



## “DEMOGRAPHY OF AGRICULTURAL MACHINE INJURIES AFFECTING UPPER EXTREMITY”

### Orthopaedics

**Dr. Aviral Gupta\*** M.b.b.s., M.s. (orthopaedics) Sawai Man Singh Medical College, Jaipur\*corresponding Author

**Dr. Nirottam Singh** M.b.b.s., M.s. (orthopaedics) Sawai Man Singh Medical College, Jaipur

**Dr. Devi Sahai Meena** M.b.b.s., M.s. (orthopaedics) Sawai Man Singh Medical College, Jaipur

### ABSTRACT

It is a prospective hospital based study conducted to evaluate the demographic parameters of agricultural machine injuries affecting the upper extremity and study the various factors contributing to occurrence of such injuries, on 130 cases admitted between January 2016 to December 2016, in a high volume tertiary care centre in Rajasthan. Injuries occurred mostly across the younger age group, ranging from simple incised wounds with soft tissue and bone injury or mutilating and crushing type injury. Quite a substantial number of patients did not receive any first aid.

Agricultural machines inflict grievous trauma, especially to the upper extremity, and usually involve the economically most productive age group i.e. <45 years. However, primary and tertiary care for these patients still remains deficient. There is an urgent need to address hazard issues and education safer operation. More importantly, steps to improve health care services aimed at managing injuries are imminently required.

### KEYWORDS

demography, agricultural machine injury, upper extremity

### INTRODUCTION

Agriculture is the most prevalent occupation in the world (1), also in rural India. Use of machines makes agriculture consistently one of the most hazardous occupations exposing the farmers to an increased risk of both fatal and non – fatal injuries (2). Kutty and thresher machines are the most commonly used machines in Indian countryside, and are known to cause severe, debilitating injuries. Almost invariably, machines cause injury to the upper extremity, more commonly, the hand. The hand is evolved to be highly specialized for facilitating prehension and sensation, and such grievous injury leads to gross disability.

So, in this research, we decided to study the demography of agricultural machine injuries causing upper limb injuries and identify the factors contributing to these injuries.

### MATERIALS AND METHODS

This is a hospital based prospective study involving 130 cases of injuries caused by agricultural machines admitted in a high volume tertiary care centre in Rajasthan, India with specialized hand surgery services available for management of these injuries. Appropriate consent was taken from the patients and demographic parameters were recorded in the proforma. Prior institutional review board approval was obtained.

### RESULTS

**The following results were obtained at the end of the study: -**

- 1) Of the total 130 cases, 95 (73.08%) patients were males while 35 (26.92%) cases were females. According to this data, mostly males were affected by farm machine injuries to extremities. This is explained as males also work during dawn and night under decreased visibility and have habit of intoxication leading to increased chances of sustaining injury. In adult females entrapment of loose clothing plays an important role in sustaining injury. In children, mostly injury was incurred during playing.
- 2) 90 patients (69.23%) were injured by kutty machine followed by 40 (30.76%) patients injured by thresher machines.
- 3) 75(57.69%) patients received injury while working while 55(42.31%) patients were injured during recreational activities around unguarded machines.
- 4) Out of 130, only 97 (74.62%) patients received primary aid at PHC/CHC level in the form of dressing and tetanus toxoid. 33 (25.38%) patients did not receive any medical aid even after being grievously injured.

PRIMARY TREATMENT			
	Frequency	Percent	Cumulative Percent
None	33	25.38	25.38

Dressing + Tetanus toxoid	97	74.62	100.00
Total	130	100.00	

All the 130 patients received injuries during routine work or recreational activities. Stress due to working overtime and sleep deprivation did not affect the feasibility of getting injured in our study.

- 6) In the study, 11 (8.46%) patients were occasional alcoholics. None of the patients admitted to habitual alcohol intake.
- 7) 79 patients (60.77%) were injured by manually operated machines. Rest 51(39.23%) patients were injured by machines operated by powered engines.
- 8) None of the patients in our study had any visual disability. So, any effect of visual status over types of injuries and final disability could not be determined.
- 9) Only 6 patients had a close family member who was affected by such injury previously. Rest all patients did not have any family member affected by agricultural machines previously.
- 10) In our study, we received patients from the following districts – Jaipur (28), Alwar (19), Karauli (14), Bharatpur (13), Sikar(13), Dausa (10), Ajmer(7), Churu(6), Jhunjhunu(6), Sawai Madhopur(4), Sri Ganganagar(3), Bikaner(2), Hanumangarh(2), Tonk(2), Jodhpur(1).
- 11) Most of the patients who suffered injury from agricultural machines were <10 years of age (44 cases, 33.85%), 19 cases (14.62%) were between 11 – 20 years, 31 cases (23.85%) between 21 – 35 years, 21 cases (16.92%) between 36 – 45 years and 14 cases (10.77%) of age > 46 years.
- 12) Maximum cases were of mutilating injury type (60 cases, 46.15%), followed by incised wounds (55 cases, 42.31%) and lastly by crushing type injury (15 cases, 11.54%).
- 13) Amongst the management of various injuries, only debridement was the most frequently performed procedure required in 41 patients (31.54%), reconstructive procedure in 29 cases (22.31%), debridement + plastic procedure in 25 cases (19.23%), bone fixation + reconstructive procedure in 23 cases (17.69%), plastic procedure in 8 patients (6.15%), debridement + bone fixation in 3 cases (2.31%) and bone fixation + plastic procedure in 1 case (0.77%).

**Table 2**

	TREATMENT		
	Frequency	Percent	Cumulative Percent
Debridement	41	31.54	31.54
Reconstructive procedure	29	22.31	53.85

Debridement +Plastic procedure	25	19.23	73.08
Reconstructive + Bone fixation	23	17.69	90.77
Plastic procedure	8	6.15	96.92
Debridement + Bone fixation	3	2.31	99.23
Bone fixation + Plastic procedure	1	0.77	0.77
Total	130	100.00	

Maximum number of procedures were debridements (41 cases, 31.54%) which included mostly total traumatic amputations at various levels. Primary closure was obtained in these injuries, caused by both thresher and kutty machines.

Bone fixation + Plastic procedure	1	0.77	0.77
Total	130	100.00	

The reconstructive procedures include extensor and flexor tendons and/or nerve repairs (29 cases, 22.31%). These are tidy incised wounds mostly caused by manual kutty machines. Management of these injuries require more complex surgeries and greater follow up time.

The injuries requiring debridement and plastic procedures (25 cases, 19.23%) are usually caused by mostly by thresher and also by kutty machines. The threshers usually cause deep lacerated wounds and total traumatic amputation over the entire upper extremity whereas kutty machines usually cause total traumatic amputations that may require coverage.

Injuries requiring reconstructive + bone fixation (23 cases, 17.69%) are usually caused by kutty machine injuries. Such injuries are usually present in fingers and palm but may be present anywhere over the entire extremity. Mostly these cases present as extensor tendon injury to the finger along with fracture of the phalanx in children. There is usually less involvement of flexor tendons and digital nerves mostly because of the mechanism of injury where dorsal aspect of the hand faces the machine.

Injuries where the wound is tidy such as fingertip amputations and which are amenable to coverage by local flaps such as cross finger flap, split thickness skin grafting are usually cause by manual or powered kutty machines. Single or multiple fingers may be involved. We had 8 such cases in our study representing 6.15% of the total cases. In other such injuries, other procedures such as primary closure was performed.

In more severe injuries caused by threshers, apart from debridement, bone fixation such as phalangeal, metacarpal or both bone forearm may also be required. Out of 130 cases, we had 3 cases (2.31%) requiring such procedures.

We had a single case where bone fixation was given primarily along with debridement followed by plastic coverage of the wound representing 0.77% of total cases.

## CONCLUSION

Agricultural machines such as kutty and thresher are known to cause serious injuries mostly involving the hand. In our study, kutty machines were responsible for greater number of cases compared to thresher. Also, children form a large number of patients affected by kutty machines because of accidental injuries during play. Agricultural work is seasonal and highly dependent on weather conditions. Attempts to accomplish large amounts of work in limited time leads to haste, fatigue and stress, all of which increase accident stress (3-5). Almost invariably, kutty machines are known to cause soft tissue injuries/amputations in children while playing around an unguarded kutty machine, where one child turns the machine on while the other has kept the hand over the blades. 89.23% of the cases were <45 years of age, indicating that resulting severe disabilities occurred in the economically most productive age group. Moreover, a staggering 48.47% cases were aged less than 20 years.

Thresher machines cause mutilating or crushed type injuries which have poorer prognosis due to extensive soft tissue damage and organic debris, whereas, kutty machines cause amputations and incised wounds with clean tendon/nerve injuries. Such injuries are amenable to repair and have a better prognosis than thresher machines. However, the dismal aspect of the health care system is that only around 75% patients received primary health care at CHC/PHC level, that too only in the form of debridement and tetanus toxoid. No basic surgical

facilities were available at lower levels. In quite a few cases, prognosis would have been improved with timely intervention/referral at a lower level.

In general, the injury caused by power machines was greater in severity than caused by manual machines. Management of these injuries required procedures of considerable surgical skill. Procedures included debridement, bony reconstruction, plastic surgeries and a combination of such procedures.

The above points clearly indicate that there is an urgent need for addressing safety issues with the machines and also educating the workers regarding use. There is also a prompt need to redress the deficits in healthcare in terms of skilled manpower and infrastructure. Even at higher levels of healthcare, adequate facilities for proper management of hand injuries is sparse, which is bothersome.

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