



Postural Discomfort Experienced by Women in Agricultural Activities: A Case Study in Dharwad District, Karnataka, India

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Authors' contributions

This work was carried out in collaboration among all authors All authors read and approved the final manuscript.

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ABSTRACT

This study explores the postural discomfort experienced by women engaged in various agricultural activities across three regions: Mandihal, Mangalagatti, and Timmapur of Dharwad Taluk, Karnataka state. A total of 300 women (100 from each region) were surveyed to assess the discomfort in specific body parts such as the shoulders, wrists, hands, lower back, buttocks, upper legs, knees, and lower legs during activities including land cleaning, top dressing of fertilizer,

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sowing/transplanting, weeding, and cob removal. The study revealed that the most commonly reported discomfort occurred in the lower back and wrists, particularly during land cleaning, fertilization, and weeding. Standing, bending, and squatting postures were the primary causes of discomfort. The findings highlight the need for ergonomic interventions to reduce musculoskeletal discomfort and improve the well-being of women in agriculture. These results provide valuable insights for designing interventions aimed at reducing physical strain and promoting better health outcomes for female agricultural workers.

Keywords: Postural discomfort; upper extremities; lower extremities and ergonomics.

1. INTRODUCTION

Agriculture remains a crucial livelihood activity in many rural areas, particularly in developing countries, where women play a pivotal role in farming tasks. Despite their central contribution, the physical demands of agricultural work often lead to various health issues, particularly musculoskeletal disorders (Singh et al., 2015). Women, who typically perform labor-intensive activities such as land cleaning, sowing, weeding, and fertilization, are frequently exposed to uncomfortable postures that put strain on their bodies (Mishra et al., 2024; Amin et al., 2009). Prolonged bending, squatting, lifting, and repetitive movements increase the risk of developing musculoskeletal discomfort and injuries, which can negatively impact their health, productivity, and overall well-being (Vyas, 2012).

The postural discomfort experienced during these activities can be exacerbated by poor ergonomics and inadequate rest periods, leading to long-term health challenges (Sharma & Badodiya, 2016). It is essential to investigate the specific postures used during agricultural tasks and their relationship to discomfort in different body parts (Das & Gangopadhyay, 2011). By understanding these discomfort patterns, it becomes possible to identify areas where ergonomic interventions, such as improved tools, better body mechanics, and proper rest practices, can reduce the risk of injury and enhance productivity (Rackiewicz et al., 2019).

The repetitive uses of same posture for prolong period leads to musculoskeletal disorders. Musculoskeletal disorders affect the soft tissues of the body such as the muscles, the tendons that connect muscles to bones, ligaments that connect bone to bone, nerves and blood vessels (Saikia, 2018).

Objectives:

1. To study the profile of selected respondents

2. To assess the knowledge on postural discomfort faced by the women while performing agriculture activities

2. MATERIALS AND METHODS

The study was conducted in Mandihal, Mangalagatti and Timmapur village of Dharwad taluka in Dharwad District of Karnataka state during 2024-2025. Random sampling technique was used to select the 100 families from each village, hence with the total sample 300 for the study.

The interview schedule was constructed to collect the information needed for the objectives of the study. It consisted of two parts: general information and specific information. General information covered the socio- personal characteristics of the selected respondents. Specific information included: activity analysis by posture used in agriculture activity, Intensity of pain felt by respondents in different body parts while performing agriculture activity. To calculate the mean score of intensity of pain felt by respondents in different body parts, respondents were asked to rate the intensity of pain felt on a five-point scale (very severe-5, severe-4, moderately severe-3, mild-2, very mild-1).

3. RESULTS AND DISCUSSION

Table 1 depicts the profile of the selected households, highlighting both the majority and minimum characteristics. Majority (80.00 %) of households had a nuclear family structure, while only 20.00 per cent belonged to joint family. In terms of age, the largest group (43.67%) fell within the middle age category (36-50 years), whereas the smallest proportion (22.00%) has in the old age group (>51 years). Regarding education, most individuals had attained primary school education (34.00%), while only small fractions (3.00%) had completed a degree. When it comes to occupation, a maximum (47.00%) respondents were engaged in agricultural labor, while only 10.00 per cent were in service or

business. Landholding patterns showed that the majority of households (68.67%) possessed small landholdings (1-5 acres), while smaller percentages (17.67%) were landless. In terms of income, about 53.00 per cent of households fell in the middle-income, whereas 18.67 per cent were in high income. According to Masudkar results are in line with (2017) the distribution of respondents revealed several key trends that among the 75 participants, 14.66 per cent were young, 65.34 per cent were middle-aged, and 20.00 per cent were old. In terms of caste, the majority (73.33%) belonged to the other background category, while 2.67 per cent were from Scheduled Castes

(SC), followed by 4.00 per cent from Scheduled Tribes (ST).

Maximum number of the family belonged to medium (40.00%) and large (40.00%) family followed by 20.00 per cent belonged to small families. Regarding education maximum number of respondents completed middle school (48.00%) followed by 17.33 per cent attended primary school and higher secondary school education. More number of respondents had marginal land (40.00%) followed by small land (33.33%). Majority of the respondents had medium annual income (81.37%) followed by high income (13.33%) and low income (5.30%).

Table 1. Profile of households from selected villages N=300

Sl No	Particulars	Mandihal (n=100)	Mangalagatti (n=100)	Timmapur (n=100)	Total (N=300)	
					Frequency	Percentage (%)
Age of the Respondent						
1	Young (18 - 35 Yrs)	33.00	36.00	34.00	103.00	34.33
2	Middle age (36-50 yrs)	43.00	46.00	42.00	131.00	43.67
3	Old age (>51 yrs)	24.00	18.00	24.00	66.00	22.00
Family Type						
1	Nuclear	77.00	86.00	77.00	240.00	80.00
2	Joint	23.00	14.00	23.00	60.00	20.00
Caste						
1	SC	20.00	20.00	20.00	60.00	20.00
2	ST	20.00	20.00	20.00	60.00	20.00
3	OBC	26.00	29.00	22.00	77.00	25.67
4	Others	34.00	31.00	38.00	103.00	34.33
Education						
1	Illiterate	29.00	32.00	39.00	100.00	33.33
2	Primary school	34.00	37.00	31.00	102.00	34.00
3	High school	24.00	21.00	19.00	64.00	21.33
4	PUC	10.00	6.00	9.00	25.00	8.33
5	Degree	3.00	4.00	2.00	9.00	3.00
Occupation						
1	Agriculture	35.00	29.00	31.00	95.00	31.67
2	Agri- Labor	42.00	55.00	44.00	141.00	47.00
3	Non-Agri- Labour	11.00	18.00	15.00	44.00	14.67
4	Service/Business	12.00	8.00	10.00	30.00	10.00
Landholdings						
1	Landless	22.00	13.00	18.00	53.00	17.67
2	Small(1-5 acres)	63.00	74.00	69.00	206.00	68.67
3	Marginal(5-10 acres)	12.00	9.00	7.00	28.00	9.33
4	Large(>10 acres)	3.00	4.00	6.00	13.00	4.33
Income Level						
1	Low(<Rs 31075.36)	25.00	28.00	32.00	85.00	28.33
2	Middle (Rs 31075.36 -RS 95209)	54.00	52.00	53.00	159.00	53.00
3	High(>Rs 95209)	21.00	20.00	15.00	56.00	18.67

Table 2. Posture used and the postural discomfort experienced by the selected women while performing in various Agriculture activities. (Mandihal village) n=100

Activities	Body part Posture used	Shoulder	Wrist	Hands	Lower back	Buttocks	Upper legs	Knees	Lower legs	Total score
Cleaning of land	Standing & Bending	2.24 (82.00)	2.00 (2.00)	2.29 (61.00)	2.86 (89.00)	-	2.48 (38.00)	2.48 (46.00)	2.49 (23.00)	16.84
Top dressing of fertilizer	Standing & Bending	2.56 (34.00)	1.67 (10.00)	2.73 (32.00)	3.21 (86.00)	2.88 (21.00)	3.20 (65.00)	2.94 (64.00)	3.06 (58.00)	22.25
Sowing/ Transplanting	Standing & Bending	3 (2.00)	-	2.60 (6.00)	3.33 (2.00)	-	3.00 (4.00)	-	3.09 (6.00)	15.02
Weeding	Bending & squatting	2.64 (61.00)	2.78 (78.00)	2.73 (95.00)	3.13 (92.00)	3.09 (7.00)	3.00 (28.00)	2.79 (66.00)	3.11 (24.00)	23.27
Cob removing	Standing, Bending, Sitting & Squatting	2.48 (20.00)	2.11 (12.00)	2.29 (39.00)	2.75 (80.00)	2.33 (8.00)	2.49 (53.00)	2.79 (75.00)	2.58 (66.00)	19.82

Note: Figures in parenthesis indicate percentage
Discomfort Rating: Very severe-5, Severe-4, Moderate-3, Mild- 2, Very mild-1

Table 3. Posture used and the postural discomfort experienced by the selected women while performing in various Agriculture activities. (Mangalagatti village) n=100

Activities	Body part Posture used	Shoulder	Wrist	Hands	Lower back	Buttocks	Upper legs	Knees	Lower legs	Total score
Cleaning of land	Standing & Bending	2.12 (88.00)	2.23 (20.00)	2.33 (63.00)	2.66 (83.00)	-	2.45 (45.00)	2.26 (49.00)	2.79 (32.00)	16.84
Top dressing of fertilizer	Standing & Bending	2.56 (35.00)	1.67 (11.00)	2.73 (33.00)	3.21 (87.00)	2.88 (21.00)	3.20 (66.00)	2.94 (64.00)	3.06 (58.00)	22.25
Sowing/ Transplanting	Standing & Bending	3 (2.00)	-	2.60 (6.00)	3.33 (2.00)	-	3.00 (4.00)	-	3.09 (6.00)	15.02
Weeding	Bending & squatting	2.64 (65.00)	2.78 (70.00)	2.73 (90.00)	3.13 (92.00)	3.09 (12.00)	3.00 (28.00)	2.79 (69.00)	3.11 (20.00)	23.27
Cob removing	Standing, Bending, Sitting & Squatting	2.23 (32.00)	2.18 (18.00)	2.30 (39.00)	2.71 (88.00)	2.33 (10.00)	2.49 (52.00)	2.37 (75.00)	2.51 (66.00)	19.12

*Note: Figures in parenthesis indicate percentage
Discomfort Rating: Very severe-5, Severe-4, Moderate-3, Mild- 2, Very mild-1

Table 4. Postural discomfort experience by the selected women while performing in various Agriculture activities. (Timmapur village) n=100

Activities	Posture used	Body part								Total score
		Shoulder	Wrist	Hands	Lower back	Buttocks	Upper legs	Knees	Lower legs	
Cleaning of land	Standing & Bending	2.14 (88.00)	2.00 (20.00)	2.29 (69.00)	2.86 (89.00)	-	2.18 (38.00)	2.48 (46.00)	2.49 (23.00)	16.44
Top dressing of fertilizer	Standing & Bending	2.14 (88.00)	2.00 (20.00)	2.29 (69.00)	2.86 (89.00)	-	2.18 (38.00)	2.48 (46.00)	2.49 (23.00)	21.52
Sowing/ Transplanting	Standing & Bending	3.14 (2.00)	-	2.60 (16.00)	3.33 (2.00)	-	3.20 (4.00)	-	3.09 (6.00)	15.36
Weeding	Bending & squatting	2.42 (62.00)	2.78 (68.00)	2.73 (85.00)	3.13 (92.00)	3.09 (7.00)	3.19 (28.00)	2.82 (69.00)	3.35 (26.00)	23.51
Cob removing	Standing, Bending, Sitting & Squatting	2.13 (25.00)	2.23 (18.00)	2.35 (40.00)	2.80 (85.00)	2.75 (10.00)	2.25 (54.00)	2.65 (75.00)	2.60 (66.00)	19.76

Note: Figures in parenthesis indicate percentage
 Discomfort Rating: Very severe-5, Severe-4, Moderate-3, Mild-2, Very mild-1

Table 5. Mean Discomfort Scores performed by the women in agriculture activity N=300

SI NO	Activities	Cleaning of land	Top dressing of fertilizer	Sowing/ Transplanting	Weeding	Cob removing	Total
	Villages						
1	Mandihal n=100	3.9	3.8	1.8	4.2	3.6	17.3
2	Mangalagatti n=100	3.8	3.7	1.8	4.3	3.8	17.4
3	Timmapur n=100	3.9	3.8	1.8	4.2	3.9	17.6

Discomfort rating: Very severe-5, Severe-4, Moderate-3, Mild-2, Very mild-1

The data revealed from the Table 2 that the postural discomfort experienced by women performing various agricultural activities varies significantly. The highest total discomfort score was observed during weeding (23.27), followed by top dressing of fertilizer (22.25), highlighting that activities involving bending, squatting, and prolonged postures caused the most discomfort. The discomfort was particularly severe in the lower back and knees during weeding, while top dressing results in discomfort in the lower back, upper legs, and lower legs. On the other hand, cleaning of land resulted least discomfort, with a total score of 16.84, primarily affecting the shoulders and hands. Activities involving standing and bending, such as sowing and cob removing, showed moderate discomfort, especially in the lower back. Overall, agricultural tasks requiring bending, squatting, and repetitive motions tend to cause the most significant physical strain, particularly on the lower back, knees, and upper legs. And the result are in line with Prajapati and Singh (2021) that the incidence of pain in various body parts during different activities in paddy cultivation lead to musculoskeletal disorders (MSDs). Uprooting seedlings was found to be the most stressful task, with 99.00 per cent of workers reporting severe lower back pain. This was closely followed by transplanting (98.00%) and harvesting (98.00%) operations. The data also revealed that 62.00 per cent of female farm workers experienced shoulder stress, while 98.00 per cent suffered from wrist pain during the transplanting process. Additionally, 72.00 per cent of female workers reported MSDs during the threshing operation.

The Table 3 highlighted the postural discomfort experienced by women while performing various agricultural activities, revealing differences in discomfort levels across body parts. Weeding emerged as the most discomforting activity, with a total score of 23.27, indicating significant discomfort in the lower back (3.13) and knees (3.11), primarily due to bending and squatting. The top dressing of fertilizer activity followed closely with a total score of 22.25, with the most discomfort in the lower back (3.21) and upper legs (3.20). The discomfort in cleaning of land and cob removing was lower, with total scores of 16.84 and 19.12, respectively. Cleaning of land showed discomfort mostly in the lower back (2.66) and hands (2.33), while cob removing involved discomfort in the lower back (2.71) and knees (2.37). The activity with the least discomfort was sowing/transplanting, with a total

score of 15.02, showed high discomfort in the lower back (3.33) but relatively lower discomfort in other areas. Overall, activities requiring bending, squatting, or prolonged postures, such as weeding and top dressing of fertilizer, caused the most significant discomfort, particularly in the lower back and knees. Results are in line with Singh et al. (2017) Women performing floriculture activities used traditional methods experienced significant musculoskeletal pain. Most reported "very severe" and "severe" discomfort in the neck, shoulders, upper back, lower back, upper arms, wrists/hands, thighs, knees, and lower legs due to prolonged bending, squatting, and repetitive motions. Over half of the workers experienced severe neck pain, while 65.00 per cent reported very severe shoulder pain. Similarly, 65.00 per cent reported severe upper back pain, and 70.00 per cent suffered from very severe lower back pain. Additionally, 85.00 per cent reported severe wrist/hands pain, and more than half had severe pain in their thighs, knees, and lower legs.

The Table 4 highlighted the postural discomfort experienced by women during various agricultural activities, showed the discomfort levels in different body parts. Weeding emerged as the most discomforting activity, with the highest total score of 23.51. This activity involved bending and squatting, causing significant discomfort in the lower back (3.13), upper legs (3.09), and knees (3.19). The next highest discomfort score was found in top dressing of fertilizer, with a total score of 21.52, where discomfort is prominent in the lower back (2.86) and upper legs (2.18). Activities like cleaning of land and sowing/transplanting also caused noticeable discomfort, with total scores of 16.44 and 15.36, respectively. In cleaning of land, the most discomfort was in the lower back (2.86), while sowing/transplanting showed discomfort mainly in the lower back (3.33) and upper legs (3.20). Cob removing resulted in moderate discomfort, with a total score of 19.76, primarily affecting the lower back (2.80) and knees (2.65). Overall, activities that involved bending, squatting, or prolonged postures, such as weeding and top dressing of fertilizer, caused the highest levels of discomfort, particularly in the lower back and knees. Results are in line with Suthar and Kaushik (2011) that the significant 76.66 per cent of tribal women reported pain in the neck, while 46.66 per cent reported shoulder pain. Women were involved in nearly all agricultural activities, except ploughing, including land preparation, sowing, transplanting, watering,

weeding, fertilizing, pesticide spraying, harvesting, threshing, processing, and storage. These tasks often lead to pain in the neck and shoulders. Factors such as lifting, forceful actions, heavy loads, repetitive tasks, and bending contribute to pain in these areas.

The results, as shown in Table 5: Mean Discomfort Scores across activities and villages, indicated that postural discomfort varied across the three villages (Mandihal, Mangalagatti, and Timmapur) during agricultural activities. In Mandihal and Timmapur, the activities of cleaning of land and top dressing of fertilizer caused the most discomfort, particularly in the lower back and shoulders due to standing and bending. The women from Mangalagatti reported the highest discomfort during weeding, with significant strain in the wrists, hands, and lower back from prolonged bending and squatting. Sowing and transplanting caused minimal discomfort across all villages. Finally, the women from Timmapur village experienced the highest discomfort during cob removing, likely due to the combination of sitting, standing, and bending postures. Overall, tasks involving bending, squatting, and repetitive movements resulted in the greatest discomfort, while the women from Mandihal and Timmapur villages had the most discomfort in performing agricultural activities.

4. CONCLUSION

The study conducted across three villages of Dharwad taluk viz., Mandihal, Mangalagatti, and Timmapur revealed significant per cent of households had a nuclear family structure, while only few per cent had a joint family system. In terms of age, the largest group fell within the middle age category (36-50 years), whereas the smallest proportion was in the old age group (>51 years). Regarding education, most individuals had attained primary school education, but only a small fraction had completed a degree. When it comes to occupation, a majority of individuals were engaged in agricultural labor, while only few per cent work in service or business. And significant postural discomfort among women engaged in various agricultural activities. Across all regions, the most frequently reported discomfort was in the lower back, followed by discomfort in the shoulders and wrists. Activities involving prolonged bending, squatting, and repetitive movements, such as land cleaning, weeding, and top dressing of fertilizer, were particularly associated with higher discomfort levels.

In Mandihal, discomfort was most severe in the lower back (89.00%) and shoulders (82.00%) during land cleaning, while wrists and hands also experienced notable discomfort during weeding. Mangalagatti showed similar patterns, with discomfort in the lower back (83.00%) and wrists (70.00%) being prominent during weeding, while Timmapur experienced comparable discomfort in the lower back (89.00%) and shoulders (88.00%) during land cleaning and top dressing.

Sowing and transplanting, which involved less strenuous postures (mainly standing and bending), resulted in minimal discomfort, with low levels of discomfort in the lower back, wrists, and shoulders. However, tasks requiring more dynamic and flexible movements, such as cob removal, also resulted in significant discomfort, particularly in the lower back and knees, with discomfort levels ranging between 66.00 per cent to 75.00 per cent across the three regions. The highest discomfort was generally observed in Mandihal and Timmapur during activities like land cleaning and top dressing, while Mangalagatti experienced the most discomfort during weeding.

The findings highlighted the physical challenges faced by women in agriculture, with discomfort primarily affecting the lower back, wrists, hands, and knees. These results emphasized the need for ergonomic interventions, such as designing better tools, promoting proper posture, and introducing periodic rest breaks, to alleviate the strain caused by these activities and improve the health and well-being of women in agricultural settings.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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