

**ASSESSMENT OF THE PATTERN OF AGRICULTURAL ACCIDENTS IN A TRIBAL DISTRICT, RATLAM, CENTRAL INDIA**LOKENDRA S KOT<sup>1</sup>, ANAND K PATIDAR<sup>1</sup>, ANURAG JAIN<sup>2</sup>, VIKASH SHARMA<sup>1</sup>, JITENDRA GUPTA<sup>3</sup>, MAHESH GUPTA<sup>1\*</sup><sup>1</sup>Department of Community Medicine, Government Medical College, Ratlam, Madhya Pradesh, India. <sup>2</sup>Department of Surgery, Government Medical College, Ratlam, Madhya Pradesh, India. <sup>3</sup>Department of Anatomy, Government Medical College, Ratlam, Madhya Pradesh, India.  
Email: drmguptagmc@gmail.com*Received: 20 January 2023, Revised and Accepted: 10 March 2023***ABSTRACT****Objectives:** The objectives of this study were as follows: (1) Study the various type of agricultural accident in selected district. (2) Study the various factors associated with agricultural accidents.**Methods:** An observational cross-sectional study conducted after getting ethical approval from ethical committee in villages of Ratlam District selected by stratified random sampling method for the duration of 1 year. Data collected using predesigned structured pro forma through selected villages using key informant approach. Study financially supported by Indian Council of Social Science Research (ICSSR).**Discussion:** Total 865 were victims of agricultural accidents in our study which include 22.20% (192) females and 77.80% (673) males. Most of the victims (46.24%) who met agricultural accident were from age of 30–45 years and about 6.47% (37 – males and 19 – females) victims were below age of 15 years. Mean age of victims was 32.98 and SD 12.415.**Conclusion:** Mean ages of victims were 32.98 and SD 12.415. Young workers recorded the highest rate of agricultural injury with 52 accidents per 1000 workers. Incidence of agricultural accidents found to be  $\approx$  26.11 per 1000 workers per year. Total 865 agricultural injuries were reported, of which 457 (52.83%) by hand tool (Sickle/Pick-axe/hand hoes). The overall accident's incidence rate calculated was 3.66/1000/year. Sickle accidents were highest which constituted 400(46.24%). The right hand fingers (101) are most affected part followed by the left hand fingers (95).**Keywords:** Agricultural accidents, Pattern, Hand tools, Central India.

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**INTRODUCTION**

Agriculture plays a key role in India's economy. About 54.6% of the total workforce is engaged in agricultural and allied sector activities (Census 2011) and accounts for 18.8% of the country's gross value added (GVA) for the year 2021–2022 (at current prices) [1]. Two hundred and twenty-five million people are employed in Indian agriculture to cultivate 140 million hectares of farmland. Despite advances in farm technology (such as 149 million pieces of machinery), much of the labor intensive, resource poor family farming still relies on antiquated methods (like 520 million hand tools and 37 million animal-drawn implements). The traumatic accidents and injuries are the foremost issues to look at choices for technology intervention and betterment of labor in crop production activities [2].

Modern-day farmers are adapting to the modern methods of farming activities, tools, and agricultural machinery procedures to carry out the farming activity. Farmers have significant changes with time they have improved their farming activities by indulging themselves in modern methods by adapting to technological advancements and agricultural machinery which leads the game [3].

Globally, occupational injuries are associated with loss of 10.5 million disability-adjusted life years every year and constitute 8% of mortality due to unintentional injuries [4].

Annually 318,000 workers die due to occupational accidents and 374 million encounter nonfatal injuries and illnesses [5]. Nonetheless, these were gross underestimates as the majority of the occupational injuries go unreported [6]. High and variable rates of injuries have been reported among agricultural workers, both from developed and

developing countries. Machineries, hand tools, tractors, heavy lifting, farm animals, pesticides, and other chemicals predispose agricultural workers to injuries [7].

Agricultural accidents and hazards are a situation based hazard for everyone working on the farm and this happens as a result of many factors, for example, man, machine, crop, toxic chemicals, or environmental factors. As the agricultural section is morally uncategorized, there is a lack of a national reserve for risks and related farms, which would be useful to measure health, security, and financial outcomes. Systems must be designed in such a way that they are not only protected from ordinary people but also from those who can belong to any group. These types of projects, laws, and regulations will reduce the chances of people harming themselves or themselves even if they make mistakes. Such programs are often referred to as "forgiveness" programs. Designing such a system the etiology of risks plays a very important role.

**METHODS****Definition of agricultural accident**

Farm accident is defined as anything unpleasant or damaging which happens unexpectedly or by chance that results in injury, loss of life, property damaged, time loss, and tangible loss as a result of operating farm machinery (Yisa, 2001, Yohanna, 2004 and Adamade, 2007). They further stated that farm accident can be referred to as all incidental occurrence related to agricultural activities such as snake bite, bee invasion, fire outbreak, chemical explosion on the farm or workshop, drowning in a farm dam, falls, recreational, and immunological disease land communal crises resulting to agricultural land resource damage which could be referred also to as farm accidents (Yohanna, 2006).

## Type of study-cross-sectional observational study

### Study period

Data are collected for past 1 year (2019–2020) on recall basis.

### Selection of villages in the district

Villages are selected through Stratified Random Sampling technique. The Ratlam district has eight blocks with 1016 villages. Each block of Ratlam district considered as stratum and select 10 villages from each stratum to get 80 representative villages of the Ratlam district. It is proposed to collect the data through selected villages by approaching key informants, namely, Sarpanch, Gram Sevak, and Agril. Extension Officer, Doctors of health centers, etc., in the selected villages through the Directorate of Agriculture/Revenue authorities.

Data collection was done by the researcher and officials of agriculture department informants about the socioeconomic-demographic and pattern of agricultural accidents related aspects using the predesigned semi-structured questionnaire.

Data collected were entered in Microsoft Excel and Epiinfo. Statistical analysis was done using appropriate statistical tests.

## RESULTS

The results of the study are presenting below in forms of figures and tables.

## DISCUSSION

Fig. 1 shows that there were 14.37% (46) females met agricultural accidents, were farmers, and about 26.78% (146) females got that agricultural accidents were laborers by occupation.

Fig. 2 shows, total 865 were victims of agricultural accidents in our study which includes 22.20% (192) females and 77.80% (673) males. Most of the victims (46.24%) who met agricultural accident were from age of 30–45 years and about 6.47% (37 – males and 19 – females) victims were below age of 15 years. Mean age of victims was 32.98 and

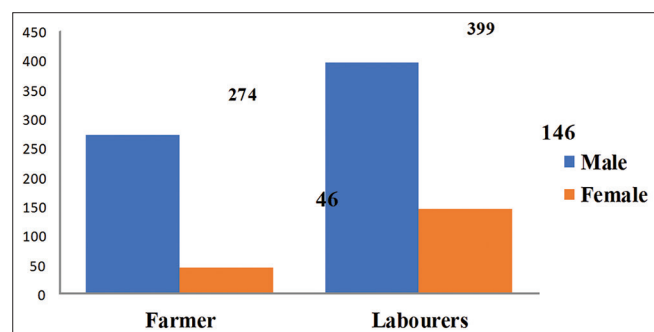


Fig. 1: Occupational status-wise accident victims

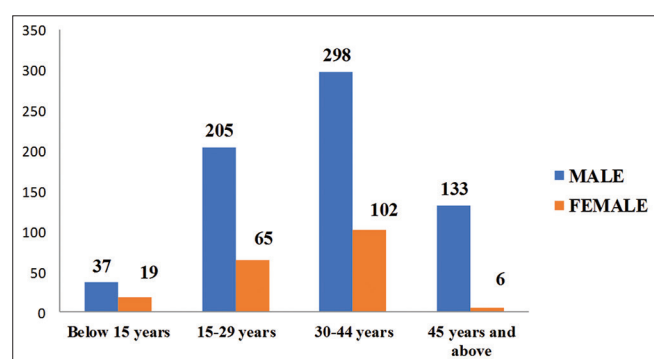


Fig. 2: Distribution of accident victims according to their age and sex

SD 12.415. Mean age of participants in study of Rabbani *et al.* found to be  $35.7 \pm 11.9$  years [7]. Report of ILO revealed that about 250 million children belongs to 5–14 years of age, work in developing countries and in Latin America and the Caribbean about 56% children work in agriculture sector from age of 5–7 years onward [8]. Young workers recorded the highest rate of agricultural injury with 52 accidents per 1000 workers [9]. Similar findings were found in study of Parvez *et al.*, where about 40% young peoples of 16–30 year of age and about 26% peoples belonged to 31–45 year of age group, who suffered agricultural injuries [10]. Dermers and Rosenstock also found similar findings, in which about 74% of all injuries reported in 18–40 years-old [11]. Tiwari *et al.* showed that most (32.9%) of the injuries reported in the farmers of 15–29 year age group [12].

Table 1 shows 33,134 workers from 44,643 families engaged in agricultural activities. Incidence of agricultural accidents found to be  $\approx 26.11$  per 1000 workers per year. Annual incidence in study of Rabbani *et al.* found to be 35 per 100 workers per year (95% CI: 28.9–42.7) [7]. In report of “Safe Work Australia,” annual incidence was found to be 56.4 injuries per 1000 workers [9].

Table 2 shows that total 865 agricultural injuries were reported, of which 457 (52.83%) by hand tool (Sickle/Pick-axe/hand hoes) and rest 47.17% injuries include machinery and others injuries. The overall accident's incidence rate calculated was 3.66/1000/year.

However, minor hand injuries (resulting in loss of <2 days) due to hand tools were common that farmers forgot over time. A maximum of 1000 accident/hand tools/year reported by pick-axe. Damage due to scissors occurred mainly during the harvest of hardy stems such as pigeon pea, chickpea, mustard, sorghum, and fenugreek. More injuries were reported in the pick-axe.

Table 2 presents the source-wise classification of agricultural accidents reported in studied villages of the district. Sickle accidents were highest which constituted 400 (46.24%) of total agricultural accidents followed by drowning in river/wells 78 (9.01%), tractors 71 (8.21%), snake/scorpion bite 62 (7.17%), electric wires 63 (7.28%), and pick axe/hand hoes 57 (6.59%). Highest accident incidence rate/1000 machines/year was in case of grain mill (142.86), followed by tractors (19.37) followed by threshers (8.47), chaff cutters (6.72), sickles (5.74), and pick axe (1.37). In the study of Parvez *et al.* [10], farm machineries (tractor, trolley, and cultivator) were responsible for about 20% of agricultural injuries. A study of Tiwari *et al.* claimed that machinery contributed about 77.6% of all agricultural injuries in India [12]. The accident incidence rate/1000 machines/year given by Mittal *et al.* [13] for tractors were higher. This variation in accident incidence rates would have been due to a number of factors such as differences in skill of workers, type of machinery used, and also the methodology adopted for survey.

The present study (Table 3) gives a clear picture that right hand fingers (101) are most affected part followed by the left hand fingers (95). It is basically due to greater use of hand tools in the field. The upper body part is comparatively less affected with the lower part. Legs are most prone then knee, foot, stomach, etc. Kumar *et al.*, in Northern India, reported, the foot and legs were the most frequently involved in hand tool injuries [14]. Parvez *et al.*, in Bangladesh, reported that hand tool injuries were 67% and remaining 33% agricultural injuries were due to machinery and other means [10]. Xiang *et al.*, in India, reported that most of the injuries in Indian farmers caused by hand tools [15]. Tiwari *et al.* reported about 77.6% injuries among Indian farmers were due to machinery used in agriculture [12]. A study conducted in rural Nepal showed that most of the injuries among the farmers were due to hand tools [16].

## CONCLUSION

Mean ages of victims were 32.98 and SD 12.415. Young workers recorded the highest rate of agricultural injury with 52 accidents per 1000 workers. Incidence of agricultural accidents found to be  $\approx$

**Table 1: Agricultural accidents reported in the selected blocks during the 1 year time**

Name of the block (Tehsil)	Number of families	Workers population engaged in agricultural activities	Number of accidents in one year time	Incident rate/1000 workers/year
Piploda	8306	4626	124	26.805
Jaora	5549	5966	112	18.773
A lot	4848	3038	121	39.8288
Sailana	3801	4329	84	19.404
Bajna	4036	2768	112	40.4624
Ratlam	8796	4517	145	32.1009
Raoti	4403	4590	93	20.2614
Tal	4904	3300	74	22.4242
Total	44,643	33,134	865	26.1061

**Table 2: Agricultural hazards reported during 1 year according to their source**

Sources of agricultural accidents	Total number of accidents (%)	Total number of machines	Incident rate/1000 machine/year
Accident prone agricultural machinery			
Self-propelled machines	8 (0.92)	1378	5.81
Tractors	71 (8.21)	3665	19.37
Grain mill	5 (0.57)	35	142.86
Threshers	15 (1.74)	1772	8.47
Chaff cutters	3 (0.35)	446	6.72
Electric motors and pump sets	15 (1.74)	26,323	0.56
Sprayers/chemicals	4 (0.46)	13,085	0.22
Hand tools			
Sickle	400 (46.24)	69,627	5.74
Pick-axe/hand hoes	57 (6.59)	41,590	1.37
Total	578 (66.82)	15,7921	3.66
Natural disaster			
Electrocution	12 (1.39)	-	-
Flood	9 (1.04)	-	-
Field work accidents			
Field	44 (5.09)	-	-
Electric wires	63 (7.28)	-	-
Other accidents			
Animal bits	19 (2.20)	-	-
Snakes/scorpion bits	62 (7.17)	-	-
Wells and rivers (drowning)	78 (9.01)	-	-

**Table 3: Distribution of body parts involve in agricultural accidents**

Name of body parts	Number of injuries
Head	15
Neck	8
Left shoulder	20
Right shoulder	22
Right hand	12
Left hand	18
Left wrist	22
Right wrist	25
Left hand fingers	95
Right hand fingers	101
Upper back	20
Chest	25
Lower back	28
Stomach	17
Right thigh	28
Left thigh	25
Right knee	32
Left knee	38
Right leg	48
Left leg	55
Right foot	22
Left foot	29

26.11 per 1000 workers per year. Total 865 agricultural injuries were reported, of which 457 (52.83%) by hand tool (Sickle/Pick-axe/hand hoes) and rest 47.17% injuries include machinery and others injuries.

The overall accident's incidence rate calculated was 3.66/1000/year. Sickle accidents were highest which constituted 400(46.24%) of total agricultural accidents. The right hand fingers (101) are most affected part followed by the left hand fingers (95).

#### AUTHORS CONTRIBUTION

Dr. Lokendra S Kot, Anand K. Patidar: Literature search, design, data acquisition, statistical analysis, manuscript preparation, and editing. Dr. Anurag Jain, Dr. Vikas Sharma: Collection of data, Writing - original draft. Dr. Jitendra Gupta, Dr. Mahesh Gupta: Conceptualization, methodology, formal analysis, writing original draft, supervision, writing-review and editing

#### CONFLICTS OF INTEREST

None declared.

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#### ETHICAL APPROVAL

Taken from Ethical Committee of Institute.

#### REFERENCES

- Annual Report 2021-22. New Delhi: Department of Agriculture, Cooperation and Farmers' Welfare, Ministry of Agriculture and Farmers' Welfare, Government of India; 2022.
- Kumar P. Farmers' Work-Related Injuries and Diseases in India.

- Meghani Nagar, Ahmedabad: J Agri Sci Food Res; 2021;12:239.
3. Available from: <https://www.tractorgyan.com/tractor-industry-news-blogs/952/top-10-farm-machinery-in-india-with-uses-and-benefits> [Last accessed on 2022 Dec 23].
  4. Concha-Barrientos M, Nelson DI, Fingerhut M, Driscoll T, Leigh J. The global burden due to occupational injury. *Am J Ind Med* 2005;48:470-81. doi: 10.1002/ajim.20226, PMID 16299709
  5. Takala J, Hämäläinen P, Saarela KL, Yun LY, Manickam K, Jin TW, *et al.* Global estimates of the burden of injury and illness at work in 2012. *J Occup Environ Hyg* 2014;11:326-37. doi: 10.1080/15459624.2013.863131, PMID 24219404
  6. Leigh JP, Du J, McCurdy SA. An estimate of the U.S. Government's undercount of nonfatal occupational injuries and illnesses in agriculture. *Ann Epidemiol* 2014;24:254-9. doi: 10.1016/j.annepidem.2014.01.006, PMID 24507952
  7. Rabbani U, Fatmi Z. Incidence, patterns and associated factors for occupational injuries among agricultural workers in a developing country. *Med J Islamic Repub Iran* 2018;32:88. doi: 10.14196/mjiri.32.88, PMID 30788325
  8. International Labour Organization. Programme on Safety, Health and the Environment. 4, Route de Morillons CH. Geneva, Switzerland: Labour Protection Department, International Labour Office; 2000. p. 1211. Available from: [https://www.ilo.org/wcmsp5/groups/public/---ed\\_protect/---protrav/---safework/documents/publication/wcms\\_110193.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/publication/wcms_110193.pdf)
  9. Safe Work Australia. Canberra ACT 260, Work-Related Injuries and Fatalities on Australian Farms. Vol. 641. GPO Box; 2013. Available from: <https://www.creativecommons.org/licenses/by/3.0/au/deed.en>
  10. Parvez MS, Shahriar MM. Agricultural farm-related injuries in Bangladesh and convenient design of working hand tools. *J Healthc Eng* 2018;2018:4273616. doi: 10.1155/2018/4273616, PMID 29682269
  11. Demers P, Rosenstock L. Occupational injuries and illnesses among Washington State agricultural workers. *Am J Public Health* 1991;81:1656-8. doi: 10.2105/ajph.81.12.1656, PMID 1836111
  12. Tiwari PS, Gite LP, Dubey AK, Kot LS. Agricultural injuries in Central India: Nature, magnitude, and economic impact. *J Agric Saf Health* 2002;8:95-111. doi: 10.13031/2013.7221, PMID 12002378
  13. Mittal VK, Bhatia BS, Ahuja SS. A Study of the Magnitude, Causes and Profile of Accident Victims with Selected Farm Equipment in Punjab. Final Report of ICAR ad-hoc Research Project. Ludhiana, India: Department of Farm Machinery and Energy Engineering, Punjab Agricultural University; 1996.
  14. Kumar A, Singh JK, Mohan D, Varghese M. Farm hand tools injuries: A case study from Northern India. *Saf Sci* 2008;46:54-65. doi: 10.1016/j.ssci.2007.03.003
  15. Xiang H, Wang Z, Stallones L, Keefe TJ, Huang X, Fu X. Agricultural work-related injuries among farmers in Hubei, People's Republic of China. *Am J Public Health* 2000;90:1269-76. doi: 10.2105/ajph.90.8.1269, PMID 10937008
  16. Bhattarai D, Singh SB, Baral D, Sah RB, Budhathoki SS, Pokharel PK. Work-related injuries among farmers: A cross-sectional study from rural Nepal. *J Occup Med Toxicol* 2016;11:48. doi: 10.1186/s12995-016-0137-2, PMID 27800010