Original Article

IAHS Medical Journal
Volume 07 Issue 02 December 2024; 78-82

Work-Pattern and Postural Stress among Jhum Cultivators

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ABSTRACT

Background: *Agricultural workers, including jhum cultivators, frequently experienced musculoskeletal disorders and injuries as a result of the physical demands of farming.*

Materials and methods: *A cross-sectional study was conducted to explore work patterns and assess levels of postural stress among 180 jhum cultivators in the Sreebardi Upazila of Mymensingh district, Bangladesh, from January to December 2023. Data on work patterns, postural stress, musculoskeletal issues and socio-demographic variables were collected using a semi-structured questionnaire.*

Results: *The study included respondents aged 18 to 60 years. Among jhum cultivators, 63% reported their activities as difficult, while 14% described them as very difficult. Most participants had around 30 years of work experience and 12.8% reported having less than 10 years of experience. The majority worked between 55 to 65 hours per week, with a smaller group working fewer than 45 hours. Approximately 67% of participants mentioned that they were not involved in any other occupations. Additionally, about 73.3% of the participants adopted extremely harmful postures during their work activities, while 26.7% adopted slightly harmful postures.*

Conclusion: *To enhance the productivity and well-being of jhum cultivators, a comprehensive strategy that integrates education, infrastructure improvements, personal hygienc, community and national-level interventions is essential.*

Key words: Jhum cultivators; Musculoskeletal problems; Ovako Working Posture Assessment System (OWAS); Postural stress; Work-pattern.

Introduction

Jhum farming, also referred to as slash-and-burn agriculture, is the most prevalent farming practice in the tropical hills of Asia, including Bangladesh.[1] Jhuming includes cutting mountain forests in January to March, leaving them on the hill slopes for a month to dry and burn. April sees small holes dug in sloppy fields to plant various crops. From July to December, crops are harvested sequentially.[2] The world's oldest occupation is jhum cultivation. Many hill tract residents grow jhum year-round.[3] Minorities like Chakma, Marma and Tripura use jhum or shifting farming in upland Bangladesh. Ethnic communities have grown jhum for millennia and used it for fishing, hunting and forest product collecting.[4]

Jhum cultivation is labor-intensive, with most of the workforce drawn from local villagers. It requires minimal capital since it needs very few inputs. This type of farming takes place on forest land, often located away from the cultivators' homes. Key steps in jhum cultivation include land selection, land preparation, sowing and planting, weeding, pest management, harvesting, threshing and storage. Land selection typically occurs in February and is influenced by various factors, such as soil fertility, hillside slope, accessibility and proximity to villages. Farmers evaluate soil fertility by observing the land's condition, considering areas with healthy crop growth as fertile and suitable for jhum cultivation.[5] Land preparation usually starts in March. Standing crops are cut and dried during the dry season. April and May are dry crop burning months. After that, partially burned crops are removed from jhum land and stacked. These forests are used to make fences to keep wild animals out of jhum land. Most years, the early showers in April and May prepare the field for crops. Seeding begins between

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Date of Submission : 4th November 2024
Date of Acceptance : 2nd December 2024

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May and June. A small, three-inch-deep hole is dug with a tagol's blunt square end. To complete, a handful of mixed rice, vegetable, cotton, etc. seeds are placed in the hole.[6]

In Bangladesh, agriculture is labor-intensive and jhum cultivation involves demanding postures. Work schedules and tasks can restrict human potential, presenting numerous challenges for jhum growers. Therefore, it is essential to monitor the labor practices and postural stress experienced by jhum farmers. This study aims to identify the factors associated with work patterns and postural stress.[7] The work patterns of jhum cultivators, which include their working hours, body postures, and tasks assigned within fixed time frames, can lead to postural problems due to prolonged work hours and positions. Musculoskeletal disorders affect individuals across all age and gender groups, as well as various socio-demographic categories within communities. These conditions comprise a range of disorders that, despite differing in pathophysiology, are connected by their anatomical association with specific body parts and are characterized by pain and diminished physical function. Although the impact of these disorders is increasing within communities related with jhum cultivation, health policies and priorities have yet to fully recognize this issue and should take necessary measures.[8]

Materials and methods

A cross sectional study was conducted among 180 jhum farmers aged from 18 to 60 years in Sreebardi upazila of Mymensingh district, Bangladesh. The study included all participants who signed the written consent form. Jhum cultivators work patterns and postural stress were assessed using a semi-structured questionnaire and OWAS (Ovako Working Posture Assessment System). Female and male jhum cultivators aged 18–60 years who worked at least 24 months and gave informed written consent were included. People who refused to participate and those with a history of falls or accidents or an illness that causes soft tissue or joint discomfort were excluded.To conduct the study, convenience sampling was used. Hariakona, Babelakona and Dhighlakona in Sreebordi union, Sherpur district, were chosen since most jhum growers lived there.

From July to December 2023, a pretested face-to-face, semi-structured questionnaire was used to interview study participants at their convenience. Prior to data collection, a pre-test was carried out to evaluate the effectiveness of the questionnaire, involving 10% of the total sample size in Durgapur Upazila, Netrokona district.

In this study, postural stress was evaluated using the OWAS method. The questionnaire covered ten activities, including land preparation, uprooting, carrying and planting saplings, harvesting, binding, carrying crops, threshing, sweeping and winnowing. Based on OWAS, two new variables were created: "Risk category 4" and "Risk category 2," coded as 1 for yes and 0 for no. Respondents who gave positive answers for any of the six activities- land preparation, uprooting, planting saplings, harvesting, binding, and carrying crops- were classified under risk category 4, while those who did not were classified under risk category 2.

Collected data were checked, edited, coded and recoded by using IBM SPSS version v26. Descriptive statistics such as mean, standard deviation and percent were computed for continuous variables of the participants. Chi-square test and Fisher exact test were used to assess the significance of associations between two nominal variables and a P-value of <0.05 at a 95% confidence interval was taken as significant. The results were presented in tables and charts.

Confidentiality was maintained and informed written consent was obtained from each participant. Ethical approval was obtained from the Institutional Review Board (IRB) of the National Institute of Preventive and Social Medicine (NIPSOM), Dhaka 1212, Bangladesh. (Reference: NIPSOM/IRB/2023/06)

Results

Table I Socio-demographic differentials of the jhum cultivators (n=180)

Characteristics		Frequency (n)	Percent (%)
Gender	Male	91	51.0
	Female	89	49.0
Age (In years)	<20	14	7.8
	20-30	34	18.9
	30-40	46	25.6
	40-50	29	16.1
	>50	57	31.7
	Mean±SD		41.2±1.0
Education	Illiterate	55	30.6
	Primary	75	41.7
	Secondary	43	23.9
	Higher secondary and above	7	3.9
Monthly income (Taka)	<15000	78	43.3
	15000-20000	94	52.2
	>20000	8	4.4
	Mean±SD		16,972.2±188.1
Working experiences	<10	23	12.8
(In years)	10-20	47	26.1
	20-30	39	21.7
	>30	71	39.4
Weekly working hour	<45	5	2.8
(In hours)	45-55	91	50.6
	55-65	71	39.11
	>65	13	7.2

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Above table depicts that 91(50%) were male, 46(25.6%) were aged 30-40 years, majority had primary level of education 75(41.7%). Only 8(4.4%) had Tk. 20,000 monthly income.

71(39.4%) had more than 30 years work experiences, 91(39.4%) worked for 45-55 hours weekly, only 13(7.2%) mentioned >65 hours weekly working time.

Table II Distribution of the respondent according to section of work (n=180)

Working section	Sub section	Frequency (n)	Percent (%)
Weeding		120	66.7
Preparing of land		90	50
Planting	Carrying saplings	90	50
	Planting saplings	39	21.7
Picking up crops		77	42.8
Carrying crops	Bindings	63	35
	Carry crops	25	13.9
Processing crops	Threshing	47	26.1
	Sweeping	27	15
	Winnowing	60	33.3

Among the respondents, 120(66.7%) were enjaged in weeding, 90(50%) had done land preparation, only 27(15%) performed sweeping.

Table III Postural stress of the respondents (n=180)

Activities	OWAS CODE	Action category	Frequency (n)	Percent (%)
Land preparation	4141	4	90	50
Uprooting	4161	4	120	66.7
Carrying saplings	1373	2	90	50
Planting saplings	4141	4	39	21.7
Harvesting	4141	4	77	42.8
Binding	4141	4	63	35
Carrying crops	2373	4	25	13.9
Threshing	2131	2	47	26.1
Sweeping	2171	2	27	15
Winnowing	2171	2	60	33.3

120(66.7%) faced postaral strem on uprooting 90(50%), For carrying saplings only 27(15%) for sweeping and 60(33.3%) narrated winnowing.

Table IV Risk category of the respondents (n=180)

Risk category	Frequency (n)	Percent (%)
Category-4	132	73.3
Category-2	48	26.7
Total	180	100.0

Discussion

Out of 180 respondents Jhum cultivators, 132(73.3%) narrated stress in all types of activities (Land preparation, uprooting, plenting saplings, harvesting, binding and carrying crops) the rest 48 (26.7%) explainined not all as strongly.

This study included 180 participants to represent the gender distribution of jhum cultivators, with 50.6% male (91 respondents) and 49.4% female (89 respondents). In a similar study by Walker et al.conducted which involved 210 participants, the majority were male 68.1% (143 respondents) and female 31.1% (67 respondents). The current study focused on jhum cultivators aged between 18 and 60 years, with 31.7% of respondents falling within the 50 to 60-year age range, yielding a mean age of 41.2 years and a standard deviation of 1.0 years.[9] Similarly, researched by Kuorinka et al. revealed 163 male workers aged 18 to 50 years, reporting a mean age of 33.2 years with a standard deviation of 10.33 years.[10]

In this study, the majority of respondents, accounting for 39.4%, reported having more than 30 years of experience in Jhum cultivation. Additionally, 26.1% of participants indicated they had between 10 and 20 years of experience, while 21.7% had 20 to 30 years of experience. A smaller group, representing 23(12.8%) reported having less than 10 years of experience in Jhum cultivation. In a related study, participants were categorized into three groups based on their work experience: Group A (≤5 years) Group B (6-15 years), and Group C (>15 years). The findings revealed that 14.72% of workers had experience of 5 years or less, 54.60% had between 6 to 15 years, and 30.68% had at least 16 years of experience. The current study also found that among respondents, 39.4% worked between 55 to 65 hours per week.[11]Additionally, 50.4% reported working 45 to 55 hours per week, indicating that a significant number of Jhum cultivators maintain a moderate work schedule. Conversely, 7.2% reported working over 65 hours per week, suggesting that a subset of individuals may endure extended and potentially strenuous hours, while a small fraction (2.8%) reported working less than 45 hours per week. The work activities in this study were categorized into weeding, land preparation, planting, harvesting, carrying crops and processing crops. Notably, weeding emerged as a common task, with 66.7% of participants indicating their involvement, highlighting its importance in the cultivation process. Furthermore, 42.8% of participants engaged in harvesting tasks, demonstrating significant involvement in the latter stages of farming, from harvesting to transportation. In a similar study showed that activities were classified into land preparation, uprooting, carrying saplings, planting, harvesting, binding, carrying crops, threshing, sweeping, and winnowing. Their results showed that 66.1% of participants participated in agricultural activities daily, while 17.2% completed their tasks on different days, suggesting a regular yet sporadic

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engagement in agricultural operations.[12] According to the report, 62.8% of participants found their work difficult. 14.4% of interviewees said their work was extremely difficult, revealing a segment that struggles with agricultural work. Jhum agriculture was the only occupation for 67.2% of study participants. This implies that most community members depend on agriculture for their living. Conversely, 32.8% of participants worked outside of Jhum cultivation.[13]

This study found that 2.2% of respondents experienced neck musculoskeletal issues in the past year, while 18.3% reported shoulder problems. Elbow issues were noted by 23.9% of participants and 25.0% experienced wrist or hand problems. Additionally, 28.9% reported upper back issues and a significant 51.1% suffered from lower back problems. Hip or thigh problems affected 71.1% of individuals, while knee issues were reported by 61.1%. Foot and ankle problems were noted by 16.1% of respondents. Over the last week, only 1.7% of participants indicated recent neck troubles among 180 respondents who reported musculoskeletal problems. In a related study, the prevalence of MSDs among 156 female jhum workers was analyzed across various body segments. According to the MNQ, the percentages of MSDs in different areas were as follows: neck (57.6%), shoulder (48.7%), elbow (36.5%), wrists (55.7%), upper back (46.1%), lower back (88.4%), thigh (51.9%), knee (27.5%) and feet (10.2%).[11,14]

Conclusion

This study investigates the relationship between agricultural practices and physical well-being in specific regions of Bangladesh. Jhum cultivation, an ancient subsistence farming method practiced by ethnic communities, meets the daily needs of farmers but often necessitates strenuous, prolonged postures. The study also identified hazardous work postures that require immediate correction. Enhancing ergonomic knowledge and practices could improve productivity and well-being among jhum cultivators. Tackling the intricate interplay between work patterns and postural stress among these farmers demands comprehensive strategies that incorporate education, infrastructure improvements and community-level interventions, health education and traing for health promotion.

Recommendations

This study recommends that jhum cultivators receive ergonomic training to enhance their posture and alleviate work-related stress. Tailored solutions should be promoted to assist jhum growers in managing work patterns and postural challenges. Additionally, regular health examinations should be conducted for jhum cultivators to address work-related health concerns. Collaboration with medical professionals is essential to address musculoskeletal issues faced by jhum cultivators.

Acknowledgements

Thank the study team and participants for their contribution of the study. Thanks to the honorable Chairmen of the villages for making the data collection process easier.

Disclosure

All the authors declare no conflict of interest.

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