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Risk Factors For Musculoskeletal Complaints Among Flower Board Craftsmen in Jember City

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ABSTRACT

The musculoskeletal system plays an important role in carrying out daily activities to increase work productivity. However, musculoskeletal complaints are still common, especially in the informal sector, which have an impact on work accidents and decreased work productivity. This study aims to assess the risk of work posture and factors related to both individuals and work on musculoskeletal complaints. This type of research is a analytic cross-sectional study with descriptive and correlational analysis. It was conducted on 8 florists producing flower boards with a sample of 31 flower board craftsmen. Data collection methods were carried out through interviews and observations, using a questionnaire on respondent characteristics, Rapid Entire Body Assessment (REBA) to measure work posture, and Nordic Body Map (NBM) to assess MSDs complaints. The results showed that almost all flower board craftsmen experienced MSDs complaints with the most common level of complaints being moderate at 45.2%. There is a relationship between individual factors (age, smoking habits, years of service, and BMI) and work factors (work posture) with MSDs complaints. However, there is no relationship between individual factors (gender, exercise habits, and length of working) and work factors (work stage) with MSDs complaints. It was concluded that the risk factors for MSDs complaints in flower board craftsmen in Jember city were age, smoking habits, years of service, BMI, and work posture.

***Keywords** : Work Posture; MSDs; Craftsmen; Nutritional Status; Informal Sector*

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INTRODUCTION

The human movement system, or musculoskeletal system, is an essential component of the human body. The potential function of the musculoskeletal systems are to protect and support the limbs, maintain posture, and generate movement (1). The musculoskeletal system plays a important role in daily activities and/or increases human productivity. However, the musculoskeletal system can experience disorders. Musculoskeletal disorders (MSDs) are a group of problems which cause pain in the tendons, nerves, and muscles due to injuries that occur due to continuous use and develop over time, such as frequent and repetitive work activities and awkward postures (2) Many people still experience musculoskeletal complaints.

Musculoskeletal disorders affect as many as 1.71 billion people worldwide. Musculoskeletal conditions, including low back pain, are a leading cause of disability worldwide, with as many as 160 countries experiencing disability (3). Poor musculoskeletal conditions significantly limit movement and speed, leading to early retirement from work, reduced well-being, and reduced participation in society. The 2019 Global Burden of Disease (GBD) data shows that 1.71 billion people worldwide experience musculoskeletal complaints such as neck pain, low back pain, osteoarthritis fractures, amputations, and like a rheumatoid arthritis (4).

Article 86 paragraph 1 of Law No. 13 of 2003 concerning Manpower states that every worker has the right to protection of occupational health and safety (4). Workers in the informal sector are exposed to a higher risk of experiencing MSDs due to a lack of OSH supervision, low education related to ergonomics, and working conditions that are not yet aware of the implementation of OSH. Specifically, problems with musculoskeletal complaints are still found in the community of flower board craftsmen. Research studies explain that the figures of MSDs in a similar sector, namely flower garden workers in Kenya, is very high at 68.1%. The most affected body parts are the lower back, hands/wrists, and

feet/ankles (5). Among flower board craftsmen in Mumbai, there is a high number of complaints of hand discomfort among florists in the informal sector. The most significant complaints based on research results are in the wrist, followed by the index finger, middle finger, and thumb. These complaints are caused by repetitive work, the use of large forces, and awkward and extreme wrist postures (4).

Individual factors include age, gender, smoking habits, exercise habits, years of service, length of working, Body Mass Index (BMI), and physical strength (6). A study in a similar informal sector, namely bamboo weaving craftsmen, showed that factors influencing musculoskeletal complaints include repetitive movements, body posture, work duration, and non-ergonomic tools (7). Other research results indicate that determinants that significantly increase the risk of MSDs include time, length of work, and exercise habits in bamboo weaving craftsmen (8). In other informal sectors, such as palm fiber broom craftsmen, four factors are age, working years, work duration, and work posture, have a significant influence on MSD complaints (9).

Flower board craftsmen are at risk of exposure to ergonomic hazards and experience MSDs complaints. When assembling flower boards, it consists of various activities such as cutting materials/florist foam, piercing or sticking flowers, lifting and holding boards which are sources of load and increase the risk of awkward work postures, activities using scissors or knives, and postures when bending, stooping and standing. Based on Observations made show that there are several things like awkward postures during the flower board making process. The work is dominated by squatting and standing work positions, even though in fact a normal sitting position with easy reach of work equipment does not require much strength and muscle performance. MSDs complaints are caused by individual, environmental, and work factors.

In the informal sector, there is less attention paid to occupational health and safety. Musculoskeletal complaints in informal workers can impact the health, productivity, and

well-being of informal sector workers, particularly flower board artisans. Research has shown that musculoskeletal complaints can lead to decreased work productivity, such as slower work hours and frequent breaks, which can lead to increased order completion time (10). Furthermore, they can also negatively impact the quality of life of flower board artisans, disrupting sleep and daily activities outside of work (11).

Efforts that can be made include monitoring or measuring risk factors such as assessing the work posture of flower board craftsmen. Monitoring worker health aims to evaluate whether interventions or improvements have been made to reduce the risk of MSDs (12). Through monitoring MSD risks and ergonomic risk factors, the aim is to monitor health risks, improve work stations, and improve workers (13). The REBA method can be used to measure work posture risks. The advantages of the REBA method are that it is easy, fast, and can assess all parts of the worker's body. This method is appropriate for the characteristics of flower board arrangement work that uses all parts of the body, starting from the neck, back, arms, hands, and legs of workers (14). There are 13 steps in calculating the REBA score, divided into three tables. Table A assesses the posture of the neck, trunk, and legs.

Jember City is the capital and center of Jember Regency's social life. It is home to three sub-districts: Kaliwates, Sumbersari, and Patrang. The majority of important buildings frequently used for receiving flower boards, such as government offices, institutional offices, and meeting halls, are located in Jember City. Therefore, it is important to consider the factors influencing the flower board craft sector.

Based on the background study and preliminary studies above, flower board craftsmen in Jember City are at risk of experiencing MSDs. The lack of studies discussing musculoskeletal complaints in flower board craftsmen is the reason for the need for research because many factors originating from individual factors, job factors, and environmental factors that can increase the risk of musculoskeletal complaint. Therefore,

this research aims to assess risk of work posture and analyze the factors that influence it as a basis for stakeholders in formulating efforts to prevent MSDs complaints in flower board craftsmen in Jember City.

METHODS

Type of this research is descriptive with quantitative approach and the design of research is cross sectional, where data collection was conducted at the same time (15). The research aimed to assess the risk of Musculoskeletal complaints among flower board craftsmen in Jember City based on individual and work factors. The study was conducted in eight florists in Jember City with a population and sample of 31 flower board craftsmen, selected using a saturated sampling method. The study took place from January to April 2023. Data collection methods were carried out through interviews with observations, using a questionnaire on respondent characteristics, Rapid Entire Body Assessment (REBA) to measure work posture, and *Nordic Body Map* (NBM) to assess MSD complaints.

The research variables consisted of independent variables consisting of individual factors (age, gender, smoking habits, exercise habits, years of service, length of working, and nutritional status/BMI) and work factors (work stages and work posture). The dependent variable consisted of MSDs complaints. The following are the operational definitions and categories of each variable:

a. Age: The respondent's lifespan in years, calculated from birth to the time of the study, with categories such as "Not at Risk" (<35 years) and "At Risk" (≥35 years) (16).
b. Gender: The biological differences observed in the physical condition of respondents, categorized as male and female.

c. Smoking habits: The respondent's smoking level, calculated using the Brinkman index. The categories are: "Never smoker," "Light smoker" (1-19), "Moderate smoker" (20-59), and "Heavy smoker" (≥60) (17).
d. Exercise habits: The frequency of physical activity involving skeletal muscles for 10-20 minutes to optimize blood circulation and improve functional capacity. The categories are: "Never"; Sometimes (1-2 times a week) and Often (≥ 3 times a week) (18).
e. Length of Working are the average number of hours per week spent by respondents arranging flower boards in one week, measured in hours, with categories being Normal (≤ 8 hours) and Excessive (> 8 hours) (19).
f. Years of Service respondents have worked as flower board craftsmen up to the time of the study, with categories being New (≤ 3 years) and Old (> 3 years) (20).
g. BMI is an indicator of respondents' nutritional status, representing the ratio of body weight (kg) to height (m) squared, with categories being Not Obese (≤ 25) and Overweight (> 25) (21).
h. The work steps in the flower board making process, which are the respondents' duties, consist of making the board; making the cork letter, and arranging the flowers.
i. Work posture is the working position of the flower board craftsmen when carrying out the work stages of making the board, making the cork letter, or arranging the flowers. The categories are Acceptable Risk (score 1); Low Risk (score 2-3); Moderate risk (score 4–7); High risk (score 8–10); and Very high risk (score ≥ 11).
j. MSDs complaints refer to pain/tenderness in the muscles and bones experienced by flower board craftsmen during or after work. The categories are Low (final score 28–49); Moderate (final score 50–70); High (final score 71–91); and Very high (final score 92–112).

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Data on age, gender, smoking habits, exercise habits, years of service, length of work, work stages, and MSDs complaints were collected through interviews, while nutritional status was obtained from measuring the respondents' height and weight. Data analysis was conducted descriptively with frequency distribution, percentages, and cross-tabulation. The statistical analysis used Spearman correlation test to test the relationship between ordinal scale variables and MSD complaints. The relationship between gender and work stage ad MSD complaints was analyzed usinguji chi-squareor alternative testKolmogorov, with a significance level of $p < 0.05$.

RESULTS

The results consist of the characteristics of the research subjects, related to work factors and MSD complaints, and a multivariate analysis related to the relationship between individual factors and work factors with MSDs complaints. The results of research on data collection through interviews and measurements obtained data The distribution of respondents' individual characteristics is presented in Table 1 as follows:

Table 1
Individual Characteristics Of Flower Board Craftsmen

Variables	Frequency (n)	Percentage (%)
Age		
< 35 Years	12	38,7
≥ 35 Years	19	61,3
Gender		
Man	24	77,4
Women	7	22,6
Smoking Habit		
No Smoking	8	25,8
Light Smokers (Brinkman Index 1 – 199)	11	35,5
Moderate Smokers (Brinkman Index 200-599)	12	38,7

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Exercise Habits		
Never	9	29,0
Rarely (1 – 2 times per week)	21	67,7
Frequently (≥ 3 times per week)	1	3,2
Working Hours		
Normal (≤ 8 jam per hari)	16	51,6
Excessive (> 8 jam per hari)	15	48,4
Working Years		
New (≤ 3 tahun)	11	35,5
Long (> 3 tahun)	20	64,5
BMI (BODY MASS INDEX)		
Not Obese (BMI ≤ 25)	14	45,2
Obese (BMI (> 25)	17	54,8
Total	**31**	**100**

Source : Primary Data, 2023

In table 4.1 are the characteristics of respondents. It is evident that the majority in Jember City are in the age range ≥ 35 years, amounting to 19 (61.3%) respondents, gender is dominated by men amounting to 24 (77.4%) respondents, moderate smokers amounting to 12 (38.7%) respondents, rarely exercise amounting to 21 (67.7%) respondents, and overweight amounting to 17 (54.8%) respondents. In addition, 16 (51.6%) respondents have a normal working period of ≤ 8 hours and 20 (64.5%) respondents have worked as flower board craftsmen for a long time, namely > 3 years.

The work factors in this study were posture, stage, duration, and frequency of work. Work posture was assessed using the REBA instrument, with the criteria being awkward postures that are frequently used and have prolonged positions. Drawing on the results of observations and measurements, data on the respondents' work factors are obtained in Table 2 below:

Table 2
Distribution of work factors among flower board craftsmen

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Variables	Frequency (n)	Percentage (%)
Work Stage		
Assembling The Board	17	54,8
Printing Cork	5	16,1
Arranging flowers	9	29,0
Work Posture		
High risk (REBA skor 8 – 10)	15	48,4
Very Highrisk (REBA skor ≥ 11)	16	51,6
Total	**31**	**100**

Source : Primary Data, 2023

Table 2 shows that the majority of flower board craftsmen in Jember City work at the board assembly stage, amounting to 17 (54.8%) respondents. The dominant work posture criteria are very high-risk postures, amounting to 16 (51.6%). In addition, 16 (51.6%) respondents work in static postures for >1 minute and 27 (87.1%) respondents experience repetitive movements >4 times per minute.

Table 3
Distribution of MSDs complaints among flower board craftsmen

No.	MSDs Complaint Rate	Amount	Percentage (%)
1	Low (Score 28 – 49)	4	12,9
2	Moderate (Score 50 – 70)	14	45,2
3	High (Score 71 – 91)	13	41,9
	Total	**31**	**100**

Source : Primary Data, 2023

The results of interviews using the NBM questionnaire with all respondents regarding MSD complaints are shown in Table 3. The table shows that all flower board

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artisans experienced MSD complaints. The most common level of MSD complaints was moderate, at 14 (45.2%) respondents.

Table 4
Distribution of MSDs complaints based on body parts among flower board craftsmen

No.	Parts Of Body	MSDs complain			
		Yes		No	
		n	%	n	%
1	Back	29	94	2	6
2	Upper Neck	28	90	3	10
3	Right Shoulder	26	84	5	16
4	Right Forearm	46	84	5	16

Source : Primary Data, 2023

Meanwhile, table 4 shows that the highest MSD complaints in the body parts were the back, 29 (94%) respondents, the upper neck, 28 (90%) respondents, and the right shoulder and lower arm, 46 (84%) respondents each.

Table 5
The correlation between individual-level factors and musculoskeletal complaints among flower board craftsmen

Individual Factors	MSDs Complain						p	r
	Low		Moderate		High			
	n	%	n	%	n	%		
Age								
< 35 years	2	16,7	8	66,7	2	16,7	0,043	0,365
≥ 35 years	2	10,5	6	31,6	11	57,9		
Gender								
Man	3	12,5	10	41,7	11	45,8	0,402	
Women	1	14,3	4	57,1	2	28,6		
Smooking habit								
No smoking	2	25	4	50	2	25	0,044	0,364
Light smoker	1	9,1	7	63,6	3	27,3		
Moderate smoker	1	8,3	3	25,0	8	66,7		
Exercise Habits								
Never	0	0	4	44,4	5	55,6	0,101	- 300

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Individual Factors	MSDs Complain						p	r
	Low		Moderate		High			
	n	%	n	%	n	%		
Seldom	3	14,3	10	47,6	8	38,1		
Often	1	100	0	0	0	0		
Working Hours								
Normal	2	12,5	8	50	6	37,5	0,704	0,071
Excessive	2	13,3	6	40	7	46,7		
Working Years								
New	3	27,3	6	54,5	2	18,2	0,022	0,409
Long	1	5	8	40	11	55		
BMI								
Not obese	3	21,4	8	57,1	3	21,4	0,029	0,393
Obese	1	5,9	6	35,3	10	58,8		

Source : Primary Data, 2023

The results of the study related to individual factors with MSDs complaints showed that the most MSDs complaints were experienced by flower board craftsmen with an age category of ≥ 35 years (57.9%), male gender (45.8%), respondents with moderate smoking experienced high MSDs complaints (66.7%), never exercised (55.6%), work period ≤ 3 years (54.5%), respondents with excessive working hours (46.7%), and respondents with a BMI category of overweight (58.8%).

The results demonstrate that there is a strong unidirectional corellation between age and MSD complaints through the Spearman test showing a significance value of 0.043 with a correlation coefficient of 0.365. Then, there is a fairly strong unidirectional relationship between smoking habits with MSDs complaints with the Spearman test showing a significance value of 0.044 with a correlation coefficient of 0.364. In addition, there is a unidirectional corellation between working years and BMI with MSD complaints based on the results of the Spearman test with each significance value of 0.022 and 0.029, and then the correlation values of 0.409 and respectively and 0.393.

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However, No significant association was found between gender and MSD complaints based on the Kolmogorov test with a significance value of 0.402 and the exercise habit variable with MSD complaints also does not have a significant relationship from the Spearman test results showing a significance value of 0.101. The Spearman test results can also be seen to have a significance value of 0.704 so There is no association between length of work and MSD complaints.

Table 6
The relationship between worker factors and MSDs complaints in flower board craftsmen

Job Factors	MSDs Complaints						p	r
	Rendah		Sedang		Tinggi			
	n	%	n	%	n	%		
Work Stage								
Assembling the board	1	5,9	9	52,9	7	41,2	0,763	
Printing Cork	0	0	1	20	4	80		
Arranging flowers	3	33,3	4	44,4	2	22,2		
Work Posture								
HIGH RISK	4	26,7	7	46,7	4	26,7	0,029	0,391
VERY HIGH RISK	0	0	7	43,8	9	56,3		

Source : Primary Data, 2023

Based on table 6, it shows that the complaints of MSDs of flower board craftsmen were mostly experienced by workers at the board assembly stage, most of whom experienced moderate levels of 9 (52.9%) respondents. Respondents who were tasked with printing cork mostly experienced high MSDs complaints as many as 4 (80%) respondents. Meanwhile, respondents at the flower arrangement stage mostly experienced moderate MSDs complaints as many as 4 (44.4%) respondents. There is no relationship between the work stage and MSDs complaints in flower board craftsmen in Jember City. Based on the results of the Kolmogorov test, it shows a significance value of 0.763.

The majority of flower board craftsmen with high-risk work postures experienced moderate MSDs complaints, amounting to 7 (46.7%) respondents. Meanwhile, respondents with very high-risk work postures mostly experienced high MSDs complaints, amounting to 9 (56.3%). The results of the Spearman test showed a significance value of 0.029 with a correlation coefficient of 391, meaning there is a fairly strong unidirectional relationship between work posture and MSDs complaints in flower board craftsmen in Jember City.

DISCUSSION

MSDs complaints based on individual factors in flower board craftsmen

Age has a consistent relationship with MSDs. Similar research in other artisan sectors, such as batik, shows a significant relationship between age and musculoskeletal disorders (22). This age is considered the adult phase, a productive period with various health risks (23). This is due to at this age, human muscle strength and endurance decline due to tissue damage, fluid loss, decreased bone density, and scar tissue replacement (24).

Gender was not significantly associated with MSDs. Similar results were found in studies in other artisan sectors, indicating that all batik artisans, both men and women, are at high risk of musculoskeletal complaints. This is because men physiologically have stronger muscles than women. Therefore, women are more likely to experience complaints or pain in their bodies when performing risky work (25). The majority of female respondents (43.9%) worked in flower arranging, which does not require much energy. Meanwhile, the majority of male respondents (58.3%) worked in board assembly, which requires greater physical exertion (26).

Smoking is strongly associated with MSDs among flower board craftsmen in Jember City. This is in line with research which found a strong association between smoking and musculoskeletal complaints, where workers spend more time smoking during breaks, increasing fatigue and increasing the risk of musculoskeletal complaints (27). Furthermore, statistical tests showed no association between exercise habits and MSDs. 58.8% of flower

board craftsmen in Jember City jog, 29.4% futsal, and 5.8% Zumba and push-ups, respectively. Futsal, Zumba, and push-ups are considered high-impact aerobics with a higher risk of injury (28).

Working years is significantly associated with MSD complaints. Research on batik artisans supports this finding, suggesting a corellation between years of service and MSD complaints. Years of service impacts muscle system deterioration due to several factors, such as continuous static loads and repetitive activities (25). Conversely, years of service is not associated with MSD complaints. This contrasts with research on stone and wood artisans in the construction sector, which found a relationship between MSD complaints and long working hours due to minimal rest periods (29).

BMI, or nutritional status, is closely related to with MSDs. Overweight workers are at higher risk of experiencing MSDs. Other research also demonstrates a link between BMI and MSDs (30). Overweight flower board artisans contract their back and leg muscles to support their own weight, which puts pressure on the spinal cord and causes pain (31).

MSDs complaints based on work factors in flower board craftsmen

Work posture is related to the occurrence of MSDs complaints among flower board craftsmen in Jember City (p-value 0.029 < 0.05 and correlation coefficient 0.391) In light of the research findings. A large proportion of respondents (56.3%) who work in very high-risk postures experience high MSD complaints, while 46.7% of respondents who work in high-risk postures experience moderate MSD complaints. Supported by research proving a link between working posture and musculoskeletal complaints among workers in the Sidoluhur Village Roof Tile Industry Center (p-value 0.00 < 0.05). High-risk work postures will increase the potential for MSD complaints by 3.889 times (32). The study findings indicated that the work posture of bamboo weavers is associated with MSD complaints. Some of the work processes with moderate or high-risk work positions, bamboo weavers complained of moderate and high-level musculoskeletal complaints. Meanwhile, in work

positions categorized as very high-risk, craftsmen complained of moderate to high levels of musculoskeletal disorders (9). Research results indicate that factors associated with an increased risk of MSDs include awkward work postures, poor work posture, lifting excessive weights, whole-body vibration, and contact pressure. In addition, several other risks include contact pressure and excessive force (33). Longer work duration also increases the time required for the recovery process (34).

Other work factors that influence the occurrence of MSDs based on REBA calculations are grip or coupling, work duration, and work frequency. The coupling score at each work stage has a different value. The availability of handles on hammers and staples allows workers to grip the tools firmly so they are given a score of 0. The sponge used for painting does not have a handle as in Figure 4.6 so it is given a score of 1. Meanwhile, the printing stage is done without holding a specific object so it is given a score of 0. The flower arrangement stage is given a score of 1 because the worker holds the flower stem without bringing it close to a body part that can support the weight. A total of 51.6% of flower board craftsmen in Jember City work in a static position, while the remaining 48.4% work in a normal position. Some board arrangers' legs are static in a squatting position for approximately 5 minutes when attaching and painting cork in one location. Then the worker will move to another attachment location. The lower body of flower arrangers and cork printers is also static in a sitting position for 30 minutes for each flower board. Static work involves the same muscles without rest periods, thus triggering the development of MSDs . However, there was no correlation between the work stage and MSDs. This suggests that musculoskeletal complaints in flower board craftsmen are influenced by other work factors like as work posture, working years, and work duration.

CONCLUSIONS AND RECOMMENDATIONS

Related research studies about "Risk Factors for MSDs Complaints in flower board craftsmen in Jember City concluded that most respondents were male, aged ≥ 35 years with

an average work period of > 3 years and a nutritional status category of obese or overweight. Work postures fall into the very high risk of MSDs category in most respondents. In most respondents, MSDs complaints are included in the moderate category, namely most experiencing MSD complaints in the upper neck, shoulders, thighs, and right forearm. The analysis of the study explain that there was a significant relationship between MSD complaints and work postures. In addition, age factors, smoking habits, work period and BMI were significantly related to MSD complaints. However, gender, exercise habits, and length of work were not related to MSD complaints.

Several research suggestions based on the research results as an effort to overcome and prevent MSDs that can be applied to flower board workers in Jember City. For business owners, namely the provision of ergonomic work equipment such as the provision of cork printing machines, automatic wood saws, cork printing tables and work chairs with a height adjusted to the average anthropometry of workers, chairs equipped with armrests and backrests as a means of workers' breaks and the provision of painting tools with strong grips. For workers should reduce smoking habits, diligently do low-impact aerobic exercise twice a week for 10-20 minutes, do stretching while working, regulate a healthy diet to maintain ideal nutritional status, rest body parts occasionally especially when feeling tired. Workers should set an ideal distance from the work object and not work in awkward positions. For further researchers, it is recommended to study the risk factors of MSDs in flower craftsmen with a larger sample so that more accurate research results are obtained, resulting in more studies related to the impact of MSDs in flower board craftsmen. In addition, the design with a more ergonomic work station for flower board craftsmen.

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