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Research Article

MUSCULOSKELETAL DISORDER COMPLAINTS AMONG WELDERS AND GRINDING WORKERS AT PT. X

Sugiantoro[1]*, Ratna Ayu Ratriwardhani[2], Moch. Sahri[3], Merry Sunaryo[4]

[1-2]Study Program D-IV Occupational Safety and Health (K3), Nahdlatul Ulama University Surabaya, East Java

Corresponding Author :
Ratna Ayu Ratriwardhani
E-mail: ratna.ayu@unusa.ac.id , Tel. 085732455591

ABSTRACT

Background: Welders and grinding work at PT. X is carried out manually with non-ergonomic working postures, such as bending or prolonged standing. This study aims to describe work-related musculoskeletal disorder (MSDs) complaints based on individual characteristics (age, gender) and job-related factors (length of employment, daily working hours, and type of work).
Methods: The method used is a descriptive quantitative approach with a cross-sectional design, involving 47 respondents using a total population sampling technique. Data were collected using a musculoskeletal complaint survey instrument based on the Indonesian National Standard (SNI) 9011:2021.
Results: The results showed that the majority of respondents were male (93%), aged 25-34 years (42%), and had 1-5 years of work experience (70%). The most reported MSDs complaints were in the lower back (36%), upper back (55%), and neck (23%).
Conclusion: Based on the descriptive analysis, both individual and occupational factors contributed to MSDs complaints, particularly in body parts affected by non-ergonomic working postures. Recommended interventions include proper posture training, provision of ergonomic aids to reduce physical load, and regular health check-ups to decrease the prevalence of MSDs among workers.

Keywords: Musculoskeletal Disorder, SNI 9011, Age, Gender, employment

INTRODUCTION

Production activities in manufacturing industries, such as those at PT. X, require physical involvement from workers in performing tasks like Welders and grinding. These activities are generally carried out manually and often demand non-ergonomic body postures, such as prolonged bending, static standing, or repetitive arm movements above shoulder level . In the long term, such postures may lead to musculoskeletal problems, known as Work-Related Musculoskeletal Disorders (MSDs). MSDs are one of the most common occupational health issues found in the industrial sector, particularly in jobs involving physical workload, repetitive movements, and extended work duration.

According to data from the International Labour Organization (ILO), musculoskeletal disorders are a leading contributor to work absences and decreased productivity. Individual characteristics such as age and gender, as well as job-related characteristics like years of service, working hours, and type of job, also contribute to the level of MSDs risk. Younger workers typically engage in more physical activity but tend to pay less attention to ergonomic principles, while workers with moderate years of service are often in the adjustment phase to workload and workplace conditions. Based on this phenomenon, this study was conducted to identify the profile of MSDs (Work-Related Musculoskeletal Disorders) complaints among Welders and grinding workers at PT. X based on individual and job-related characteristics, as well as to provide input for the prevention of such disorders.

This study addresses several research gaps. First, there is a lack of studies that specifically focus on MSDs complaints among Welders and grinding workers in the manufacturing sector, especially in Indonesia. Second, the use of national standard instruments such as SNI 9011:2021 remains very limited in previous studies. Most existing research tends to rely on other assessment tools such as RULA, REBA. This study is one of the few that adopts the Indonesian National Standard SNI 9011:2021, making it more relevant to the local context and regulations in Indonesia.

Third, most previous studies have only examined one or two risk factors, such as age or working posture. This study aims to provide a more comprehensive overview by analyzing a combination of individual factors (age, gender) and job-related factors (years of service, working hours, and type of job) in relation to MSDs complaints. Fourth, no prior research has been conducted specifically at PT. X, making this study an initial contribution to providing contextual data that can be utilized in decision-making within the company.

MATERIAL AND METHODS

This study employed a descriptive quantitative approach with a cross-sectional design. The population consisted of all workers in the Welders and grinding sections at PT. X, totalling 47 individuals. The sampling technique used was total sampling, meaning the entire population was included as research respondents. Data were collected using a musculoskeletal complaint survey questionnaire that referred to the Indonesian National Standard (SNI) 9011:2021. The questionnaire included 21 body parts for which the level of complaints was assessed, such as the neck, shoulders, upper back, lower back, elbows, wrists, and others.

The observed variables were divided into two categories: (1) individual characteristics, including age and gender, and (2) job-related characteristics, including

years of service, daily working hours, and type of work (Welders or grinding). The data obtained were then analyzed descriptively using cross-tabulation and percentage distribution to illustrate the occurrence of WMSD complaints based on each respondent's characteristics.

RESULTS

The analysis results showed that the majority of respondents were male (93%) and female (7%). The largest age group was between 25-34 years (42%), followed by 35-44 years (36%). In terms of years of service, 70% of respondents had worked for 1-5 years, indicating a group with moderate to high risk of MSDs complaints. Job type also influenced the number of complaints, where Welders workers reported 60% of complaints, while grinding workers accounted for 40%. The most frequently reported MSDs complaints were in the upper back (55%), followed by the lower back (36%), and the neck (23%). This indicates that static and repetitive working postures, especially during Welders activities, place greater stress on those body areas. The younger age group (25-34 years) tended to dominate the complaints, likely due to high physical activity combined with a lack of attention to ergonomic posture. Meanwhile, the 1-5 years of service group showed a peak in complaints, which may be related to the adaptation period to physical workload.

Table 1. Frequency Distribution of Characteristics Based on Age Among Welders and Grinding Workers at PT. X

No	Age Group	Life Stage	Frequency (n)	Percentage (%)
1.	15-19	Adolescence	0	0
2.	20-24	Early Adulthood	12	26
3.	25-34	Young Adulthood	20	42
4.	35-44	Late Adulthood	8	17
5.	45-59	Early Elderly	7	15
6.	60	Late Elderly	0	0
Total			**47**	**100**

Table 1 shows the frequency distribution of respondent characteristics based on age groups. Out of a total of 47 respondents, the majority were in the 25-34 age range (early adulthood), with 20 individuals or 42% (nearly half). The next most dominant age group was 20-24 years (young adulthood), with 12 individuals or 26% (almost half), followed by the 35-44 age group (late adulthood) with 8 individuals or 17% (a small portion). Meanwhile, 7 respondents or 15% (a small portion) were in the 45-59 age range (early elderly). There were no respondents in the 15-19 age group (adolescence) or the 60 years and above group (late elderly), both of which had a frequency of 0 individuals or 0% (none).

Table 2. Frequency Distribution of Characteristics Based on Gender Among Welders and Grinding Workers at PT. X

No	Gender	Frequency (n)	Percentage (%)
1.	Male	44	93
2.	Female	3	7
	Total	**47**	**100**

Based on Table 2, which presents the frequency distribution of respondents by gender among Welders and Grinding workers at PT. X, out of a total of 47 respondents, 44 individuals or 93% (nearly all) were male, while only 3 individuals or 7% (a small portion) were female.

Table 3. Frequency Distribution of Characteristics Based on Length of Service Among Welders and Grinding Workers at PT. X

No	Length of Service	Frequency (n)	Percentage (%)
1.	Length of Service < 1 year	0	0
2.	Length of Service 1 -5 year	33	70
3.	Length of Service 6-10 year	10	22
4.	Length of Service > 10 year	4	8
	Total	**47**	**100**

Based on Table 3, which presents the distribution of respondents by length of service among Welders and Grinding workers at PT. X, out of a total of 47 respondents, the majority had worked for 1-5 years, totaling 33 individuals or 70% (the majority). A total of 10 individuals or 22% (a small portion) had worked for 6-10 years, and only 4 individuals or 8% (a small portion) had more than 10 years of service. There were no respondents with less than 1 year of service, 0% (none).

Table 4. Frequency Distribution of Characteristics Based on Working Duration Among Welders and Grinding Workers at PT. X

No.	Working Hours per Day	Frequency (n)	Percentage (%)
1.	< 8 hours/day (Low)	0	0
2.	8 hours/day (Moderate)	47	100
3.	> 8 hours/day (High)	0	0
	Total	**47**	**100**

Table 4 shows the distribution of respondents based on daily working duration. Out of a total of 47 respondents, all of them 100% (entirely)-worked 8 hours per day, which is categorized as a moderate working duration. There were no workers with a daily working duration of less than 8 hours (low category) or more than 8 hours (high category).

Table 5. Frequency Distribution of Characteristics Based on Job Type Among Welders and Grinding Workers at PT. X

No	Type of Job	Frekuensi (n)	Percentage (%)
1.	Welders	26	55
2.	Grinding	21	45
	Total	**47**	**100**

Table 5 shows the distribution of respondents based on job type. Out of a total of 47 respondents, 26 individuals or 55% (the majority) worked in the Welders section, while 21 individuals or 45% (nearly half) worked in the grinding section; [15].

Table 6. Frequency Distribution of Characteristics Based on Work-Related Musculoskeletal Disorders (MSDs) Complaints Among Welders and Grinding Workers at PT. X

Body Part GOTRAK	Level of MSDs Complaints by Body Part GOTRAK							
	Low Risk		Moderate Risk		High Risk		N	%
	n	%	n	%	n	%		
Neck	24	51,06	12	25,53	11	23,40	47	100
Right Shoulder	40	85,10	3	6,38	2	4,26	47	100
Left Shoulder	2	4,26	0	0	0	0		
Upper Back	26	55,32	11	23,40	10	21,28	47	100
Lower Back	17	36,17	15	31,91	15	31,91	47	100
Right Hip	40	85,10	4	8,51	0	0	47	100
Left Hip	2	4,26	1	2,13	0	0		
Right Knee	37	78,72	6	12,77	2	4,26	47	100
Left Knee	1	2,13	1	2,13	0	0		
Right Foot	44	93,62	0	0	0	0	47	100
Left Foot	2	4,26	1	2,13	0	0		
Right Calf	42	89,36	2	4,26	1	2,13	47	100
Left Calf	2	4,26	0	0	0	0		
Right Thigh	45	95,74	1	2,13	0	0	47	100
Left Thigh	1	2,13	0	0	0	0		

Based on data from 47 respondents, the level of work-related musculoskeletal disorder (MSDs) complaints varied across several body parts. The most frequently reported complaints were in the lower back, with a relatively balanced distribution between moderate risk at 31.91% (nearly half), high risk at 31.91% (nearly half), and low risk at 36.17% (nearly half). Additionally, the neck and upper back also showed significant complaint levels. For the neck, 51.06% (the majority) of respondents reported low risk, followed by 25.53% (nearly half) moderate risk, and 23.40% (a small portion) high risk. The upper back showed 55.32% (the majority) low risk, 23.40% (a small portion) moderate, and 21.28% (a small portion) high. The high complaint rates in these areas may be related to prolonged bending or static postures. Meanwhile, other body parts such as the right shoulder, right hip, right knee, and right calf were predominantly reported with low-risk complaints, above 78% (almost all), indicating that workload on these areas remains within light limits. Conversely, areas such as the left shoulder, left arm, left hand, left thigh, and left elbow showed very low complaint rates, generally only 2.13%-4.26% (a small portion) of respondents experiencing

low risk, with almost no respondents in the moderate or high-risk categories.

a. Neck
High risk = 23.40% (a small portion)
Moderate risk = 25.53% (nearly half)
Low risk = 51.06% (the majority)

b. Lower Back
High risk = 31.91% (nearly half)
Moderate risk = 31.91% (nearly half)
Low risk = 36.17% (nearly half)

c. Left Elbow
Low risk = 2.13% (a small portion)
Moderate & High risk = 0% (none)

DISCUSSION

Musculoskeletal disorder (MSDs) complaints were more frequently reported among the 25-34 age group. This age range falls under the productive age category, which is typically more physically active and often involved in intensive work activities. As age increases, muscle elasticity and physical endurance tend to decline, resulting in a higher risk of muscle fatigue. This aligns with the literature stating that muscle complaints often begin in middle age and tend to increase with aging (Tarwaka, 2015).

The majority of respondents were male, and MSDs complaints were predominantly reported by male workers. This is because men are more commonly engaged in physically demanding jobs, such as Welders and grinding. While men generally have greater muscle strength than women, it does not mean they are free from risk; in fact, male workers are more exposed to heavy physical activity and static work postures that significantly contribute to MSDs.

MSDs complaints were most frequently found among workers with 1-5 years of service. This period may represent an adaptation phase where workers have not yet fully adjusted, and still lack sufficient experience in applying ergonomic working postures. It may also relate to the cumulative workload over a period that has not yet reached a stable phase, where the muscles and body have not fully adapted to the physical demands of the job. Most respondents worked for 8 hours per day.

Prolonged working hours-especially when performed in static positions without stretching or task rotation-can increase muscle tension and lead to musculoskeletal complaints. Extended physical activity without adequate breaks can impair blood circulation, cause muscle fatigue, and raise the risk of musculoskeletal injuries.

CONCLUSION

Based on the research findings on work-related musculoskeletal disorders (MSDs) among Welders and grinding workers at PT. X, it can be concluded that individual factors such as age and gender, as well as occupational factors such as length of service, working duration, and job type, contribute to MSDs complaints. The most commonly reported complaints were in the upper back, lower back, and neck, with a higher prevalence among Welders workers compared to grinding workers.

Workers aged 25-34 years and those with 1-5 years of service reported the highest levels of complaints. Non-ergonomic working postures, repetitive activities, and prolonged work duration were identified as the main triggers. Therefore, MSDs risk control should be implemented through proper posture training, the provision of ergonomic tools, and regular health check-ups to maintain workers' musculoskeletal health and improve work productivity.

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