can cause prolonged static strain on the shoulder and neck muscles, thereby increasing the risk of shoulder pain. Several studies have reported that long working hours are associated with an increase in musculoskeletal complaints among industrial workers, including shoulder pain (Chen et al., 2022).

Several preventive efforts have been implemented to reduce musculoskeletal complaints in industrial workers, including ergonomic interventions, stretching exercises during work, rest period regulation, and occupational health promotion programs. However, previous findings regarding the relationship between working hours and shoulder pain remain inconsistent. Some studies reported a significant association between prolonged working hours and shoulder pain, while others found that working hours alone was not the dominant contributing factor without poor work posture or excessive workload exposure (Liang et al., 2022; Li et al., 2021).

Although studies regarding musculoskeletal disorders among industrial workers have been widely conducted, research specifically examining the relationship between working hours and shoulder pain among female cigarette factory workers in Indonesia, particularly in Malang Regency, remains limited. In addition, the characteristics of cigarette factory work differ from other manufacturing sectors because workers generally perform repetitive activities in relatively homogeneous work patterns and static Working Hours. Therefore, further investigation is needed to better understand whether working hours are significantly associated with shoulder pain incidence in this specific occupational population.

Based on the above description, this study aims to analyze the relationship between working hours and the incidence of shoulder pain among female workers at the Trubus Alami cigarette factory in Malang. The hypothesis of this study is that there is a relationship between long working hours and an increased incidence of shoulder pain. This study uses an analytical observational design with a cross-sectional approach.

Methods

Study Design

This study employed an observational, non-experimental design with a descriptive-analytic approach and a cross-sectional design. The study aimed to determine the relationship between sitting position and work duration with the occurrence of shoulder pain among female workers at Trubus Alami Cigarette Factory, Malang. In this design, the independent variables, namely sitting position and work duration, and the dependent variable, namely shoulder pain, were measured at the same time during the data collection period.

Setting

The study was conducted at Trubus Alami Cigarette Factory, Malang Regency, East Java, Indonesia. The initial survey and coordination with the research site were conducted from November 2025 to 25 December 2025. Data collection was conducted in December 2025 using self-administered questionnaires. The participants were female workers in the production section, particularly those working in rolling/grinding and packing activities.

Research Subjects

The study population consisted of 892 workers at Trubus Alami Cigarette Factory, Malang Regency. Participants were selected using purposive sampling based on predetermined inclusion and exclusion criteria relevant to the research objectives.

The inclusion criteria were female workers aged 18–60 years, working in the rolling/grinding or packing sections, having a minimum work period of six months at Trubus Alami Cigarette Factory, being physically and mentally healthy, and willing to participate in the

study. The exclusion criteria were workers with a history of shoulder injury, including dislocation, fracture, or other trauma that could affect pain perception; workers with musculoskeletal or degenerative musculoskeletal disorders; pregnant women; and workers who were unwilling to participate in the study.

Potential participants were approached directly at the workplace and screened according to the eligibility criteria. Eligible participants received an explanation regarding the study objectives, procedures, benefits, confidentiality, and voluntary nature of participation. Participants who agreed to participate provided written informed consent before completing the questionnaires.

The minimum sample size was calculated using the Slovin formula with a 10% margin of error:

$$n = N / [1 + N(e)^2]$$

where n is the required sample size, N is the population size, and e is the margin of error.

With a population of 892 workers and a margin of error of 0.10, the calculation was:

$$n = 892 / [1 + 892(0.10)^2] = 89.92$$

The calculated sample size was rounded to 90 participants. However, the final number of participants included in the study was 100 respondents, based on the number of eligible participants who completed the research instruments and met the predetermined criteria.

Instruments

Data were collected using a demographic questionnaire, a modified sitting-position questionnaire, a work-duration questionnaire, and the Shoulder Pain and Disability Index (SPADI).

Demographic Questionnaire

The demographic questionnaire was used to obtain information regarding participants' characteristics, including age, length of employment, working hours per day, work position, other activities performed outside the factory, exercise habits, and rest or stretching periods during work.

Sitting Position Instrument

The sitting-position instrument was developed by adapting the ergonomic principles of the Rapid Upper Limb Assessment (RULA) developed by McAtamney and Corlett and the Rapid Entire Body Assessment (REBA) developed by Hignett and McAtamney. RULA and REBA are originally observational ergonomic assessment methods designed to evaluate working posture and the risk of musculoskeletal disorders.

In this study, the original observation-based assessment was modified into a self-administered questionnaire because the researcher was not permitted by the factory management to conduct direct observation of workers during the production process. The modification involved converting relevant ergonomic posture components into simple statements that could be understood and assessed by participants based on their usual working posture.

The questionnaire consisted of 11 items covering sitting posture, including back posture, forward bending, shoulder alignment, body inclination, neck posture, leg position, static sitting, and repetitive movements involving the shoulder, arm, and hand. Each item was assessed using a five-point Likert scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always. Higher scores indicated a more ergonomic sitting position, whereas lower scores indicated a less ergonomic sitting position.

The modified instrument was tested for validity using 30 respondents. All 11 items met the validity criterion, with the calculated correlation coefficient exceeding the critical value of $r = 0.361$ at $\alpha = 0.05$. Reliability testing using Cronbach's Alpha produced a coefficient of 0.925, indicating very high internal consistency. Therefore, the modified sitting-position questionnaire was considered valid and reliable for use in this study.

The total score was obtained by summing the scores of all 11 items. The score was subsequently categorized into two groups: non-ergonomic sitting position (11–33) and ergonomic sitting position (34–55).

Work Duration Instrument

Work duration was measured using a single factual question regarding the average number of working hours per day. Participants were asked to report their usual daily working duration. Because work duration represents factual information rather than a psychometric construct measured through multiple items, the instrument did not require validity and reliability testing.

Work duration was categorized into two groups: normal working duration, defined as 7–8 hours per day, and overtime, defined as more than 8 hours per day.

Shoulder Pain Instrument

Shoulder pain was assessed using the Shoulder Pain and Disability Index (SPADI), a standardized instrument developed by Roach et al. (1991) to evaluate shoulder pain and functional disability. SPADI consists of 13 items divided into two subscales: five items assessing pain intensity and eight items assessing disability related to shoulder function.

Each item is scored from 0 to 10, with 0 indicating no pain or no difficulty and 10 indicating the most severe pain or maximum difficulty. The pain subscale is converted to a 0–100 score by dividing the total pain score by 50 and multiplying by 100. The disability subscale is converted to a 0–100 score by dividing the total disability score by 80 and multiplying by 100. The total SPADI score is calculated as the mean of the pain and disability subscale scores. Therefore, the final SPADI score ranges from 0 to 100, with higher scores indicating greater shoulder pain and disability.

In this study, the SPADI score was categorized using the median score as the cut-off point. Respondents with scores $\leq$ the median were categorized as not experiencing shoulder pain, whereas respondents with scores $>$ the median were categorized as experiencing shoulder pain. Based on the descriptive analysis of the 100 respondents, the median SPADI score was 19.88.

The SPADI instrument has been widely used to assess shoulder pain and disability and has demonstrated good validity and reliability. Previous psychometric studies of the Indonesian version have also demonstrated good internal consistency and reliability, supporting its use in adult populations.

Data Collection Procedure

Data were collected using primary data obtained directly from participants. The researcher, assisted by one research assistant and two workplace supervisors, approached eligible workers and provided an explanation of the research. The supervisors assisted with participant coordination but did not determine participants' responses to the questionnaires.

After informed consent was obtained, participants completed the demographic questionnaire, sitting-position questionnaire, work-duration questionnaire, and SPADI. Participants were given sufficient time to complete the questionnaires independently. The completed questionnaires were checked by the researcher to ensure completeness before being processed and analyzed.

Data Analysis

Data were processed and analyzed using IBM SPSS Statistics version 27 for Windows. Data processing included editing, coding, scoring, tabulation, and data entry.

Univariate analysis was performed to describe the characteristics of the participants and the distribution of each research variable. Categorical variables were presented as frequencies and percentages. The variables analyzed descriptively included age, length of employment, sitting position, work duration, and shoulder pain.

Bivariate analysis was performed using the Chi-Square test to determine the relationship between sitting position and shoulder pain and between work duration and shoulder pain. The Chi-Square test was selected because the variables had been categorized into categorical data and the research objective was to examine the association between the independent and dependent

variables. Statistical significance was set at $\alpha = 0.05$. A p-value < 0.05 was considered statistically significant, indicating a significant relationship, whereas a p-value ≥ 0.05 indicated no statistically significant relationship.

When the assumptions of the Chi-Square test were not met, Fisher's Exact Test was considered as an alternative statistical test based on the distribution of the contingency table.

Ethical Consideration

This study was conducted in accordance with ethical principles for research involving human participants, including respect for persons, beneficence, justice, confidentiality, privacy, and informed consent. Participation was voluntary, and participants had the right to refuse or withdraw from the study at any time without consequences. Before completing the questionnaires, participants received information regarding the objectives and procedures of the study, potential benefits and risks, confidentiality of information, and their rights as research participants. Written informed consent was obtained from each participant before data collection.

Participant confidentiality and privacy were maintained throughout the research process. Participants' names were not recorded on the research instruments; identification codes were used instead. All information obtained during the study was kept confidential and used solely for research purposes. Research findings were reported in aggregate form without identifying individual participants.

The ethical feasibility of the study was reviewed by the Health Research Ethics Committee of Institut Teknologi Sains dan Kesehatan RS dr. Soepraoen Kesdam V/BRW Malang (Komite Etik Penelitian Kesehatan ITSK RS dr. Soepraoen). The study received an Ethical Exemption/Statement of Ethical Feasibility with protocol number No. KEPK-EC/394/XI/2025, issued on 27 November 2025. The ethical declaration stated that the study met the seven WHO 2011 ethical standards, namely social value, scientific value, equitable assessment and benefits, risks, persuasion/exploitation, confidentiality and privacy, and informed consent, with reference to the CIOMS 2016 Guidelines. The ethical declaration was valid from 27 November 2025 to 26 November 2026.

Results

1. Respondent Characteristics

Before the Chi-Square analysis was conducted, data was collected through demographic questionnaires, then grouped and tabulated. Univariate analysis was used to describe the characteristics and frequency distribution of respondents, which were then presented in tabular form.

Table 1. Characteristics of Female Workers Respondents at PR. Trubus Alami (n=100)

No	Variable	category	Frequency (n)	Percentage (%)
1	Age	18–25 years old	28	28,0 %
		26–35 years old	22	22,0 %
		36–45 years old	30	30,0%
		46–55 years old	17	17,0%
		56–65 years old	3	3,0%
2	Status	Single	26	26,0%
		Married	61	61,0%
		Other	13	13,0%
3	Education	Elementary school	24	24,0%
		Junior high school	33	33,0%
		Senior high school	44	43,0%

No	Variable	category	Frequency (n)	Percentage (%)
4	Job Position	Rolling machine / grinder	75	75,0%
		Packaging	25	25.0%
5	Length of Service (at the factory)	Less than 1 year	4	4.0%
		1 - 5 years	77	77,0%
		6 – 10 years	15	15,0%
		More than 10 years	4	4,0%
6	IMT (Indeks Massa Tubuh)	Underweight	10	10,0%
		Normal	62	62.0%
		Overweight	16	16,0%
		Obesity	12	12,0%
7	Duration of Sleep	Less than 8 hours	61	61,0%
		8 hours	31	31,0%
		More than 8 hours	8	8,0%
8	Stretching	No	20	20.0%
		Yes	80	80.0%
9	Work-related stress	No	70	70.0%
		Yes	30	30.0%
10	Shoulder pain complaint	No	11	11.0%
		Yes	89	89.0%
Total			100	100%

Source: Primary data, research results from 2025

This study involved 100 female workers as respondents. Most respondents were in the productive age group with a dominant length of service of 1–5 years, and the majority worked in the cigarette rolling section. Based on nutritional status, most respondents had a Body Mass Index (BMI) in the normal category and slept less than 8 hours per day. More than half of the respondents had additional activities outside of factory work, and most did stretching exercises during working hours. In addition, the majority of respondents stated that they did not experience work-related stress.

The results of the analysis show that 89% of respondents experienced shoulder pain. The high proportion of complaints indicates that shoulder pain is a prominent occupational health problem among female workers in the cigarette industry. These findings are consistent with previous studies that reported a high prevalence of musculoskeletal disorders, particularly in the upper extremities, among manufacturing workers who perform static and repetitive tasks for long periods of time (Hodgetts et al., 2021; Chen et al., 2022; Versloot et al., 2024).

This finding indicates a high prevalence of shoulder pain among female cigarette factory workers and suggests that musculoskeletal complaints remain a prominent occupational health problem in the cigarette manufacturing industry. These findings are consistent with previous studies reporting a high prevalence of musculoskeletal disorders among workers exposed to repetitive movements and prolonged static postures (Hodgetts et al., 2021; Chen et al., 2022).

2. Working Hours

Before conducting the Chi-Square test, the data was first grouped and tabulated based on working hours categories to determine the frequency distribution and ensure the data met the assumptions required for statistical analysis.

Table 2. Working Hours at PR. Trubus Alami

No	Working Hours	Frequency (n)	Percentage (%)
1	Normal (7–8 hours/day)	33	33.0%
2	Long (>8 hours/day)	67	67.0%

Source: Primary data, 2025 research results

The results showed that most respondents had long working hours, with 67.0% of female workers working more than 8 hours per day. In addition, the majority of respondents also experienced shoulder pain complaints based on SPADI assessment results. Long working hours performed in relatively static working hours may increase muscle tension in the shoulder and neck regions due to prolonged static loading and limited movement variation.

Theoretically, prolonged working hours can increase the risk of muscle fatigue, decrease blood circulation to muscle tissues, and contribute to musculoskeletal complaints, including shoulder pain (Li et al., 2021; Chen et al., 2022). Female workers in cigarette factories generally perform repetitive and monotonous activities such as rolling and packaging cigarettes, which may increase static muscle workload on the upper extremities. However, in this study, working hours among respondents were relatively homogeneous because most workers had similar work schedules and durations.

This condition may explain why long working hours were not always followed by more severe shoulder pain complaints. In addition, regular rest periods, light stretching habits during work, and relatively consistent work patterns may help reduce muscle tension and minimize the negative effects of prolonged working hours. These findings are consistent with previous studies reporting that working hours alone are not the dominant factor contributing to musculoskeletal complaints if not accompanied by poor ergonomic posture and excessive physical workload (Liang et al., 2022).

3. Relationship between Working Hours and Shoulder Pain Incidence

Table 3. Chi Square Test Results for the Relationship between Working Hours and Shoulder Pain Incidence

Variable	p-value	χ^2
Relationship between working hours and shoulder pain incidence	0,433	0,613

Table 3 shows that the statistical test results using the Chi-Square test obtained a χ^2 value of 0.613 with a p-value of 0.433, which is greater than 0.05 (χ^2 and p-value explicitly presented). This means that there is no significant relationship between working hours and the incidence of shoulder pain among female workers in cigarette factories.

Discussion

1. Overview of Working Hours

The results showed that most respondents had long working hours, with 67.0% of female workers working more than 8 hours per day. This finding indicates that long working hours are common among female workers in the cigarette manufacturing industry. Long working hours in industrial settings are generally associated with repetitive activities, static working positions, and limited movement variation, which may increase physical workload and muscle fatigue.

Theoretically, prolonged working hours may increase static muscle load, reduce blood circulation to muscle tissues, and contribute to musculoskeletal complaints, particularly in the shoulder and neck regions (Chen et al., 2022). Female cigarette factory workers commonly perform repetitive tasks such as cigarette rolling and packaging continuously during working hours. These repetitive activities may increase muscle tension in the upper extremities, especially when performed for prolonged periods without adequate ergonomic support. However, working hours among respondents in this study were relatively homogeneous because most workers had similar work schedules and workloads. In addition, workers generally had regular rest periods during work activities. These conditions may reduce the negative effects of prolonged working hours and help maintain muscle recovery during work.

2. Overview of Shoulder Pain

The results of this study showed that 89.0% of respondents experienced shoulder pain complaints based on SPADI assessment results. This finding indicates that shoulder pain is a common occupational health problem among female cigarette factory workers. The high prevalence of shoulder pain may be related to repetitive upper extremity movements, static work positions, and continuous manual activities performed during cigarette production processes. Similar findings were also reported among female industrial workers in developing countries, where repetitive work activities and prolonged static postures contributed to a high prevalence of musculoskeletal complaints (Rahman et al., 2022)

Previous studies have reported that shoulder pain is one of the most common musculoskeletal complaints among industrial workers, particularly among workers exposed to repetitive movements and prolonged static postures (Coenen et al., 2021; Yang et al., 2023; Liang et al., 2022). Repetitive work activities may increase muscle tension and fatigue in the shoulder region, while static working positions may reduce muscle flexibility and circulation, thereby increasing the risk of discomfort and pain.

In this study, the high prevalence of shoulder pain may also be influenced by other ergonomic and individual factors, including work posture, repetitive movement frequency, stretching habits, sleep duration, and psychosocial workload. Although most respondents reported performing stretching exercises during work, repetitive occupational exposure over a long period may still contribute to musculoskeletal complaints.

3. Relationship between Working Hours and Shoulder Pain

The results of the Chi-Square test showed that working hours were not significantly associated with shoulder pain incidence among female cigarette factory workers ($\chi^2 = 0.613$; $p = 0.433$). These findings indicate that prolonged working hours alone may not be the primary factor contributing to shoulder pain complaints in this occupational population.

Theoretically, long working hours are considered a risk factor for musculoskeletal disorders because prolonged muscle activity may increase static loading, decrease muscle recovery time, and trigger muscle fatigue (Govaerts et al., 2021). Several previous studies also reported a significant relationship between prolonged working hours and shoulder pain complaints among industrial workers (Liang et al., 2022).

However, the findings of this study differ from several previous studies. The absence of a significant relationship may be influenced by the relatively homogeneous working hour distribution among respondents, where most workers had similar work durations and work patterns. Limited variation in exposure duration may reduce the statistical ability to detect

significant differences between groups. In addition, shoulder pain complaints among workers may not only be influenced by working hours but also by other ergonomic factors such as work posture, repetitive movements, workplace ergonomics, rest patterns, and stretching habits. Ergonomic risk factors including awkward posture, repetitive movements, and static work positions are known contributors to work-related musculoskeletal disorders among manufacturing workers (Yang et al., 2023). Most respondents in this study reported regular stretching activities during work, which may help reduce muscle tension and minimize the negative effects of prolonged working hours. Previous studies have shown that physical exercise and stretching programs may reduce pain intensity and improve functional outcomes among workers with work-related musculoskeletal disorders (Deus et al., 2024).

The novelty of this study lies in the finding that long working hours were not significantly associated with shoulder pain incidence among female cigarette factory workers. These findings suggest that the assessment of musculoskeletal disorder risk should not focus solely on working hours but should also consider comprehensive ergonomic factors in the workplace.

These findings imply that occupational health interventions for female industrial workers should not focus solely on reducing working hours but should also emphasize ergonomic improvements, regular stretching programs, work posture correction, and adequate rest periods. Comprehensive ergonomic assessment may help identify multiple contributing factors associated with shoulder pain complaints among industrial workers. This study has several limitations. The cross-sectional design could not determine causal relationships between working hours and shoulder pain complaints. In addition, working hours were measured using self-reported questionnaires, which may introduce recall bias. Future studies are recommended to include ergonomic posture assessment and longitudinal observation to obtain more comprehensive findings.

Conclusion

Based on the results of research on female workers at the PT Trubus Alami Malang cigarette factory, it can be concluded that most respondents had long working hours (≥ 8 hours per day) and the majority experienced shoulder pain. However, bivariate analysis using the Chi-Square test showed that working hours were not significantly associated with the incidence of shoulder pain (p -value = 0.433). These findings indicate that long working hours is not always the main determining factor for shoulder pain in female cigarette factory workers. Other factors such as work schedule homogeneity, relatively uniform work patterns, the availability of breaks, and the habit of stretching during work are thought to play a role in reducing the negative impact of working hours on shoulder pain complaints. Therefore, the assessment of shoulder pain risk needs to consider working hours in conjunction with other aspects of work ergonomics. The results of this study are expected to form the basis for the development of efforts to prevent musculoskeletal disorders in industrial work environments, particularly through balanced work schedules, adequate rest periods, and the application of more optimal work ergonomics principles. section should state clearly the main conclusions and provide an explanation of the importance and relevance of the study reported.

Ethics approval and consent to participate

This study has obtained ethical approval (ethical exemption) from the Health Research Ethics Committee (KEPK) of ITS RS dr. Soepraoen Kesdam V/BRW Malang with number KEPK-EC/394/XI/2025. All research procedures were carried out in accordance with research ethics principles based on the 2011 World Health Organization (WHO) and 2016 CIOMS standards, including respect for scientific values, data confidentiality, and protection of respondents' rights and safety. Prior to data collection, all respondents were given an explanation of the purpose and procedures of the research, particularly regarding the measurement of work working hours, and gave their informed consent to participate voluntarily.

Acknowledgments

The author would like to thank the academic advisor who provided valuable guidance, direction, and input during the process of preparing and conducting this research. The author also expresses appreciation to PT Trubus Alami Malang Cigarette Factory for granting permission and providing facilities so that the research could be carried out properly. Thanks are also extended to all respondents who participated and took the time to participate in this research. The support from various parties was very meaningful in the completion of this research.

References

- Alfianty, D., et al. (2023). *Posisi dan durasi kerja menjadi faktor risiko keluhan nyeri leher dan bahu pada penjahit rumahan di Kota Malang*. Universitas Islam Malang.
- Bezzina, A., Austin, E., Nguyen, H., & James, C. (2023). Workplace psychosocial factors and their association with musculoskeletal disorders: A systematic review of longitudinal studies. *Workplace Health & Safety*, 71(12). <https://doi.org/10.1177/21650799231193578>
- Chen, Y., Ma, T., Song, X., & Wang, X. (2022). Musculoskeletal diseases and risk factors among electronics manufacturing workers: A cross-sectional study. *BMC Public Health*, 22(1), 1065. <https://doi.org/10.1186/s12889-022-13487-1>
- Coenen, P., Gouttebauge, V., van der Burght, A. S. A. M., et al. (2021). Associations of occupational standing, sitting, and physical activity with musculoskeletal symptoms: A systematic review. *Scandinavian Journal of Work, Environment & Health*, 47(2), 86–95. <https://doi.org/10.5271/sjweh.3935>
- Deus, A. A. B., et al. (2024). Benefits of physical exercise on pain and functioning in workers with work-related musculoskeletal disorders: A systematic review. *Fisioterapia e Pesquisa*.
- Firdaus, F., Prihatin, M. Y., Romadhoni, R., & Setiawan, M. R. (2023). The relationship between work duration and carpal tunnel syndrome in cigarette rolling workers. *Jurnal Keperawatan Komprehensif*, 9(4), 1–8.
- Govaerts, R., Tassignon, B., Ghillebert, J., et al. (2021). Prevalence and incidence of work-related musculoskeletal disorders in secondary industries of 21st century Europe: A systematic review and meta-analysis. *BMC Musculoskeletal Disorders*, 22, 751. <https://doi.org/10.1186/s12891-021-04615-9>
- Hodgetts, C. J., Leboeuf-Yde, C., Beynon, A., & Walker, B. F. (2021). Shoulder pain prevalence by age and within occupational groups: A systematic review. *Archives of Physiotherapy*, 11(1), 24. <https://doi.org/10.1186/s40945-021-00119-w>
- International Labour Organization. (2021). *Working conditions in the manufacturing sector in Asia: A focus on Indonesia*. ILO Publishing.
- Liang, L., Hu, L., Zhang, Q., Tian, H., Peng, M., & Yu, Z. (2022). Shoulder work-related musculoskeletal disorders and related factors of workers in 15 industries of China. *BMC Public Health*, 22(1), 757. <https://doi.org/10.1186/s12889-022-13177-y>
- Li, X., et al. (2021). Associations between physical or psychosocial risk factors and work-related musculoskeletal disorders in construction workers: A systematic review. *International Journal of Industrial Ergonomics*, 83, 103113. <https://doi.org/10.1016/j.ergon.2021.103113>
- Oakman, J., Kinsman, N., Stuckey, R., Graham, M., & Weale, V. (2021). A rapid review of musculoskeletal disorders among workers in manufacturing industries. *Safety Science*, 134, 105070. <https://doi.org/10.1016/j.ssci.2020.105070>
- Polit, D. F., & Beck, C. T. (2017). *Nursing research: Generating and assessing evidence for nursing practice* (10th ed.). Wolters Kluwer.
- Priyanto, R. A., Ma'rufi, I., & Hartanti, R. I. (2020). Postur kerja duduk, gerakan berulang, dan keluhan ekstremitas atas pada pekerja bagian pelintangan rokok. *Multidisciplinary Journal*, 4(1), 27–34.
- Rahman, M. M., Khan, A. A., & Ali, N. A. (2022). Work-related musculoskeletal disorders among female garment workers in developing countries: A systematic review. *Work*, 71(2), 321–333. <https://doi.org/10.3233/WOR-210456>
- Republik Indonesia. (2003). *Undang-Undang Republik Indonesia Nomor 13 Tahun 2003 tentang Ketenagakerjaan*. Jakarta.
- Sugiyono. (2017a). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Alfabeta.
- Sugiyono. (2017b). *Statistika untuk penelitian*. Alfabeta.

- Versloot, A. H. C., et al. (2024). Physical and psychosocial work-related exposures and the occurrence of disorders of the shoulder: A systematic review update. *Applied Ergonomics*, 118, 104277. <https://doi.org/10.1016/j.apergo.2024.104277>
- Widiyanto, A., Lestari, W., & Prabowo, A. (2023). Validasi dan uji reliabilitas Shoulder Pain and Disability Index (SPADI) versi Bahasa Indonesia pada pasien dengan gangguan bahu. *Jurnal Kesehatan Indonesia*, 14(3), 210–218.
- World Health Organization. (2021). *Musculoskeletal conditions*. WHO.
- World Health Organization & International Labour Organization. (2021). Joint estimates of the work-related burden of disease and injury, 2000–2016. WHO.
- Yang, H., Liu, H., Li, Y., & Wang, Y. (2023). Ergonomic risk factors for work-related musculoskeletal disorders among manufacturing workers: A systematic review. *International Journal of Environmental Research and Public Health*, 20(4), 3156. <https://doi.org/10.3390/ijerph20043156>