

## **Fodder Cutter Machine Injuries: An Unsafe Household Item in Rural Sindh in Pakistan**

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**ABSTRACT**

**OBJECTIVE:** To analyze the demographic features and patterns of fodder cutter machine injuries in rural areas of Hyderabad, Sindh.

**METHODOLOGY:** This descriptive study was conducted in the Department of Orthopedic Surgery and Traumatology at Liaquat University of Medical Health Sciences Jamshoro from February 2018 to January 2019. Total 56 patients with fodder cutter machine injuries of either sex and any age presented were included in the study. Data collected and analyzed on SPSS version 21.

**RESULTS:** In this study 56 patients affected by fodder cutter machine injury were received, out of these 38 (68%) were male and 18 (32%) were females. All patients sustained injuries to the upper limbs. The mean age was  $24.54 \pm 12$  years. Amputations of the distal phalanges were the commonest injuries noted in 11(13.5%) patients followed by palm and dorsum of the hand injuries (11.1%, n=9) and amputations at carpometacarpal joints (11.1%, n=9). Majority (86%, n=48) patients were injured while operating the machine at home and (14%, n=8) patients sustained injuries while laboring outside of home. Majority (75%, n=42) patients were injured by electric motor driven, while 14 (25%) were injured by manual machine. Time of injury was mostly in the morning (48%, n=27) followed by afternoon (41%, n=23) and evening (10.7%, n=6).

**CONCLUSION:** Amputations of the right-hand distal phalanges were the most commonly reported injuries due to electric fodder cutter machines used at home in the morning time. Male adolescents were more prone to these injuries than others.

**KEY WORDS:** fodder cutter machine, injury, amputation, hand injuries.

## **INTRODUCTION**

Pakistan is a farming dependent country and Hyderabad is the second largest city of Sindh surrounded by agriculture lands. In rural areas, the use of fodder cutter machine for preparation of fodder for the domestic animals is daily life activity<sup>1</sup>. A fodder/chaff/toka cutter machine is a locally manufactured mechanical cutter machine designed to cut the straw or hay into small pieces<sup>2</sup>. The manual and the electric motor are two types, electric motor-controlled machines is more usual and extreme. This development of electrical motors has increased the incidence of traumatic agriculture related injuries<sup>3-5</sup>.

Fodder cutter injuries are usually seen nearly in every emergency but exact prevalence is not documented in developing countries like Pakistan<sup>4</sup>. Traumatic fodder cutter injuries are very serious and challenging cases. Young age group is predominantly affected by these injuries. Since the prosperity of any nation is mainly dependent on the proportion of its young people therefore the disability of young people in preventable accidents may lead to loss of potential resources resulting in additional burden to both community and the economy<sup>6,7</sup>. Fodder cutter injuries are increasing day by day<sup>1</sup>. Very few studies have been conducted in developed countries regarding incidence of such agricultural injuries and associated amputations<sup>8</sup>. Therefore, more studies are the required to project the true epidemiology of agriculture related injuries in developed and developing countries<sup>9</sup>.

The aim of our study was to evaluate the patterns of agriculture related injuries by fodder cutter machine presented to our hospital. The results of our study would help to formulate guidelines for preventing and managing these injuries, allocations of adequate resources and provision of expert orthopedic surgeons to treat these injuries.

## **METHODOLOGY**

This descriptive study was conducted in the Department of Orthopedic Surgery and Traumatology at Liaquat University of Medical health sciences Jamshoro from February 2018 to January 2019. The study's approval was obtained from Ethical Review Committee (ERC) of the institute. All patients of either sex and any age who presented to accident and emergency department having history of fodder cutter machine injury were included in the study. Patients presenting with injuries /amputations resulting from industrial tools other than farming and diabetic peripheral vascular amputations were excluded from the study. All patients were resuscitated according to Advance Trauma Life Support (ATLS) protocol. Informed written consent was taken from each patient for surgery and publication. Tetanus prophylaxis was done in all cases and empirical antibiotics administered in each case were recorded as well. The emergency surgical procedure was prioritized for all patients. Both preoperative and postoperative radiological photographs were also included in the data for each case. Demographic data regarding age, sex, dominant limb, status of injury, injury time, type of treatment given and type of fodder cutter machine used was documented as well. Data obtained and analyzed on SPSS version 21.

**RESULTS**

In this study, total 56 patients affected by fodder cutter machine were presented. Of all patients, 38 (68%) were males and 18 (32%) were females. With regard to age, 17 (30.3%) were in between 11-20 years, 13 (23.2%) cases were in between 21-30 year, 12 (21.4%) cases were in between 31-40 year, 8 (14.2%) cases were in between 41-50 year and 6 (10.7%) cases were <10 years. Minimum age was 5 years and maximum age was 50 years. The mean age was 24.54±12 years. About 38 (68%) patients suffered right upper limb injury while 18 (32%) patients sustained left upper limb injury. Majority (86%, n=48) patients were injured while operating the machine at home and 8 (14%) patients sustained injuries while laboring outside of home. Majority (75%, n=42) patients were injured by electric motor driven, while 14 (25%) were injured by manual machine. Time of injury was mostly in the morning (48%, n=27) followed by afternoon (41%, n=23) and evening (10.7%, n=6). Dominant hand was affected in 37 (66%) cases at the ratio of 2:1. Majority (75%, n=42) patients were injured by electric motor driven whereas 14 (25%) patients were injured by manual machine. Amputations of the distal phalanges were the commonest injuries noted in 11(13.5%) patients (Figure I) followed by palm and dorsum of the hand injuries (11.1%, n=9) and amputations at carpometacarpal joints (11.1%, n=9), Elbow dislocation was the least common injury noted in only 1(1.2%) patient as shown in Table I.

**TABLE I: PATTERN OF INJURIES**

<b>INJURIES</b>	<b>FREQUENCY</b>	<b>PERCENTAGE%</b>
Amputation of distal phalanges	11	13.5
Wound at palm / dorsum of hand	9	11.11
Amputation at carpometacarpal level	9	11.11
Fracture of metacarpals	8	9.87
Amputation at level of wrist joint	7	8.64
Amputation at level of PIP joint	7	8.64
Fracture of phalanges	6	7.4
Amputation of all fingers including thumb	6	7.4
Tendon laceration	5	6.17
Amputation at level of proximal forearm	4	4.93
Amputation at level of distal forearm	3	3.7
Amputation at level of MCP joint	3	3.7
Fracture of distal radius	2	2.46
Elbow dislocation	1	1.23

**FIGURE I: AMPUTATIONS OF THE PHALANGES DUE TO FODDER CUTTER INJURY**



**DISCUSSION**

There is limited data available regarding the fodder cutter machine injuries in Pakistan and other countries<sup>10,11</sup>. We conducted this study to evaluate the demographic features and patterns of injuries caused by fodder cutter machine. Pakistan's economy is agricultural-based and 65 % of the population belongs to rural areas and depends on agriculture and livestock. Most common type of injury was amputation involving right upper limb at different levels, phalanx, hand, forearm and arm as shown in other international studies<sup>9,12</sup>. Similar results were seen in our study as hand was the most commonly injured part and distal phalanx traumatic amputation was more frequent than others. Right hand was affected more than left as noted by Shrestha<sup>11</sup>. All age groups are prone to get injured but children below 15 years of age are affected more and the causes are poverty, lack of schooling and copying their elders<sup>12-14</sup>. Similar result seen in our study where children are affected more. Children try to copy their elders and result in disastrous wrist and hand injuries. There is trend to develop safer fodder cutting machines in the developed countries<sup>4</sup>. In our study circumstance's injury was observed in upper limbs only while in the regions of Lahore and Sialkot documented such injuries to head, neck, scalp and lower limbs<sup>3,6</sup>. Research shows that farmers are on high risk of agriculture related injuries. Male work more in farms and more prone to injury<sup>15</sup>. Males were more injured as also evident in our study<sup>7</sup>. Mean age in our study was 24.5 years comparable with results of Shrestha<sup>15</sup>. Most of the cases in our study had amputation at different levels leading to disability, dependency and deformity. Young populace with loss of their digits, hands had worst impact on their socioeconomic psychological status. The rehabilitation of such patients back to work should be the ultimate goal of treating surgeon.

It has been observed that most of such type of injuries is inflicted mainly due to some negligence on the part of the individuals including exhaustion, over-worked, hastiness and overconfidence during operating fodder cutter machine<sup>16,17</sup>. The incidence of such injuries could be prevented by adopting various protective measures so as to reduce the direct contact of the operator to the cutting blades and include shielding the fodder cutting blades, addition of fodder feeding tunnel<sup>6</sup>. In rural areas, houses are built at agricultural sites which unprotected equipment like fodder cutter machine are easily accessible. In the majority of published papers, preventive measures are focused mostly on behavior modification and medical facilities; however, some authors have advocated design modifications for injury control. The effectiveness of suggested modifications and implementations has not been discussed in the majority of papers<sup>18</sup>.

Our study had few limitations. Our sample size was small and could not followed the rehabilitation of our patients. We therefore recommend further studies to confirm our results. We further recommend that incidence of such injuries could be reduced to a greater extent by implementing various protective standard operating measures including putting an age restriction to protect the children from inflicting such injuries and other measures that reduce the direct contact of the operator with the cutting blades in this regard, there must be a regulatory authority at the national and provincial levels which takes the responsibility of monitoring such protective measures. Awareness programs should be started with the help of social, electronic and the print media so that limbs and lives can be saved from these types of accidental devastating, crippling but preventable tragedies.

**CONCLUSION**

Amputations of the right-hand distal phalanges were the most commonly reported injuries due to electric fodder cutter machines used at home in the morning time. Male adolescents were more prone to these injuries than others. Having a knowledge regarding injury pattern will help to treat accordingly and prevent this tragedy. It was revealed that the automated fodder cutter machine used in the rural areas does not have any safety features nor do people have any awareness as to the safe handling the machine; resulting in injuries, lives being disrupted and dreams being shattered. It was also very clear that in a country whose economy is based on agriculture with the majority the population living in rural settings, the injury statistics from are just the tip of the iceberg.

### RECOMMENDATION

It is recommended that there must be some regulatory authority at the national and provincial levels which takes the responsibility of monitoring such protective measures in such type of agriculture-based electrical and manual machines. Government should take action by establishing a committee comprising of the departments of Health, Agriculture & Industries to come up with a comprehensive plan by introducing safety measures in the design of the machines and helping communities in the safe handling of these machines.

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