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Prevalence of work-related musculoskeletal disorders among farmers in Pancasari Village, Sukasada District, Buleleng Regency: a preliminary study

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ABSTRACT

Background: Farmers are professionals who work actively in processing agricultural land. Farmers use physical strength to carry out all agricultural land activities, from seedling to harvesting. The daily work of farmers with high frequency in the long term can increase the risk of musculoskeletal systems called musculoskeletal disorders (MSDs).

Methods: This study used analytic descriptive research with data collection techniques in the cross-sectional study. Data was collected in May 2022 using the Nordic Body Map (NBM) questionnaire and interviews. The analysis method used the univariate software IBM SPSS Statistics 26 to describe the characteristics of the variables.

Results: Complaints experienced by research respondents with a score of 2 participated in the lower neck area (37.5%), right calf (35%), a score of 3 experienced in the waist area (22.5%), left knee and right knee (20%), a score of 4 was experienced in the waist area (35.5%). Respondents reported the risk of musculoskeletal issues, with 32 people in the low category and 8 in the medium category.

Conclusion: According to the questionnaire responses, the most common complaints were with the lower back, knees, lower neck, and shoulders. Musculoskeletal diseases are mainly in the low-risk category among farmers.

Keywords: Farmers, musculoskeletal disorders, nordic body map, work-related musculoskeletal disorders

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Background

Indonesia is an agricultural country where the majority of its population works as farmers and depends on the agricultural sector to improve national economic welfare and meet the demand for food. Based on data from the Central Statistics Agency in 2020, Indonesia's population was 270,203,917.[1] The number of residents whose farming profession is 33,487,806.[2] Farmers meet their living needs by using privately owned or rented land to grow crops.[3] Pancasari Village is 850 meters above sea level with an area of 12.80 km2.[2] Most Pancasari Village residents work in the agricultural sector, cultivating vegetables and strawberries.[4]

Farmers predominantly use physical strength to carry out all agricultural land activities, from seeding to harvest. Farmers' daily work with high frequency over a long period can increase the risk of health problems related to the musculoskeletal system.[5] This results in reduced work productivity, which lowers job satisfaction. Musculoskeletal complaints are complaints felt by a person that occur in the musculoskeletal system, including nerves, muscles, tendons, ligaments, joints, and cartilage due to decreased function of muscle strength and damage due to repeated muscle loading over a long period.[6]

Factors that cause musculoskeletal disorders include external factors, including the environment and work. The scope of work factors include work position, work tools, use of force, and repetitive movements related to body posture.[7] Other internal factors include age, gender, weight, height, years of work, and exercise habits.[8] Work activities carried out in awkward work postures will repeatedly cause muscle tension, which can reduce tissue circulation. Farmers' work positions in cultivating vegetables and strawberries are predominantly bending, squatting, sitting, lifting, and standing.[9]

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Globally, musculoskeletal complaints are the highest contributor to medical rehabilitation services. Global Burden of Disease (GBD) reports that around 1.71 billion people worldwide experience musculoskeletal complaints.[10-12] The main complaint of musculoskeletal disability as an occupational disease in farmers is usually in the form of acute pain that arises in the lower back or waist area due to continuous activity with unnatural body postures such as pushing, pulling, bending, squatting, and lifting, which triggers complaints of lower back pain.[13] It is feared that farmers will carry out work postures in the wrong pattern for a long time and repeatedly, triggering the emergence of musculoskeletal complaints. Therefore, researchers want to describe the incidence of musculoskeletal complaints experienced by farmers in Pancasari Village.

Methods

The research method used was descriptive-analytical research with data collection techniques used in a cross-sectional study. This study used informed consent and does not conflict with the Declaration of Helsinki. The research was conducted in Pancasari Village, Sukasada District, Buleleng Regency, in May 2022 by examining farmers in the Pancasari Village area. The research subjects obtained were 40 respondents. The sampling technique used was consecutive sampling. The inclusion criteria in this study were the people of Pancasari Village who worked actively as farmers and gave their consent by signing the research informed consent. The exclusion criteria in this study were farmers' unwillingness to be research respondents.

The data collection technique used a questionnaire containing personal identity including name, age, gender, duration of work per day, total years of work, and last level of education, as well as the Nordic Body Map questionnaire as a means of data collection, which aims to analyze musculoskeletal complaints experienced by respondents.[14] The Indonesian version of the NBM has item validity values ranging from 0.501 to 0.823 and high-reliability values with a Cronbach's alpha value of 0.726.[15.] The measuring instruments used in this research were a stature meter to measure height and a digital scale to measure body weight, as shown in Figure 1.

Figure 1. Assessment of musculoskeletal disorders in farmers

Researchers conducted research with the initial procedure of arranging a permit letter between the research institution at the Undergraduate Physiotherapy and Physiotherapy Profession Study Program, Faculty of Medicine, Udayana University, and the Pancasari Traditional Village. After obtaining approval, the researcher contacted village residents who worked as farmers and were willing to act as research respondents. Researchers carried out the research with the help of a team in the Pancasari Village area. Research activities included signing informed consent, personal data questionnaire interviews, measuring body weight and height, and oral interviews with respondents using the Nordic Body Map questionnaire.

The data was then analyzed using the univariate analysis method. Univariate analysis in this study was work posture, musculoskeletal complaints, age, gender, BMI, duration of work per day and work period with assistance, and IBM SPSS Statistics 26 software to describe each characteristic of the variable.

Results

The respondents in this research are people from Pancasari Village who work as farmers and work actively in the agricultural sector. The following is an analysis of research data. Table 1 shows the research results on the variable characteristics of research respondents. The average age of respondents is 45.32 years, with a standard deviation of 13.71. The dominant gender of respondents was female, with a total of 23 people. The average and standard deviation of respondents' weight is 61.60± 11.70, and the mean and standard deviation of respondents' height is 1.620 ± 0.070.

The respondents' dominant body mass index category was obese, with 13 people. The most recent education level of the respondents was dominantly at the senior high school or vocational high school level, with 19 people. Respondents' average duration of work per day is 6.175 hours, with a standard deviation of 1.972. The average working period of respondents was 18.97 years, with a standard deviation of 14.19. The risk of musculoskeletal complaints experienced by respondents was predominantly in the low category, with 32 people shown in Table 1.

Table 2 shows the results of research on the characteristics of musculoskeletal complaints. The number of musculoskeletal complaints most frequently experienced by respondents was about the waist, right knee, left knee, lower neck, and right shoulder. Respondents in the lower neck area are more likely to report musculoskeletal issues with a score of 2 (slight pain), while respondents in the waist area report scores of 3 (pain) and 4 (extremely painful).

Discussion

Increasing age affects metabolism and physical function in the human body. Complaints about decreasing physical function start around age 35 or older. As age increases, the decline in physical function will also increase due to reduced muscle strength and performance.[6] This

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statement is supported by the results of research by Vini V et al. (2017) with farmer research respondents who showed a relationship between age and musculoskeletal complaints.[7] Other research results that support this are research by Marthin Enrico J et al. (2016) with bus driver research

Table 1. The results of descriptive analysis of respondent characteristics

Variable	Frequency (n)	Percentage (%)	Mean	SD	Mean ± SB
Age (years)					
17-25	3	7.5			
26-35	11	27.5			
36-45	5	12.5	45.32	13.71	
46-55	8	20.0			
56-65	9	22.5			
>65	4	10.0			
Gender					
Man	17	42.5			
Woman	23	57.5			
Body Weight (kg)					61.10 ± 11.70
Height (m)					1.620 ± 0.070
Body mass index					
Underweight	2	5.0			
Normal	18	45.0			
Overweight	13	32.5			
Obesity	7	17.5			
Last education					
Not attending school	4	10.0			
Elementary School	9	22.5			
Junior High School	5	12.5			
Senior High School	19	47.5			
D2	2	5.0			
S1	1	2.5			
Work Duration Per Day (hours)					
≤8 Hours	38	95.0	6.175	1.972	
>8 Hours	2	5.0			
Work Period (years)					
<6 Years	10	25.0			
6-10 Years	5	12.5	18.97	14.19	
>10 Years	25	62.5			
Risk Level					
Low	32	80.0			
Currently	8	20.0			
Total	40	100.0			

respondents. The results of research conducted on farmers in Pancasari Village showed that respondents aged over 35 years experienced musculoskeletal complaints, and several respondents in the elderly and senior age categories experienced complaints in many areas of the body compared to respondents under 35 years.[16]

The dominant gender of research respondents was female, with a percentage of 57.5%. The risk of women experiencing musculoskeletal complaints is higher than that of men, with a ratio of 1:3, accompanied by hormonal influences during menstruation, pregnancy, and the menopause phase. Research by Helmina et al. (2019) supports the statement that gender is related to the incidence of musculoskeletal complaints.[17]

Another factor is Body Mass Index (BMI). Research respondents had an average BMI in the normal category with a percentage of 45%. People with a BMI category above normal are more at risk of experiencing musculoskeletal complaints because it places an increased burden on the biological and mechanical tissues in the lower extremities area. This statement is in line with the research results of A. Aljonak (2022) examined the influence of individual factors, such as BMI, on office workers.[18] On the other hand, the results of research by Tjahayuningtiyas (2019) with research respondents from informal sector workers obtained analysis results showing no close relationship between BMI and musculoskeletal complaints.[6]

Most research respondents had education up to high school level, with a percentage of 47.5%. The higher a person's level of education, the better their knowledge and understanding of receiving information. This statement aligns with the research results of Indriyani et al. (2022),

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which state that the level of expertise is related to understanding preventive measures to minimize musculoskeletal complaints due to work risks.[19]

Table 2. Distribution of musculoskeletal complaints

No	Location	NP		SP		P		VP	
		n	%	n	%	n	%	n	%
0	Upper Neck Pain	35	87.5	5	12.5	0	0	0	0
1	Lower Neck Pain	18	45.0	15	37.5	6	15.0	1	2.5
2	Pain in Left Shoulder	22	55.0	10	25.0	5	12.5	3	7.5
3	Pain in Right Shoulder	20	50.0	11	27.5	6	15.0	3	7.5
4	Pain in Left Upper Arm	24	60.0	8	20.0	7	17.5	1	2.5
5	Back pain	21	52.5	8	20.0	7	17.5	4	10.0
6	Pain in the Right Upper Arm	27	65.5	5	12.5	7	17.5	1	2.5
7	Pain in the Waist	8	20.0	9	22.5	9	22.5	14	35.5
8	Pain in the Buttocks	28	70.0	9	22.5	3	7.5	0	0
9	Pain in the Buttocks	37	92.5	2	5.0	1	2.5	0	0
10	Pain in Left Elbow	36	90.0	3	7.5	1	2.5	0	0
11	Pain in Right Elbow	36	90.0	4	10.0	0	0	0	0
12	Pain in Left Forearm	28	70.0	7	17.5	5	12.5	0	0
13	Pain in Right Forearm	27	67.5	10	25.0	3	7.5	0	0
14	Pain in Left Wrist	28	70.0	10	25.0	2	5.0	0	0
15	Pain in Right Wrist	25	62.5	11	27.5	3	7.5	1	2.5
16	Pain in Left Hand	30	75.0	5	12.5	5	12.5	0	0
17	Pain in the Right Hand	29	72.5	6	15.0	4	10.0	1	2.5
18	Pain in Left Thigh	31	77.5	8	20.0	1	2.5	0	0
19	Pain in Right Thigh	32	80.0	7	17.5	1	2.5	0	0
20	Pain in Left Knee	18	45.0	9	22.5	8	20.0	5	12.5
21	Pain in Right Knee	17	42.5	10	25.0	8	20.0	5	12.5
22	Pain in Left Calf	22	55.0	13	32.0	4	10.0	1	2.5
23	Pain in Right Calf	20	50.0	14	35.0	5	12.5	1	2.5
24	Pain in Left Ankle	31	77.5	4	10.0	4	10.0	1	2.5
25	Pain in Right Ankle	28	70.0	6	15.0	5	12.5	1	2.5
26	Pain in Left Leg	. 30	75.0	5	12.5	3	7.5	2	5.0
27	Pain in Right Leg	29	72.5	6	15.0	3	7.5	2	5.0

NP, No Pain; SP, Slightly Painful; P, Pain; VP, Very Painful

Average daily work duration is 6 to 8 hours. The average duration of work of respondents is 6.175 hours. Respondents' average length of service is 18.97 years, which is classified in the extended service category because it exceeds ten years. According to research findings, respondents' most common musculoskeletal symptoms were in the waist, knees, lower neck, and shoulders. These results indicate that inappropriate work positions can cause musculoskeletal complaints carried repeatedly over a long period. This statement is supported by the research results of Indriyani et al. (2022), general workers with a service period of <5 years experienced higher complaints than workers with a service period of >5 years. The cause of this is the lack of adaptation of new workers in mastering work techniques, working conditions, and the environment. On the other hand, workers with a long period of service will

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have more knowledge and experience.[19] Research by Fatejarum et al. (2020) found that 65% of respondents with a working period of 5-10 years experienced musculoskeletal complaints, and the results showed that the longer a person's working period, the higher the perceived complaints due to repetitive work positions related to muscle fatigue.[20]

The relationship between work duration per day and musculoskeletal complaints was also stated through research by A Fatejarum et al. (2020), which shows a relationship between length of work and musculoskeletal complaints in farmers. Complaints were reported more frequently (78.5%) in respondents with work durations more significant than 8 hours in various regions, despite the recommended work duration typically being 6-8 hours daily. If there is a lengthening of the duration, it will cause a decrease in efficiency and more significant fatigue in the muscles. The higher the duration of work per day, the higher the risk of musculoskeletal complaints.[15] Other research that supports this is the results of Hasheminejad's (2021) research on Pistachio agricultural workers with the highest prevalence of musculoskeletal complaints occurring in the lower back and shoulders.[21]

The results of research conducted on farmers in Pancasari Village are supported by the results of research by V. Vini (2019) shown on farmers in Kanonang Dua Village, West Kawangkoan District, the majority of musculoskeletal complaints were found to be in the low-risk level category.[8] Farmers have monotonous work positions, which increase the risk of fatigue and muscle tension. Pain in the lower back can generally be caused by bending, sitting, and standing for long periods, which triggers stretching of the muscles in the lower back area.[13] Complaints of neck pain can be caused by inappropriate working positions and repetitive joint movements, which result in fatigue and even muscle spasms.[22] Neck pain can be caused by bending, looking down, and twisting the neck, which is part of the farmer's working posture. Another working position for farmers, namely squatting for more than 109 minutes during the plant care and maintenance phase, also increases the risk of musculoskeletal complaints.[23] Musculoskeletal pain experienced by farmers also occurs in the shoulders. The problem of shoulder pain is influenced by shoulder position factors during work, such as lifting and pushing, which burdens the muscles in the shoulder area.[24]

Musculoskeletal issues are often caused by constant muscle contractions, which result in hypoxia, tissue damage, increased discomfort, and incapacity.[24] Excessive contraction of the muscles results in inhibition of blood circulation in the muscles so that oxygen supply decreases and causes carbohydrate metabolism to be hampered. As a result, the body carries out anaerobic metabolism by resynthesizing ATP molecules without oxygen, which produces products in the form of energy that function in muscle contraction. Apart from having energy, anaerobic metabolism also makes a product of lactic acid, which causes a response in the form of a painful muscle sensation due to tissue damage.[25]

The weakness of this research is that the sample size is relatively small. Future research would greatly benefit from using more extensive and diverse samples to increase the generalizability of the findings. Second, this study did not control other variables that could influence musculoskeletal complaints, such as body type, injury history, and rest time, so this can be used as input for future research.

Ergonomic ideas must be implemented to avoid increasing musculoskeletal complaints among farmers. The principles of good working posture based on ergonomics will affect the body's functionality when working because it can reduce excessive loading and contraction of muscles and joints when doing work. Body posture determines the joints and muscles that work in a movement. Ergonomic working posture is a posture that does not differ significantly from the body's position when it is in an anatomically neutral state.

Conclusion

The results of the research analysis showed that there were musculoskeletal complaints in farmers. Complaints predominantly occur in the waist, knees, lower neck, and shoulders. The risk level for musculoskeletal complaints of the dominant respondents is in the low category.

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This study received no grants from any institution.

Conflict of interest

This study has no conflicts of interest.

Author contributions

KNA prepares study designs, collects data, processes data, and writes manuscripts. MHSN and AW are directing data collection and revising the manuscript.

Ethical consideration

Before beginning the study, the author obtained consent from the sample to ensure their willingness to participate as respondents.

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