

Prevalence of occupational injury among vegetable cultivators of West Bengal, India

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ABSTRACT

Manual agricultural task is an accident prone task in the harsh working environment, with occupation related health problem and injuries. They are exposed to extensive usage of primitive tools, bearing awkward working postures, manual handling of materials during long working hours. This study thus aims at studying the prevalence of occupational injury of vegetable cultivators in North 24 Parganas, West Bengal. A cross-sectional study on 181 male vegetable cultivators using traditional and/or modern agricultural techniques was conducted using predesigned survey questionnaire and direct observation of the mode of work. It was revealed that 68% of agrarian working with mechanical and 86% of traditional agricultural workers suffered from cut accident and there is a significant difference in frequency and type of cut accident between the both groups of workers. Traditional agrarian are more prone to occupational injuries like cut, fracture, sprain injury, etc. rather than cultivators working with mechanical tools, hinting at reduced work performance. Ergonomic interventions viz., natural working posture, work-rest schedule and optimization of body movements are required to reduce the prevalent accident frequency.

Keywords: Occupational injury, cultivators, traditional tools, manual agricultural task.

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INTRODUCTION

Agriculture is one of the most hazardous sectors, standing third lead following mining and construction. Many workers suffer occupational injuries and health problems each year, being exposed to the weather, being in close contact with small animals and plants, through extensive use of chemicals and pesticides, usage of hazardous tools, bearing difficult working postures and enduring long working hours with modernization in agriculture.^{1,2}

Agricultural activities have been known to be responsible for 170,000 deaths per annum from workplace accidents, which represent about 50% of the global estimate deaths related to all the productive activities.^{3,4}

In the Northeast region of India, manual mechanized tools are also responsible for some non-fatal accidents. The prevalence rate was 3.6 times higher in male workers than in females as they used different traditional tools and equipments during agricultural activities.^{5,6}

So, this study aims at studying the prevalence of occupational injury of vegetable cultivators in North 24 Parganas, West Bengal.

MATERIALS AND METHODS

Study Design:

A cross-sectional survey was initiated after obtaining the ethical clearance from the host institute (Approval No: WBSU/IEC/14/02, Dated: 13-11-2017). The study was conducted among randomly selected 181 male vegetable cultivators, who were divided into two groups, according to their working experience in vegetable cultivation. Modern agricultural workers are those with <10 years experience in the vegetable

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fields and traditional workers are those who have been in the fields for more than 10 years.

Inclusion Criteria

Adult male cultivators regularly using traditional and/or modern agricultural tools beyond one year and were interested to participate and submitted written consent, were selected for the study. Traditional farmers worked for prolonged period of time with inappropriate tools or machineries and mostly did not practice safety measures. In Modern Technology based agricultural systems, the farmers used semi-mechanized or mechanized farming tools and machineries.⁷

Exclusion Criteria

Vegetable cultivators aged below 20 years and above 60 years were excluded. Those individuals other than solely vegetable cultivators and those reported any chronic disease were also excluded from the study.

Table 1: Physical characteristics, age and work experience of modern and traditional male agricultural workers

Parameters	Modern workers	Traditional workers
Age (years)	31.57 ± 5.67	49.96 ± 5.76*
Height (cm)	159.96 ± 9.00	157.08 ± 8.88*
Weight (kg)	57.08 ± 7.74	57.71 ± 8.75
Body mass index (kg/m ²)	22.34 ± 2.84	23.38 ± 2.85*
Working experience (years)	15.13 ± 6.27	24.51 ± 8.15*
Working hours	8.93 ± 1.03	8.17 ± 1.05

All the data are presented as mean ± standard deviation.

*Indicates significant difference between the means ($p < 0.05$).

Questionnaire Study

The subjects were interviewed using pre-designed and pretested survey questionnaire which consisted of demographic profile (age, weight, height, period of work experiences, working hours, etc.), presence of discomfort or pain in different body parts - severity and frequency of occurrence, etc.

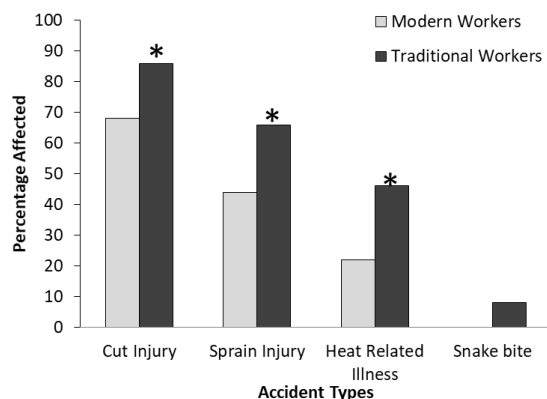
Data Analysis

The questionnaire study was converted into data and analyzed using SPSS (version 22). t-test and chi-square test were applied to compare all data between the traditional and mechanized vegetable cultivators.

RESULTS

The physical parameters of the traditional and mechanized vegetable cultivators have been compared in Table 1, from where it may be inferred that the BMI of all male vegetable cultivators are normal (20 to 25) as per World Health Organization⁸.

Significant difference in age, height, work experience and working hours exists between the traditional and mechanized vegetable cultivators. Though the weight of the traditional and modern vegetable cultivators have no significant difference, observed differences in BMI could



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Figure 1: Frequency of affected modern and traditional workers during last one year of agricultural activities

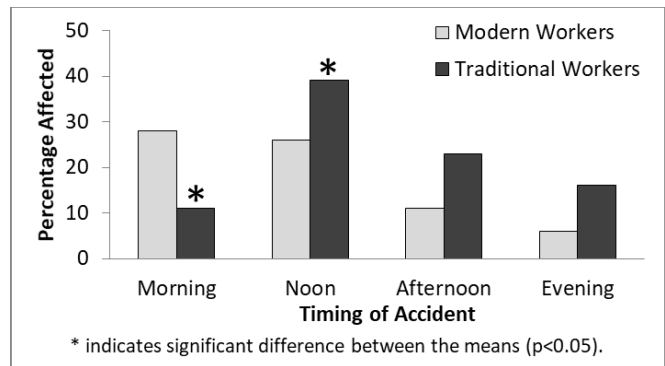


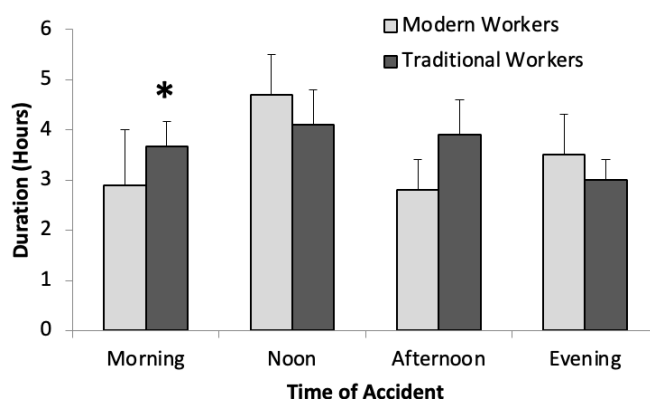
Figure 2: Frequency of affected by accident during last one year during agricultural activities

be associated with the differences in the height of workers. Figure 1 represents the frequency of accidents from cut injury, sprain, heat-related illness and snake bite among the vegetable cultivators. In the present study, 68% of the agrarian working with mechanical and 86% of the traditional workers suffer from cut accident. Agricultural workers suffer from minor to severe accidents or death from cuts, fractures, deep wounds, amputation and spinal cord injury.⁹

Figure 2 denotes the timing of accidents among the vegetable cultivators. 28% of the agrarian workers with machineries suffer from occupational accident during noon time and 44% of the traditional workers suffer from cut accident during noon time and there is a significant difference also.

Figure 3 denotes the correlation between work duration and accident time among male subjects in last one year showing that most of the time accident occurs approximately within 3 hours of work though the duration of work differs for both groups of workers.

Within first four hours of initiation of the farming, 65% of farm-related accidents occurred. 28% of all incidents were observed within 4 to 8 hours of labor, (especially the *dnao* (sickle)-related injuries) of which 31% were related to hand-tool-related accidents.¹³



* indicates significant difference between the means ($p < 0.05$).

Figure 3: Correlation between work duration and accident time in last one year during agricultural activities

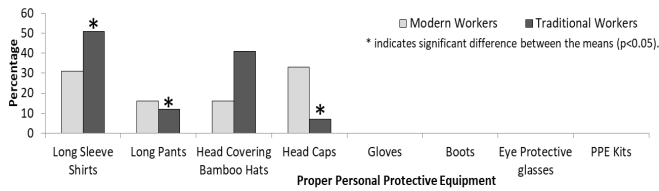


Figure 4: Type of Personal Protective Equipment (PPE) used in last one year during agricultural activities

Figure 4 represents the proper PPE details among the two types of male vegetable cultivators in last one year during agricultural activities. The vegetable cultivators do not wear any kind of PPE kit or hand gloves or eye protecting glasses during their activities as a result may be they are more prone to cut injury in their hands or legs. The result also shows that only 34% of the modern vegetable cultivators wear long sleeve shirt whereas 57% of the traditional workers wear long sleeve shirts. Rest of them do not wear any full shirt or may be use T-shirt, 31% of the agrarian workers with machineries and 12% of traditional works wear long pants, while the rest of them use half pants or lungi. This may expose them more to agricultural sharp tools and slippage related cut or injuries with regular involvement of the fingers, feet, legs and hands in agricultural activities are more common. Most workers use bamboo hat as a head protector or heat protector whereas others use normal cap (36% of the modern vegetable cultivators and only 8% traditional workers) while the rest do not use any kind of head protector during their working activity. This might causes heat related problem among the non-users. The findings are similar to that in the rural farmers of Nepal.¹⁴

Figure 5 represents the frequency of cut injury among the vegetable cultivators, according to age during last one year in different agricultural activities. Frequency of cut injury is more common among the 41-60 years aged workers who use traditional type of agricultural tools. At the same time the frequency of cut injury is also common among 20 to 30 years individuals as they are young and less experienced in the fields. Proportion of the injuries is higher among the farmers in the age group of 40–49 years.^{13,14}

Table 2 denotes the attendance of the workers i.e. number of

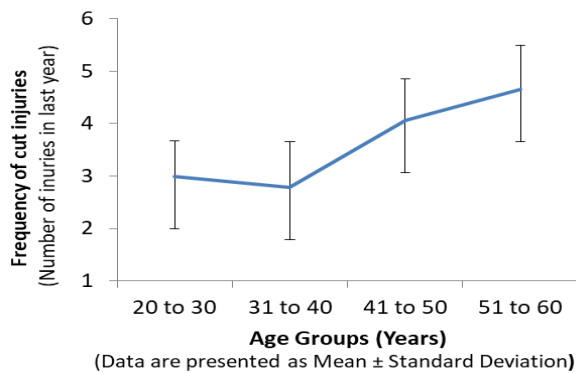


Figure 5: Frequency of cut injury in accordance with age in the workers during last one year while pursuing agricultural activities

Table 2: Field attendance in modern and traditional subjects for agricultural activities during last year

Different Agricultural Activities	Working days for each activity during last year (No. of days / worker)	
	Modern Workers	Traditional Workers
Weeding	126.50 ± 49.27	42.20 ± 9.78*
Furrowing	21.04 ± 5.53	24.50 ± 8.21*
Spraying	78.50 ± 31.48	108.07 ± 29.82*
Axing	69.21 ± 15.95	68.20 ± 26.67
Spading	54.17 ± 21.57	60.76 ± 26.67*
Sowing	14.94 ± 11.92	22.96 ± 8.10*
Carrying	53.88 ± 6.13	60.57 ± 15.57*
Gamitification	297.35 ± 10.65	290.69 ± 11.69*
Digging	13.35 ± 3.80	17.17 ± 4.78*

All the data are presented as Mean ± Standard Deviation.

* indicates significant difference between the means (p<0.05).

working days and number of day absent from the agricultural duties. 68% of the modern vegetable cultivators and 86% of the traditional workers do not attending the fields due to agricultural injuries. Farmers those who spend more hours in the agricultural fields are more prone to injury.¹⁴ The finding is similar with Ethiopian farmers.¹⁵ On an average a farmer attends the field on all days barring his physical disability which usually does not exceed about two weeks a year.

Figure 6 shows that fingers of the both hand and legs, especially the finger cut in the left hand is common among the vegetable cultivators, as there is regular involvement of the fingers - hands in agricultural activities which differs significantly between the two groups. With mechanization, image of the hand tools use be reduced. Therefore, hand tools like spades and sickles may contribute to farm injuries in India.^{16,17}

The figure 7 represents the nature of sprain injury among the vegetable cultivators. Faulty lifting technique of agriculture related products, carrying heavy weight (agricultural products and other materials like fertilizer, heavy equipments, carrying spray machine) and digging, affect shoulders, lower back and ankle from sprain injury.

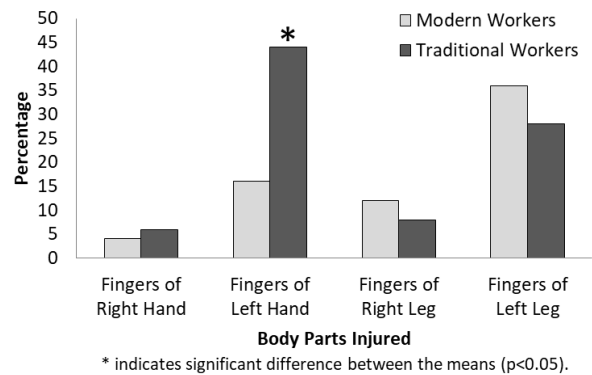


Figure 6: Cut injuries affected subjects during different agricultural activities

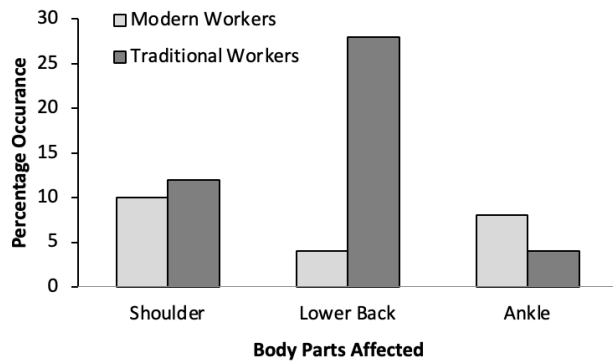


Figure 7: Sprain injuries in different body parts among the vegetable cultivators

DISCUSSION

Both the traditional and modern groups of workers devoted an average 8-hours-a-day from morning to evening, though the activity type differed according to vegetation cultivation and also according to their working experience, predisposing them to different kinds of work-related accidents.

Accidents like cuts, fractures, sprain injuries are more common for both group of workers using traditional and or modern farming tools but the traditional workers are more prone to cut accident than others as they worked for prolonged period of time with inappropriate tools or machineries without practicing safety measures. Agrarian working with machineries suffers from similar problems with semi-mechanized agricultural tools as they might not be ergonomically suited to the new machine. Field workers may have age-related injuries as a result of financial insecurity, sluggish reflex and carelessness from overconfidence through experience, physiological limitations and other geriatric factors.¹⁰⁻¹² The agricultural workers experienced snake bite as they toiled in the open fields without protective dress. Different activities with different duration of work might result in differential hazard level with prolonged time in the fields, being more prone to activity-related accidents.

Sprain injury is another occupational health problem for both groups of vegetable cultivators as they carry heavy load on their shoulders or head, viz. vegetables from the fields, fertilizers, spray machine etc.

Heat related discomfort is common in both group of workers as they have a routine timeframe of work from morning to noon time and afternoon to evening, outdoors, despite the scorching sun.

The traditional workers used traditional type of equipment and most of them worked as laborer for prolonged period to meet the deadline for that day. So, the extra burden on them predisposes them to accident. The workers also suffered from accident in the mornings. The modern workers are more prone to accident than traditional workers because they hurry to go home for their food and then again to rejoin their work. Being newcomer to the job, they are less experienced.

The traditional workers are more prone to accident and other health problems as they are aged with less alertness,

muscular weakness and tissue loss resulting in slippage of sharp tools. This may contribute to their absence in the fields. The vegetable cultivators practice various kinds of jobs like weeding, furrowing, spraying, axing, spading, ploughing, gamification and carrying agricultural products throughout the year in their fields for about 7-8 hours a day. Extreme weather is also responsible for their absence.

Hand equipment like sickle, spade, weeding hook, hand hoe are routinely used in farms for weeding, furrowing, spading, digging, harvesting and making irrigation channels. As all of these are practiced manually in the fields, slippage of the tools might be responsible for cut injuries especially in the fingers.

CONCLUSION

Occupational injury like cuts, accident, fracture are common among the vegetable cultivators along with sprain injury affecting shoulders, lower back and ankle. In order to reduce the prevalent sprain injury risk and discomfort in different body parts, especially lower and upper body parts, there is requirement of introduction of alternate posture and technique of weight carrying, work-rest schedule and frequent change in body movement.

Thus, it may be recommended that vegetable cultivators should avoid activities which are more prone to occupational injury. There is also a need to increase the number of cultivators so that shift of work may be possible; to reduce the frequency of accident and also health risks associated with their job.

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DECLARATIONS

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