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Prevalence of Work-Related Musculoskeletal Symptoms and Ergonomic Risk Levels among Manual Harvesting Farmers in Rural Raigad District

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Abstract: ***Agriculture is one of the major physically demanding occupations, exposing workers to various occupational ergonomic risk factors that may contribute to work–related musculoskeletal symptoms. Manual harvesting involves repetitive bending, squatting, lifting, carrying loads, and maintaining awkward working postures, increasing physical strain on the musculoskeletal system. This study aimed to determine the prevalence of work–related musculoskeletal symptoms and ergonomic risk levels among manual harvesting farmers in rural Raigad District, Maharashtra. We conducted a prevalence study among 150 male and female manual harvesting farmers aged 30-60 years, selected through convenience sampling. The NMQ was used to assess musculoskeletal symptoms across different body regions, while the REBA scale was used to evaluate ergonomic risk associated with harvesting postures. Data analysis was performed using Microsoft Excel, and descriptive statistics were used to analyse frequencies and percentages. The prevalence of work–related musculoskeletal symptoms among manual harvesting farmers was 94.67%. The most commonly affected body region was the lower back (77.33%), followed by the neck (50%) and upper back (49.33%) during the previous 12months. Furthermore, 63.33% of participants demonstrated very high ergonomic risk during forward bending in standing while plucking, whereas 16.67% demonstrated very high ergonomic risk during forward bending and lifting heavy weights. The study concluded that manual harvesting farmers experience a high prevalence of work–related musculoskeletal symptoms and considerable ergonomic risk, particularly during repetitive bending and lifting activities. These findings highlight the need to reduce occupational musculoskeletal problems among farmers.***

Keywords: Work-related musculoskeletal symptoms, Ergonomics, Manual harvesting farmers, Nordic Musculoskeletal Questionnaire, REBA, Agriculture

1. Introduction

Agriculture is one of the major occupational sectors in India and involves various physically demanding activities. Manual harvesting farmers perform repetitive tasks such as bending, squatting, lifting, carrying loads, reaching, and maintaining prolonged working postures. These activities require continuous physical effort and may expose farmers to considerable musculoskeletal strain, contributing to work–related musculoskeletal symptoms. [1-3]

Work-related musculoskeletal symptoms include pain and discomfort affecting muscles, joints, tendons, and related structures. They may develop due to repetitive movements, excessive physical force, awkward postures, and prolonged working positions. Among agricultural workers, symptoms may affect several body regions, including the neck, shoulder, upper and lower back, wrist, hands, hips, knees and ankles. Previous studies and systematic reviews have reported a considerable burden of musculoskeletal symptoms among agricultural workers. [4-6]

Manual harvesting activities involve repeated forward bending, prolonged squatting or sitting, and lifting and carrying harvested materials. These activities may increase physical loading on the musculoskeletal system, particularly when workers have limited opportunities to change their posture. Studies involving greenhouse workers and mushroom harvesters have identified potentially hazardous working postures and ergonomic concerns. [7-9] Research involving rice farmers, tobacco farmers, tea harvesters, and other agricultural populations has also documented musculoskeletal symptoms and ergonomic concerns associated with farming activities. [10-20]

The NMQ is a standardised tool used to identify self-reported musculoskeletal symptoms across different body regions during specified recall periods, including the previous 12 months and previous 7 days. [21] The REBA is an observational ergonomic assessment tool used to evaluate whole-body working postures and classify their associated ergonomic risk levels.[22] Together, these tools provide information about musculoskeletal symptoms and ergonomic demands during occupational activities.

Although previous studies have examined musculoskeletal symptoms and ergonomic risks among agricultural workers, findings from other agricultural settings may not fully represent the occupational conditions and harvesting practices of farmers in rural Maharashtra. Therefore, the present study aims to determine the prevalence of work-related musculoskeletal symptoms and ergonomic risk levels among manual harvesting farmers in rural Raigad District using the NMQ and REBA. The findings may help identify commonly affected body regions and potentially hazardous working postures, highlighting the need for occupational health awareness and ergonomic preventive measures.

2. Materials and Methods

An observational study design was used to assess the prevalence of work-related musculoskeletal symptoms and ergonomic risk levels among manual harvesting farmers in rural areas of Raigad District, Maharashtra, India. A total of 150 manual harvesting farmers were recruited using a convenience sampling technique.

The inclusion criteria consisted of both male and female farmers aged between 30 and 60 years, with a minimum of 1 year of work experience and working for more than 6 hours per day. Farmers with a recent history of surgery or trauma, including joint replacement surgery, spinal surgery, arthritis or strains, previous neurological conditions, physical deformities, those working for less than 6 hours per day, part-time workers, and pregnant females were excluded from the study.

Data were collected using 2 outcome measures: the NMQ and REBA scale. The NMQ was used to assess the prevalence of musculoskeletal symptoms among manual harvesting farmers by identifying the affected body regions during the previous 12 months and the previous 7 days. The REBA scale was used to evaluate whole-body postural ergonomic risks associated with manual harvesting activities and classify the corresponding risk levels.

The collected data were analysed using Microsoft Excel. Descriptive statistical methods, including frequencies, percentages, mean, and standard deviation, were used to analyse and present the study findings.

3. Results

A total of 150 manual harvesting farmers from rural Raigad District participated in the study. The prevalence of work-related musculoskeletal symptoms was assessed using the Nordic Musculoskeletal Questionnaire (NMQ), while ergonomic risk levels associated with manual harvesting activities were evaluated using the Rapid Entire Body Assessment (REBA) scale. The collected data were analysed using descriptive statistics and presented in tables.

Table 1: Demographic Characteristics of Participants

Variable	Frequency (n)	Percentage (%)
Male	112	74.67
Female	38	25.33
Total	150	100

Mean Age: 43.60 ± 8.07 Years.

Table 2: Overall Prevalence of Work-Related Musculoskeletal Symptoms

Musculoskeletal symptoms	Frequency (n)	Percentage (%)
Present	142	94.67
Absent	8	5.33
Total	150	100

Table 3: Region-Wise Distribution of Musculoskeletal Symptoms During the Past 12 Months

Body Region	Frequency (n)	Percentage (%)
Neck	75	50.00
Shoulder	57	38.00
Elbow	14	9.33
Wrist/Hands	19	12.67
Upper Back	74	49.33
Lower Back	116	77.33
Hips/Thighs	46	30.67
Knees	58	38.67
Ankles/Feet	14	9.33

Table 4: Region-Wise Distribution of Musculoskeletal Symptoms Affecting Normal Activities During the Past 12 Months

Body Region	Frequency (n)	Percentage (%)
Neck	74	49.33
Shoulder	48	32.00
Elbow	10	6.67
Wrist/Hands	19	12.67
Upper Back	66	44.00
Lower Back	104	69.33
Hips/Thighs	37	24.67
Knees	49	32.67
Ankles/Feet	11	7.33

Table 5: Region-Wise Distribution of Physician Visits Due to Musculoskeletal Symptoms During the Past 12 Months.

Body Region	Frequency (n)	Percentage (%)
Neck	61	40.67
Shoulder	38	25.33
Elbow	7	4.67
Wrist/Hands	13	8.67
Upper Back	58	38.67
Lower Back	87	58.00
Hips/Thighs	28	18.67
Knees	34	22.67
Ankles/Feet	8	5.33

Table 6: Region-Wise Distribution of Musculoskeletal Symptoms During the Past 7 Days

Body Region	Frequency (n)	Percentage (%)
Neck	59	39.33
Shoulder	34	22.67
Elbow	6	4.00
Wrist/Hands	12	8.00
Upper Back	52	34.67
Lower Back	77	51.33
Hips/Thighs	22	14.67
Knees	27	18.00
Ankles/Feet	7	4.67

Table 7: Distribution of Participants According to REBA Scores

REBA Score	Frequency (n)	Percentage (%)
1	0	0.00
2	0	0.00
3	0	0.00
4	1	0.67
5	2	1.33
6	6	4.00
7	23	15.33
8	4	2.67
9	55	33.67
10	34	22.67

11	20	13.33
12	0	0.00
13	5	3.33

Table 8: Assessment of Ergonomic Risk According to REBA Scores in Different Working Postures

Working posture	REBA Score	Participants (n)	Risk interpretation
Sitting and plucking with hands	4-7	30	Medium Risk
Bending forward while standing and plucking	8-10	95	High Risk
Bending forward while standing and lifting heavy weights	11+	25	Very High Risk

4. Discussion

The present study aimed to determine the prevalence of work-related musculoskeletal symptoms and ergonomic risk levels among 150 manual harvesting farmers in rural Raigad district. The findings revealed that 94.67% of participants reported musculoskeletal symptoms. The lower back was the most commonly affected region (77.33%), followed by the neck (50.00%) and upper back (49.33%). REBA assessment showed high ergonomic risk in 63.33% of participants during bending forward, standing and plucking, while 16.67% demonstrated very high risk during bending and lifting activities.

The prevalence observed in the present study is comparable to findings of Jaikla et al. [1], who reported musculoskeletal symptoms in 92.2% of Thai rice farmers. Both studies indicate a considerable burden of musculoskeletal symptoms among agricultural workers. Their study also identified repetitive movements, awkward postures and forceful exertion as important occupational risk factors. [1]

The REBA findings highlight the physical demands of manual harvesting. Similarly, Tonchoy et al. [2] identified frequent non-neutral neck and trunk postures among manual lychee harvesters, including forward bending, lateral bending, twisting and overhead reaching. These findings highlight the postural demands associated with agricultural harvesting activities.

In the present study, the lower back, neck and upper back were the most commonly affected regions. Kumar et al. [3] reported symptoms predominantly in the knees(47%), ankles and feet (43%), shoulder and neck (37%), and the lower back (24%) among tobacco cultivation workers. Nabi et al. [4] reported musculoskeletal pain in 44% of male rice farmers, commonly affecting the waist/thigh, knees and neck. Similarly, Dev et al. [5] reported a 74.74% prevalence among female farmers, with the lower back and neck/shoulder being commonly affected. Differences may reflect variations in agricultural tasks and participant characteristics.

The high ergonomic risk observed during bending and lifting is supported by Kouhnavard et al. [6], who identified heavy load handling, repetitive hand movements, and prolonged working hours as occupational risk factors among tea harvesting farmers. De-Benavides-Jiménez et al. [7] also highlighted the need to avoid continuous back flexion, leg flexion and arm elevation during agricultural activities.
Shivakumar et al. [10] reported a considerable burden of musculoskeletal disorders and pain among agricultural workers in low- and middle-income countries. In the present study, lower back symptoms affected daily activities in 69.33% of participants and led to physician visits in 58.00%. Similarly, Kairi and Dey [17] reported reduced work activity, reduced leisure activity and healthcare consultation among tea garden workers.
The findings highlight the need for ergonomic education, improved working postures and safe lifting practices. Ergonomic task analysis and modifications to harvesting equipment may also help reduce physical strain among agricultural workers. [15,16]

5. Conclusion

The present study found a high prevalence of work-related musculoskeletal symptoms among manual harvesting farmers in rural Raigad District, with 94.67% of participants reporting symptoms. The lower back was the most commonly affected body region, followed by the neck and upper back. Ergonomic assessment using REBA identified high-risk postures during forward bending and plucking, while bending and lifting activities demonstrated very high ergonomic risk.

These findings highlight the physical demands of manual harvesting and the need for greater awareness of ergonomic practices among farmers. Education regarding proper working posture, safe lifting techniques, and appropriate work practices may help reduce occupational strain and support musculoskeletal health among agricultural workers.

6. Educational Implications

The findings of the present study highlight the importance of ergonomic education among manual harvesting farmers. Awareness programmes should focus on maintaining appropriate working postures, reducing prolonged forward bending, and adopting safe techniques while lifting and carrying heavy loads. Farmers should also be encouraged to take regular breaks and change their working positions to minimise continuous physical strain.

Physiotherapists and occupational health professionals can contribute by conducting educational sessions, demonstrating posture correction and safe lifting techniques, and promoting simple exercises to support musculoskeletal health. These educational measures may help farmers recognise occupational risk factors and adopt safer work practices during harvesting activities.

7. Limitations

The present study had certain limitations. It was conducted among manual harvesting farmers in a selected rural area of Raigad district; therefore, the findings may not be generalised to farmers in other geographical regions. The sample consisted of a higher proportion of male participants (74.67%), which may limit the representation of female farmers. Musculoskeletal symptoms were assessed using the

self-reported NMQ, making the findings susceptible to recall bias. Additionally, REBA was used as an observational assessment tool and did not include instrumental measurement of biomechanical loading.

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