



Analysis of The Relationship Between Work Posture and Complaints of Musculoskeletal Disorders (MSDS) In Workers Of Sri Tanjung Cracker Factory, Indramayu, In 2024

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Abstract

Background. Musculoskeletal complaints refer to issues within the skeletal muscles experienced by an individual, varying from slight discomfort to severe agony. An improper working posture significantly increases the likelihood of musculoskeletal diseases, particularly in the lumbar and cervical regions. At the Sri Tanjung cracker facility in Kenanga Indramayu Village, there were reports of Musculoskeletal Disorders (MSDs) with differing incidence rates, including symptoms of pain in the back, neck, waist, shoulders, arms, and wrists. A continually adopted ergonomically unsound work posture, along with large workloads and extended durations, can jeopardize worker safety.

Aims. This study aimed to investigate the correlation between work posture and the prevalence of Musculoskeletal Disorders (MSDs) among employees at a cracker factory.

Methods. The employed methodology was an analytical study utilizing a cross-sectional design. The research population encompasses all employees in the production department of the Sri Tanjung cracker factory, totaling around 50 individuals, which constitutes the entire population—data analysis with Pearson's chi-squared statistical tests.

Result. The study identified work position as the statistically significant variable influencing the incidence of Musculoskeletal Disorders (MSDs) ($p = 0.031$).

Conclusion. Work posture is a contributing factor to Musculoskeletal Disorders (MSDs) among workers at the Sri Tanjung cracker industry.

Implementation. Consequently, manufacturing workers can enhance their awareness of Musculoskeletal Disorders (MSDs) via social media platforms, improve their work posture, and engage in stretching exercises for limbs subjected to awkward positions.

Keywords: Work Posture, *Musculoskeletal Disorders* (MSDs)



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INTRODUCTION

The economy of Indonesia is partially propelled by Micro, Small, and Medium Enterprises (MSMEs). Micro, Small, and Medium Enterprises (MSMEs) possess the capacity to enhance the economy, diminish unemployment, and elevate community welfare by broadening employment prospects and delivering extensive economic services to the community. Ministry of Finance, Republic of Indonesia, 2023. The majority of MSMEs in Indonesia concentrate solely on product marketing and have not upgraded their operational practices. Additional operational elements, like work protocols, instruments, and personnel, are frequently neglected. (Cahyanto, 2023).

The Sri Tanjung Cracker Factory, one of the MSMEs, conducts all production processes utilizing human labor. There are instances in which improper work posture arises. Continuous engagement in improper work posture poses significant risks to worker safety. Hamdy, 2018. Included are skeletal muscle disorders or Musculoskeletal Disorders (MSDs), which pertain to afflictions of the musculoskeletal system caused by repetitive exposure to excessive strain on the upper limbs (hands, wrists, elbows, and shoulders), neck, back, and lower limbs (Kurniawidjaja, 2019).

Studies demonstrate that a non-neutral work posture markedly elevates the risk of musculoskeletal problems, especially in the lumbar and cervical regions (Gasperini et al., 2024). The World Health Organization (WHO) states that musculoskeletal diseases constitute the second most significant contributor to global disability, with low back pain being the primary cause of disability worldwide (WHO, 2018).

The physical consequence is that unaddressed spinal symptoms in workers have a considerable likelihood of resulting in spinal dislocation, which can lead to severe discomfort and may be irreversible or fatal. Physical pain can psychologically diminish attentiveness and induce exhaustion due to delayed cognitive processing and alterations in organs beyond conscious awareness, hence increasing the risk of accidents and Occupational Diseases (ODs). The repercussions of Musculoskeletal Disorders (MSDs) on a company's production and economic dimensions include diminished output and productivity, material damage, unacceptable production targets and services, lost working hours, and elevated handling costs (Handayani, 2011).

The International Labour Organization (ILO) reports that global cases of Occupational Accidents (KK) and Occupational Diseases (PAK) total 430 million annually, comprising 270 million (62.8%) cases of KK and 160 million (37.2%) cases of PAK, resulting in the deaths of

2.78 million workers each year. Simultaneously, 40% of KK and PAK cases arise among young workers (Ministry of Manpower of the Republic of Indonesia, 2022).

The Bureau of Labor Statistics (BLS) reported a 20% increase in occupational disorders from 2021 to 2022. In 2022, the reported cases were 45.2 per 10,000 workers, compared to 37.7 per 10,000 workers in 2021. The U.S. Bureau of Labor Statistics (BLS) reported that the private sector recorded 976,090 instances of work-related accidents and illnesses, with Musculoskeletal Disorders (MSDs) comprising 502,380 cases. This problem frequently occurs in the extremities, particularly the shoulders (36%), the back (43%), and the lower extremities, notably the knees (15%) (Council, 2023).

Data from the Central Statistics Agency (BPS) indicates that the total number of Indonesian workers aged 15 and older as of August 2019 was 126.51 million individuals. The largest distribution is among informal laborers, totaling 70.49 million individuals. This figure exceeds that of official workers, who number just 56.02 million (BPS, 2020).

In Indonesia, work accident data published by the Employment Social Security Administration Agency (BPJS) rose from 173,415 instances in 2018 to 182,835 cases in 2019. In 2018, 3,400 individuals perished, 8,722 individuals sustained disabilities, and the remaining 161,293 individuals recovered. In 2019, 3,172 individuals succumbed, 6,091 were rendered incapacitated, and 173,572 recovered. (BPJS, 2019).

Rani Pratiwi's 2020 research indicates a strong correlation between wrist-related work position experienced by respondents and the incidence of Musculoskeletal Disorders (MSDs) among door construction workers on Jl. Pahlawan, Medan City in 2020 (Pratiwi, 2020).

Vira Teresia's 2022 research indicates a correlation between work posture and musculoskeletal issues among oil palm harvesting workers at PT. A Homage to the Maharaja of Central Bengal (Teresia, 2022). Hardiyati's 2022 study reveals a substantial correlation between work posture, working hours, and musculoskeletal pain among brick producers in Karangsono Village, Mranggen District, Demak Regency (Hardiyati et al., 2022).

The correlation between work posture and Musculoskeletal Disorders (MSDs) is a significant occupational factor contributing to MSDs, marked by reports of discomfort in joints, muscles, ligaments, cartilage, skeletal structures, and nerves. The manifestation of these problems results in diminished concentration while work, weariness, and reduced productivity. This leads to injuries in the neck, spine, shoulders, wrists, and other regions (Helmi, 2013). From the interview results, it was found that two individuals reported complaints of back and neck pain, one person reported complaints of back and shoulder pain, and two individuals

reported complaints in the arm and wrist. This is due to ergonomic issues with worker positions and heavy workloads, accompanied by long loading durations while working. To mitigate the risk of injury or Occupational Disease (PAK) in the cracker factory environment, it is essential to identify further factors detrimental to workers arising from incompatible work postures or processes. Additionally, researchers should provide recommendations to mitigate the impact of Musculoskeletal Disorders (MSDs).

Recognizing that issues about skeletal muscles among workers can be significantly detrimental, and noting the absence of research on the correlation between work posture and the prevalence of Musculoskeletal Disorders (MSDs) at the Sri Tanjung Cracker Factory, the author intends to undertake a study entitled "The Relationship between Work Posture and the Incidence of Musculoskeletal Disorders (MSDs) in Sri Tanjung Cracker Factory Workers in Kenaga Indramayu Village." The purpose of this study is to determine the relationship between work posture and the incidence of Musculoskeletal Disorders (MSDs) in Sri Tanjung cracker factory workers in Kenanga Village, Indramayu, in 2024.

METHODS

The study methodology employed is quantitative analytics, utilizing a cross-sectional design. The study population comprises all 50 workers from the Sri Tanjung cracker factory, representing the complete sample of the population. The research site is the Sri Tanjung Cracker Factory, situated in the Hamlet block, Sindang District, Indramayu Regency, West Java. The study was conducted in June and July 2024. Data acquisition with questionnaires. Conducting bivariate analysis with Pearson's chi-square test.

DISCUSSION

Univariate Analysis

According to Table 1, it is evident that the majority (86%) of workers at the Sri Tanjung Cracker Factory exhibit a high (awkward) work posture. The distribution of response frequencies according to work posture for each question item is presented in Table 2 below:

Table 1. Distribution of Frequency of Working Posture of Sri Tanjung Cracker Factory Workers, Kenanga Village, Indramayu in 2024

No.	Work Posture	Frequency (F)	Percentage (%)
1	High (Awkward)	43	86,0
2	Keep	7	14,0
	Sum	50	100

Source: Primary Data

Table 2. Distribution of Work Posture Containing Body Parts of Sri Tanjung Cracker Factory Workers in Kenanga Indramayu Village in 2024

No.	Work Posture	Frequency (F)	Percentage (%)	Average	Std. Deviation
1	Wrist and Hand	50	100,0	4,00	0,000
2	Elbow	42	84,0	3,76	0,771
3	Shoulder	49	98,0	3,39	0,283
4	Neck	36	72,0	2,68	0,551
5	Back	36	72,0	2,66	0,593
6	Foot	25	50,0	1,04	0,989

Source: Primary Data

According to Table 2, all 50 employees at the Sri Tanjung cracker factory demonstrate improper working postures in their wrists and hands, with the majority also exhibiting improper postures in their shoulders (98%) and elbows (84%).

Table 3. Distribution of Frequency of Musculoskeletal Disorders (MSDs) Occurrence of Sri Tanjung Cracker Factory Workers, Kenanga Village, Indramayu in 2024

No.	Incidence of Musculoskeletal Disorders (MSDs)	Frequency (f)	Percentage (%)
1	Tall	8	16,0
2	Keep	27	54,0
3	Low	15	30,0
	Sum	50	100

Source: Primary Data

According to Table 3, it is clear that the predominant proportion (54%) of Musculoskeletal Disorders (MSDs) among workers at Sri Tanjung Cracker Factory falls within the moderate category of complaints.

Table 4 below illustrates the distribution of response frequencies concerning Musculoskeletal Disorders (MSDs) question items:

Table 4. Distribution of Frequency of Incidence of Musculoskeletal Disorders (MSDs) in the "High" category of Sri Tanjung Cracker Factory Workers in 2024

No.	Musculoskeletal Disorders (MSDs)	Frequency (F)	Percentage (%)
1	Neck	11	69
2	Below the Neck	10	63
3	Left Shoulder	1	6
4	Right Shoulder	1	6
5	Back	10	63
6	Upper Right Arm	5	31
7	Waist	16	100
8	Buttocks	16	100
9	Bottom Ass	15	94
10	Left Forearm	2	13
11	Right Forearm	2	13
12	Left Wrist	6	38
13	Right Wrist	6	38
14	Left Hand	1	6
15	Right Hand	1	6
16	Skin Thigh	4	25
17	Right Thigh	4	25
18	Left Knee	1	6
19	Right Knee	1	6
20	Left calf	13	81
21	Right calf	13	81
22	Left Ankle	1	6
23	Right Ankle	1	6
24	Left Leg	6	38
25	Right Foot	6	38

Based on Table 4 above, the percentage of Sri Tanjung cracker factory workers with complaints of *Musculoskeletal Disorders* (MSDs) is presented. The "high" category encompasses complaints ranging from mild discomfort to severe pain in various body parts. The most common complaints felt by respondents in the "high" category were all pain in the waist and buttocks, and most but not all of them experienced complaints of pain in the lower buttocks (94%).

Bivariate Analysis

Table 5. Relationship between Work Posture and the Incidence of Musculoskeletal Disorders (MSDs) of Sri Tanjung Cracker Factory Workers in 2024

Work Posture	Musculoskeletal Disorders (MSDs)						Total		Value <i>p</i>
	Tall		Keep		Low		n	%	
	n	%	n	%	n	%			
Tall	8	18,6	25	58,1	10	23,2	43	100,0	0,031
Keep	0	0,0	2	28,6	5	71,4	7	100,0	
Sum	8	16,0	27	54,0	15	30,0	50	100,0	

Source: Primary Data

Based on Table 5 above, it is evident that among all workers with a high or awkward working posture, 18.6% experience a high incidence of *Musculoskeletal Disorders (MSDs)*. Meanwhile, among all workers with a moderate working posture, 28.6% experience moderate *Musculoskeletal Disorders (MSDs)*.

Based on the bivariate analysis mentioned above, it is known that there is a statistically significant relationship between work posture and the incidence of *Musculoskeletal Disorders (MSDs)* in Sri Tanjung cracker factory workers with a value of $p=0.031$ ($p < 0.05$).

DISCUSSION

Overview of the Working Posture of Sri Tanjung Cracker Factory Workers

Based on the study's results, it is evident that 86% of respondents exhibit a high or awkward work posture. Based on the results of the calculation of the level of occupational posture risk in Sri Tanjung cracker workers, the level of occupational posture risk ranges from moderate to high risk, with complaints of pain in the wrist, hand, elbow, and shoulder. The complaint arises because every work process in the cracker factory involves repetitive movements, such as mixing materials, winding, printing, and drying. Thus, it shows that work in cracker factories poses a risk of *Musculoskeletal Disorders (MSDs)* related to work posture, indicating the need for improvement efforts.

Overview of *Musculoskeletal Disorders (MSDs)* of Sri Tanjung Cracker Factory workers

Based on the research results at the Sri Tanjung cracker factory, it is known that 54% of respondents reported complaints of illness in the "moderate" category. Based on the results

of the calculation of the level of *Musculoskeletal Disorders* (MSDs) complaints in Sri Tanjung cracker workers, the total score of individual complaints starts from low, medium and high on the parts of the body that have a very painful/high complaint, including the waist, buttocks and under the buttocks. This occurs because the body position deviates significantly from the normal position when doing work, causing injury or trauma to the soft tissues and nervous system. The trauma will result in a considerable injury, which is then expressed as pain, tingling, aches, pressure pain, swelling, and muscle weakness. Tissue trauma that arises due to chronic or repetitive use of force, excessive stretching, or over-emphasis on one tissue, and MSDs can be caused by biomechanical factors such as excessive muscle stretching or constant pressure on specific tissues, resulting in micro-trauma and chronic pain.

The Relationship between Work Posture and the Incidence of *Musculoskeletal Disorders* (MSDs) in Sri Tanjung Cracker Factory Workers

Based on the results of research and analysis using the *Chi-square* test, the obtained p-value of 0.031 ($p < 0.05$) suggests a significant relationship between work posture and the incidence of Musculoskeletal Disorders (MSDs) among Sri Tanjung cracker factory workers. The results of the study align with Nabila Husna's 2020 research, which concluded that there is a significant relationship between awkward work postures and Musculoskeletal Disorders (MSDs) among oil palm harvesting workers at PT Astra Agro Lestari Tbk (Husna, 2023). Research by Gasperini et al. (2024) Meta-analytically concluded that non-neutral working postures, especially in prolonged and bent positions, significantly contributed to the incidence of lower back, neck, and upper extremity pain. These findings support the results of a study conducted at the Sri Tanjung Cracker Factory, where workers performed repetitive tasks and lifted weights without the use of ergonomic aids. Moreover, Akbar et al. (2023) stated in their systematic review of the Southeast Asian region that the use of the REBA method and field observation is a strong indicator of the high risk of MSDs in the informal employment sector. The study found that 86% of workers in the food processing sector experience chronic complaints of hand and waist issues. Similar findings were also reported by Bullo et al. (2024), indicating that a lack of variation in working posture and the absence of active stretching increase the static load on the muscles of the lower back and legs. The addition of stretching sessions or micro-breaks was shown to lower the incidence of MSDs in their intervention studies significantly. Tassignon et al. (2021). It was also found that manual work sectors, such as food MSMEs, have a prevalence of MSDs of up to 78% in the female worker population

who perform monotonous and repetitive activities. Therefore, preventive measures such as workstation redesign and ergonomics education should be a priority.

The working posture at the Sri Tanjung cracker factory in an unergonomic standing position, bending too long, the neck looking up continuously, and the position of the knees bending can cause discomfort and pain in the muscles for a relatively long period because while working they do sometimes unstable position transfer activities, such as lifting the dough basin, trash crackers and cut crackers and non-ergonomic work tools. An unnatural working posture is a body position that does not change the body's angle reasonably. This unnatural work posture is due to the wrong working posture when lifting weights and shoulders, inappropriate workstations, and the workers' capacity to do their jobs. Based on the results of the research carried out and calculations using the Brief Survey method on Sri Tanjung cracker factory workers, a score of 2-4 was obtained, indicating a medium to high risk category. Sri Tanjung cracker factory workers can produce 50 tons or more of crackers in a day, whose production is spread around the Indramayu area. In performing this work activity, workers are more likely to stand upright, look back, bend, lift and hold loads that are too long on average above 5 kg, and push heavy weights. Due to the workload, it can lead to an unnatural or ergonomically incorrect work posture. The study found that 18.6% of workers experienced a high category of *Musculoskeletal Disorders* (MSDs), 58.1% experienced a moderate category of *Musculoskeletal Disorders* (MSDs), and another 23.2% experienced a low-category *incidence of Musculoskeletal Disorders* (MSDs). For the occurrence of MSDs complaints, control and prevention efforts are needed to reduce the risk of injuries or occupational diseases that occur in the workplace based on the work environment or work. Based on the study's results, further action is necessary to address these issues, and recommendations can be provided to mitigate the identified worker risks at the Sri Tanjung cracker factory.

CONCLUSION

Based on the results of research at the Sri Tanjung cracker factory in Kenanga Indramayu Village, it can be concluded that: workers have a high level of work posture irregularities; workers have a moderate level of *Musculoskeletal Disorders* (MSDs) complaints; there is a statistically significant relationship between work posture and the incidence of *Musculoskeletal Disorders* (MSDs) of Sri Tanjung cracker factory workers in Kenanga Indramayu Village in 2024.

SUGGESTION

The results of this study are expected to be used as reading materials for scientific studies on the work posture and incidence of *Musculoskeletal Disorders* (MSDs), for teaching, research or community service purposes; For Sri Tanjung cracker factory workers, it is necessary to reduce the danger of working posture by providing knowledge or information about *Musculoskeletal Disorders* (MSDs) through social media platforms from the company or outside the company, improving work posture while working, doing body *stretching movements* that often experience awkward postures so that the risk of *Musculoskeletal Disorders* (MSDs) can be suppressed; To the *owner* of Sri Tanjung, to pay more attention to the work posture of each worker in the production department, by applying engineering and management engineering. Engineering engineering is carried out by providing media or tools such as special chairs and tables in the tapping section to provide an ergonomic workplace, it is also necessary to procure tools that make it easier for the dough workers to lift the dough to be milled so that workers do not have the risk of *Musculoskeletal Disorders* (MSDs) due to an awkward posture. Management engineering is carried out more neatly in the recruitment of prospective workers so that worker data can be recap properly and the division of *work shifts* can run well and consistently as well as the implementation of stretching every 15 minutes so as to reduce the risk of awkward posture; To the health center, it is expected to be able to conduct health coaching and education (counseling) regarding health problems *of Musculoskeletal Disorders* (MSDs) in Sri Tanjung cracker factory workers in particular, and cracker factories in Kenanga Indramayu Village in general; To educational institutions, the results of this research are expected to be an input for community service activities, in the form of providing information and health education either through the media (poster installation) or direct counseling related to work posture problems and the incidence of *Musculoskeletal Disorders* (MSDs); To other researchers, it is hoped that further research can be conducted between secondary/environmental factors and the incidence *of Musculoskeletal Disorders* (MSDs).

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