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RELATIONSHIP OF WORK POSTURE WITH WORK RELATED MUSCULOSKELETAL DISORDERS ON RICE FARMERS IN SOUTH SULAWESI

(CASE STUDY OF PLANTING MEDIA PREPARATION, SELECTION OF SEEDS AND RICE NURSERIES)

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ABSTRACT

In the agricultural sector, farmers are at risk of musculoskeletal disorders (MSDs) due to repetitive movements and non-ergonomic work postures. This study aims to determine the relationship between work posture and musculoskeletal disorder (MSD) complaints among farmers. A descriptive-analytic method with a cross-sectional approach was used. The sampling technique applied in this study was total sampling (n = 74). The Chi-square statistical test was used with a significance level of ∝ = 0.05. The results showed a significant relationship between work postures (manual) during the planting media preparation stage (p = 0.040) and the seedling stage (p = 0.031) with MSD complaints. However, no significant relationship was found between work postures (machine) during the planting media preparation stage (p = 0.051) and the seed selection stage (p = 0.241) with MSD complaints. It is recommended that farmers perform stretching exercises during breaks, and it is suggested that relevant agencies provide counseling on ergonomic work postures for farmers.

Keywords: Work posture; farmer; musculoskeletal disorders (msds); nordic body map (nbm); rapid entire body assessment (reba)

1. INTRODUCTION

The Global Burden of Disease (GBD) study shows that 171 billion people worldwide are affected by musculoskeletal disorders (MSDs). This condition can impact individuals of all ages, including those in high-income countries, with a total of 441 million affected. This is followed by

countries in the Western Pacific region, with 427 million people, and Southeast Asia, with 369 million cases (WHO, 2019). Experts from the Asia-Pacific region, speaking in Tokyo, have warned that MSDs pose a significant threat to productivity and economic growth across all types of businesses and industries. Informal workers, in particular, often lack awareness and knowledge of workplace hazards. (Tambun, 2019). In 2020, the prevalence diagnosed by health workers was 11.9%, whereas self-reported symptoms indicated a higher prevalence of 24.7%. The Basic Health Research Report of South Sulawesi Province indicates that the region has a prevalence of musculoskeletal disorders (MSDs), with a total of 34,958 cases (Kemenkes RI, 2018). According to the study's findings, there is a significant relationship between work posture and MSDs among rice farmers (Niswatun et al., 2018).

Indonesia is a country where the majority of the population works in the agricultural sector, particularly in rice cultivation, as rice is a staple food for the community (Nurmatia et al., 2020). Sidenreng Rappang District is a major rice granary in South Sulawesi Province. In addition to meeting the needs of the region, it also supplies food for eastern Indonesia (Sidrap District Regional Statistics, 2020). According to data from the Kulo District Agricultural Extension Center in 2021, there are 1,464 farmers, including those cultivating rice, corn, and plantation crops. In this study, the number of rice farmers in Rijang Panua Village, Kulo Sub-district, was 74.

Rice farmers follow several stages in the farming process, including the preparation of planting media, seed selection, and nursery. During the planting media preparation stage, farmers plow the fields using either a tractor or manually with a hoe. In the seed selection stage, farmers soak the seeds and select those suitable for sowing. At the nursery stage, the seeds are sown on prepared land. The seedlings are then transplanted to the planting field when they are 21–27 days old.

Based on this background, the researchers aim to examine the relationship between work postures and MSD complaints among rice farmers during the planting media preparation, seed selection, and nursery stages. Work postures were assessed using the REBA method by scoring the postures adopted, while MSD complaints were measured using the Nordic Body Map (NBM) questionnaire.

2. METHODS

The research method used was descriptive analytic with a cross-sectional study. Respondents' work posture data were analyzed using the REBA method, while MSD complaint data were obtained using the Nordic Body Map questionnaire. Work posture in this study refers to the position of respondents' bodies while working as rice farmers, assessed using the Rapid Entire Body Assessment (REBA) method. Complaints of musculoskeletal disorders in this study are defined as discomfort or pain affecting the skeletal muscles of respondents, ranging from mild discomfort to severe pain experienced during work. The sampling technique used was total sampling, involving 74 rice farmers from Rijang Panua Village, Kulo District, Sidenreng Rappang Regency. The primary data collected were processed using SPSS and analyzed with the chi-square test at a significance level of $\propto = 0.05$. The study team strictly followed ethical standards in

research, ethics approval documents are available by B.185/KEPK/FKIK/XII/2021 UIN Alauddin Makassar.

3. RESULTS AND DISCUSSION

Result

Univariate Analysis

The research conducted on 74 respondents identified their characteristics, including age, gender, tenure, and length of work. Based on the findings, the majority of respondents were aged 46–55 years (44.6%), male (98.6%), had 15–21 years of service (37.8%), and worked 8 hours per day (33.8%).

Table 1 Respondent Characteristics

Respondent Characteristics	Amount (n)	Percentage (%)
Age (Year)		
26-35	5	6,7
36-45	15	20,3
46-55	33	44,6
56-65	21	28,4
Gender		
Man	73	98,6
Woman	1	1,4
Length of Service (Year)		
1-7	3	4,1
8-14	3	4,1
15-21	28	37,8
22-28	22	29,7
29-35	18	24,3
Total	74	100
Length of Work (Hour)		
3	1	1,3
4	2	2,7
5	3	4,1
6	8	10,8
7	12	16,2
8	25	33,8
9	19	25,7
10	4	5,4
Total	74	100

Source: Primary Data, 2021

Work Posture of Rice Farmers

The respondents' work posture was assessed using the REBA method. In this method, body parts are individually coded and assessed. The assessment is derived from scoring results, which are then used to determine values in the Group A, B, and C tables. The final result indicates the level of risk and the necessary corrective actions.

Table 2 Distribution of REBA Respondents Based on the Work Postures of Rice Farmers

Workflow Process	Work Posture Risk Levels	Amount (n)	Percentage (%)
Preparation of Planting Media	**Using the machine**		
	Low	28	43,7
	Medium	36	56,3
	Total	**64**	**100**
	Manual Work Methods		
	Medium	3	30,0
	High	7	70,0
	Total	**10**	**100**
Seed Selection	Low	5	6,8
	Medium	50	66,2
	High	20	27,0
	Total	**74**	**100**
Rice Nursery	Medium	13	17,6
	High	45	60,8
	Very High	16	21,6
	Total	**74**	**100**

Source: Primary Data, 2021

Based on Table 2, the majority of rice farmers' work posture risk levels at the planting media preparation stage (machine) are categorized as medium (56.3%), while the planting media preparation stage (manual) is categorized as high (70.0%). During the seed selection stage, the majority fall into the moderate risk category (66.2%), and at the rice nursery stage, most are at a high-risk level (60.8%).

The following is an example of a calculation used to determine the risk level of work postures frequently performed by respondents. For moderate risk, with a final score of 4–7, refer to the figure below.

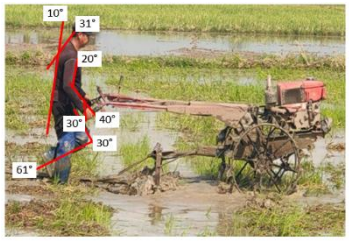


Figure 1: Plowing Rice

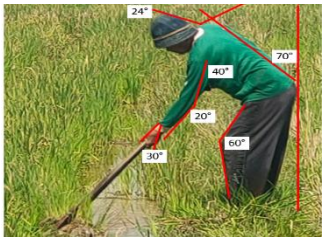
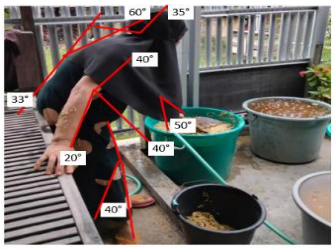


Figure 2: Manual



Rice Seed Soaking

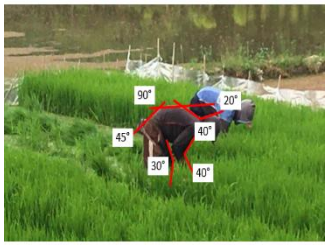


Figure 4. Rice nursery

Based on the REBA calculations (Figure 1) from the analysis results, the farmer's neck posture is bowed at an angle of 31° (score 2). The spine is in an upright position with an angle of 10° (score 1). The leg posture indicates standing on both legs, but the knees are bent at an angle of 30° (score 1), with an additional score for the legs bending between 30° and 60° (score 2).

All these scores are then entered into Table A, resulting in a score of 2. This score is further combined with the load carried by the farmer, which ranges between 117–183 kg, indicating a weight >10 kg (score 2). Finally, the score from Table A is summed with the load score, yielding a total score of 4 for Group A

The farmer's upper arm posture is flexed at an angle of 20° (score 2). The forearm forms an angle of 40° (score 1), and the wrist posture is extended (score 2). This score is then added to the grip condition score, which indicates a good and strong grip (score 0). As a result, the score for Group B is 2. The sum of the scores from Group A and Group B can be seen in Table C, resulting in a total score of 4.

In the process of preparing the planting media, specifically during plowing, farmers maintain a static posture for more than 1 minute (activity score = +1). To obtain the final result, the Table C score is added to the activity score, resulting in a final REBA score of 5. This indicates an action level of 2, which corresponds to a moderate risk, requiring corrective action to be taken.

In the REBA method, the preparation stage of planting media (manual) is categorized as high risk (Figure 2). The analysis results show that the neck posture is bowed at an angle of 24° (score 2). The spine is in a flexed position at an angle of 70° (score 4). For the leg posture, it is observed that the farmer is standing on both legs, with one leg bent at an angle of 60° to support the body's weight (score 2). Additionally, there is an extra score of +1 due to the leg bending at a 60° angle (score 3). All these scores are entered into Table A, resulting in a total score of 7. This

score is then added to the load score for the manual process, which involves a load of 1.5 kg (score 0). After summing, a total score of 7 is obtained for Group A.

The upper arm posture shows a slight flexion at an angle of 40° (score 2). The forearm forms an angle of 20° (score 2). For the wrist posture during hoeing, it forms an angle of 30° (score 2). This score is then added to the grip condition of holding and lifting weights with a strong grip, brought closer to the body (score 0). Thus, the sum of the Group A and Group B scores results in a Group C score of 7.

During the manual plowing stage, farmers perform posture activities in a static/still position for more than 1 minute. Based on the activity table, the activity score is +1. To obtain the final result, the Table C score is added to the activity score, resulting in a final REBA score of 8. Based on the REBA score calculation, it can be concluded that the action level is 3, indicating a high-risk level, so corrective action needs to be taken immediately.

MSDs Complaints from Rice Farmers

The Nordic Body Map is a questionnaire used to determine and assess the level of MSD complaints in the limbs of rice farmers. Below are the results showing the distribution of the risk levels of MSD complaints among the respondents.

Table 3: Distribution of MSD Complaint Risk Levels Experienced by Respondents

Workflow Process	Risk level of MSD complaints	Amount (n)	Percentage (%)
Preparation of Planting Media (Using Mechine)	Medium	7	10,9
	High	39	60,9
	Very High	18	28,2
	Total	64	100
Preparation of Planting Media (Manual)	Medium	1	10,0
	High	4	40,0
	Very High	5	50,0
	Total	10	100
Seed Selection	Low	21	28,4
	Medium	21	28,4
	High	12	16,2
	Very High	20	27,0
	Total	74	100
Rice Nursery	Medium	15	20,3
	High	49	66,2
	Very High	10	13,5
	Total	74	100

Source: Primary Data, 2021

Table 3 shows that during the preparation of planting media using machines, the majority of MSD complaint risk levels fall into the high-risk category (60.9%). In the preparation of planting media manually, the majority are at a very high-risk level (50%). For seed selection, the majority

fall into the moderate-risk category (28.4%), while the rice nursery stage is predominantly at a high-risk level (66.2%).

Bivariate Analysis

The following is an analysis of the relationship between work posture and MSDs complaints, as shown in Table 4.

Table 4: Bivariate Analysis of the Relationship Between Work Posture and the Risk of MSD Complaints

Work Posture Risk	Risk level of MSD complaints								Total		*p-value*
	Low		Medium		High		Very High				
	n	%	n	%	n	%	n	%	N	%	
Preparation of Planting Media (Using Mechine)											
Low	0	0,0	5	17,8	19	67,9	4	14,3	28	100	0,051
Medium	0	0,0	2	5,6	20	55,5	14	38,9	36	100	
Preparation of Planting Media (Manual)											
Medium	0	0,0	0	0,0	3	100	0	0,0	3	100	0,041
High	0	0,0	1	14,3	1	14,3	5	71,4	7	100	
Seed Selection											
Low	0	0,0	1	20,0	2	40,0	2	40,0	5	100	0,240
Medium	14	28,5	12	24,5	7	14,3	16	32,7	49	100	
High	7	35,0	8	40,0	3	15,0	2	10,0	20	100	
Rice Nursery											
Medium	2	15,4	10	76,9	1	7,7	13	100	2	15,4	0,031
High	11	24,4	31	68,9	3	6,7	45	100	11	24,4	
Very High	2	12,5	8	50,0	6	37,5	16	100	2	12,5	

Source: Primary Data, 2021

At the stage of planting media preparation (machine), the majority of farmers with a low risk of work posture were found to have a high risk of MSD complaints (67.9%). Similarly, among those with a moderate risk of work posture, the majority also had a high risk of MSD complaints (55.5%). The results of the chi-square statistical test yielded a p-value of 0.051 ($p > 0.05$), indicating that there is no significant relationship between the work posture of farmers at this stage and the level of risk for MSD complaints.

At the stage of planting media preparation (manual), the majority of farmers with a moderate risk of work posture were found to have a high risk of MSD complaints (100%), while those with a high work posture risk predominantly had a very high risk of MSD complaints (71.4%). The chi-square statistical test results yielded a p-value of 0.041 ($p < 0.05$), indicating a significant relationship between the work posture of farmers at this stage and the level of risk for MSDs complaints.

At the seed selection stage, the majority of farmers with a low work posture risk were found to have both a high (40%) and very high (40%) risk of MSD complaints. For those with a moderate work posture risk, the majority had a very high risk of MSD complaints (32.7%), while for farmers with a high work posture risk, the majority had a moderate risk of MSD complaints (40%). The results of the chi-square statistical test yielded a p-value of 0.240 ($p > 0.05$), indicating that there is no significant relationship between the work posture of farmers at the seed selection stage and the level of risk for MSD complaints.

At the rice nursery stage, the majority of farmers with a moderate work posture risk were found to have a moderate risk of MSD complaints (76.9%), while those with a high work posture risk predominantly had a moderate risk of MSD complaints (68.9%). The chi-square statistical test results yielded a p-value of 0.031 ($p < 0.05$), indicating a significant relationship between the work posture of farmers at the rice nursery stage and the level of risk for MSDs complaints.

Discussion

The Relationship Between Machine and Manual Work Postures of Rice Farmers in Preparing Planting Media and the Risk Level of Musculoskeletal Disorders

Based on the results of the study, there is no relationship between the work posture of farmers using machines during the preparation of planting media and complaints of musculoskeletal disorders (MSDs). This contrasts with the work posture of farmers using manual methods, which shows a relationship between manual work posture and MSD complaints. High-risk activities include manual hoeing to clear the land, manual plowing, and cutting grass for land clearing. The study found a significant relationship between the manual work posture of farmers at the planting media preparation stage and MSD complaints. This is consistent with research conducted in Thailand, where most farmers report lower back complaints. The results also indicated that the majority of respondents in this study fell into the high-risk category for MSDs, highlighting the need for immediate intervention (Sombatsawat et al., 2019).

The stage of planting media preparation using manual methods carries a higher risk of musculoskeletal disorders (MSDs) because the work posture of farmers, when using hoes, is often hunched. The body follows the direction of the hoe, causing the upper body to lean forward. Additionally, the hands are in a repetitive motion while lifting the weight of the hoe. This work is also performed under the hot sun for extended periods, which can contribute to musculoskeletal complaints. The repetitive load placed on the muscles over a prolonged period can lead to damage to tendons, ligaments, and joints (Batara, 2021).

The Relationship Between Work Posture at the Seed Selection Stage and Musculoskeletal Disorder Complaints

Based on the results of the MSDs complaint levels at this stage, it was found that the majority of respondents fell into the moderate category, suggesting that corrective action may not be immediately necessary. The statistical analysis revealed no significant relationship between the work posture of farmers at the seed selection stage and MSD complaints. However, even though no relationship was found between work posture and MSD complaints at the seed selection stage, this posture remains an important factor to consider, given the relatively high risk of MSD complaints identified in the risk assessment.

The lack of a relationship may be due to farmers taking breaks between tasks or engaging in other activities, such as cooking. Seed selection is not done continuously throughout the day, so any poor work posture is offset by other movements or activities. Additionally, this stage is typically performed at home, and after the screening process, the seeds are transferred to sacks and left to dry in the sun.

The Relationship Between Work Posture at the Seedling Stage and Musculoskeletal Disorders

Based on the results of the study, it was found that there is a relationship between the work posture of farmers at the rice nursery stage and MSD complaints in Rijang Panua Village, Kulo District, Sidenreng Rappang Regency in 2021. This finding is consistent with the study by Salcha and Arni Juliani (2021), which also identified a relationship between work posture and MSD complaints in rice farmers. The results of the MSD complaint levels at this stage showed that the majority of respondents fell into the high-risk category, indicating the need for immediate action (Salcha and Arni Juliani 2021).

This research shows a relationship because, during this activity, the farmer's work posture is often very bent, repetitive on the hands, and carried out for long periods under the hot sun. This is consistent with research by Silviana et al. (2022), which found that MSD complaints experienced by coffee fruit pickers were predominantly in the pain category, especially in the left hand (Nukhe Andri Silviana et al., 2022). After the nursery process, rice seedlings are taken to the field for replanting. The load carried when transporting rice seedlings to the field can cause muscle fatigue, particularly in the shoulder and back muscles. This is supported by research in Thailand, which found that repetitive and awkward postures, along with carrying and lifting heavy loads of harvested crops, result in excessive pressure on the back, neck, and upper limbs (Sombatsawat et al., 2019).

4. CONCLUSION

The results showed a relationship between manual work posture (p = 0.040) and the seedbed stage (p = 0.031) with the risk level of MSD complaints. However, there was no relationship between the work posture of rice farmers during the planting media preparation stage (machine) (p = 0.051) and the seed selection stage (p = 0.240) with the risk level of MSD complaints. It is recommended that farmers perform stretching exercises during breaks, and it is suggested that relevant agencies provide counseling on ergonomic work postures for farmers.

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