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"A Clinical and Epidemiological Study of Occupational Injuries"

Dr. Jayesh Sachde, Dr. Sudarshan Gothwal, Dr. Dhaval Vanzara, Dr. Divya Guguloth*, DR. Jigarkumar Modi, Dr. Manav suri

(Professor and Head, Dept of Burns and Plastic surgery, Civil hospital, Ahmedabad.)
(3rd year resident,Dept of Burns and Plastic surgery, Civil hospital, Ahmedabad.)
(3rd year resident,Dept of Burns and Plastic surgery, Civil hospital, Ahmedabad.)
(3rd year resident,Dept of Burns and Plastic surgery, Civil hospital, Ahmedabad.)
(2nd year resident,Dept of Burns and Plastic surgery, Civil hospital, Ahmedabad.)
(Professor,Dept of Burns and Plastic surgery, Civil hospital, Ahmedabad.)

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ABSTRACT

Background: According to the World Health Organization in developing countries, occupational injury is an epidemic problem in the field of public health.[1] The hazards which are taking place in the construction industries are eight times more compared to the manufacturing industry.[2] Lack of supervision of the workers, unsafe behavior of the workers, and lack of commitment of management toward safety are significant causes of injury.[3]Agriculture related injuries are important causes of mortality and morbidity in all age groups. These injuries result in major physical and psychological impacts as well as economical burdens. Objectives of the study was to study the pattern and epidemiological basis of occupational injuries, to analyse the prognosis and recovery pattern of occupational injuries in terms of return to work following treatment and to suggest measures for prevention of occupational injuries.

Methods: The study was a prospective descriptive study conducted in the department of burns and plastic surgery, B.J. medical college Ahmedabad from June 2021 to May 2023. About 89 patients admitted with occupational injuries were evaluated. Data on age, sex, injury patterns, anatomical localizations, injury season, length of stay in the hospital, and infections were evaluated.

Results: occupational injuries constituted about 16.18% of total emergency trauma. Males were more commonly affected than females. Majority of the patients were in the age group 21-50. Most of the patients were right handed individuals. Construction machines were most common mode of injury in this study which involves 38.20 % patients. Agriculture injuries were second most common mode of injury in this study (25.84%). In this study out of 89 patients maximum number of patients had crush injury (48.31%). Sharp cut injuries occurred in 26.96% patients.

Conclusions: We can reduce occupational injuries by shielding the rotating components of farming machinery that cause injuries, informing and educating farming families, forbidding the entrance of children to areas with agricultural machines, providing information about agricultural accidents and their prevention methods, and adjusting the working hours of farming personnel, especially in the hottest months of the year.

Keywords: Reconstructive surgeries, occupational injuries, crush injuries, sharp injuries

I. INTRODUCTION

According to the World Health Organization in developing countries, occupational injury is an epidemic problem in the field of public health.[1] The hazards which are taking place in the construction industries are eight times more compared to the manufacturing industry.[2] Lack of supervision of the workers, unsafe behavior of the workers, and lack of commitment of management toward safety are significant causes of injury.[3]Agriculture related injuries are important causes of mortality and morbidity in all age groups. These injuries result in major physical and psychological impacts as well as economical burdens.

The agricultural business is considered as one of the most hazardous sectors in both developing and developed countries with high rates of accidental deaths, injuries, and work-related illnesses. [1,2] Injuries due to threshers are mostly of the upper limb and result in significant morbidity. In our setting, agriculture is largely family owned-family run activity, thereby involving a fairly large number of children in the farming activities. Children are particularly prone

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to severe hand and upper extremity injuries and machinery related limb amputations, which require multiple surgical procedures and weeks of hospital stay for limb-threatening injuries.[3]

The objectives of this study were aimed to focus on (1) the types and incidences of injuries due to occupational accidents (2) the severity of these injuries, (3) description of the treatment required especially for infection and possibility of amputation and (4) outcome of treatment and successful return to work or resumption of prior work capacity.

II. METHODS

The study was a descriptive study conducted in the Department of Burns and Plastic Surgery of B J Medical College Ahmedabad from June 2021 to May 2023.The patients were assessed clinically and included in the study. Total 89 patients admitted with occupational injuries were evaluated. Data on age, sex, injury patterns, anatomical localizations, injury season, length of stay in the hospital, and infections were evaluated. The main inclusion criterion of the study group was all patients with injuries of upper limb, lower limb, head and neck, abdomen and trunk related to occupation related works. Patients with road traffic accidents, Assault, other major abdominal, head injuries, cardiothoracic injuries were excluded from study.

All the patients to the study criteria were admitted in Trauma wing. They were received first aid and then referred to Plastic Surgery Department. Detailed history was taken on the mode of injury, time of injury, time since injury and Hospital admission. Then all the patients were subjected to average general examination and local examination to assess the nature of injury and the need for surgical intervention. The nature of injury includes skin, soft tissue laceration / loss, tendon injury, nerve injury & vascular injury, bony injury and also the viability of the distal part, wound contamination. Laboratory investigations, haemoglobin(Hb), urine - albumin sugar, BT/CT, blood sugar, urea, creatinine, ECG, X- Ray of local part and chest taken . Doppler study in suspected cases of vascular injury, was done.

Patients were taken to emergency operation theatre and wound wash, wound debridement done under anesthesia. (Digital block, wrist block Axillary block, supraclavicular block, GA). Fractures were fixed with axial / cross K wire / POP splint / external fixator. Tendon repair was done by modified Kessler method with nylon 3/0 for core suturing and nylon 6/0 for peripheral suturing. Nerve was repaired using nylon 9/0 or 10/0 under loop magnification. Vascular repair was done using nylon 7/0. Post operatively limb elevation done and supplemented with antibiotics and analgesics. Other soft tissue repair was done according to the nature of injury.From infected wound, pus was taken and sent for Culture and sensitivity. Patients treated according to results. Daily saline dressing was done. Patients evaluated on every days, till discharge. Sutures removed on 10th postoperative day. Follow up visits on every Tuesday and Friday in our department, if needed in between. We had Physiotherapists, to take care of our patient and to improve the functional outcome. There is also a paraplegic clinic and rehabilitation center for artificial limb to meet out the basic needs of our patients.Patients evaluated with parameters: wound healing / wound infection / functional deficit / return to work / psychological satisfaction.

Scores given for
Functional Improvements : 2 points
Return to work: 2points
Aesthetical appeal: 2 points
5 - 6 good results,
3 - 4 satisfactory,
< 3 poor results.
Data's collected, analyzed statistically and results obtained, conclusions derived from the results.

III. RESULTS

Out of the total number of 550 injuries admitted in the hospital between June 2021 and May 2023, 89 patients were admitted due to occupational injuries (16.18 %) (Table 1).

Table 1: Prevalence of occupational injuries.

TOTAL NO. OF INJURIED PATIENT	NO. OFOCCUPATIONAL INJURIES	PERCENTAGE
550	89	16.18%

Maximum number of patients belong to construction occupation (38.20%). The age of the injured patients ranged from 3 years to 72 years. Majority of the patients were in the age group 21-50 (Table 2). Males were more commonly affected in occupational injuries (86.51%). Most of the patients were right handed individuals.

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Table 2: Age and sex distribution.

S.NO	AGE IN YEAR	NO.OF CASES		TOTAL	PERCENTAGE
		MALE	FEMALE		
1	0 - 12	4	3	7	7.8%
2	13 - 20	14	0	14	15.7%
3	21 - 50	51	7	58	65.16%
4	Above 50	9	1	10	11.23%

Table 3:Nature of injury.

S.NO	NATURE	NO. OFCASES
1.	Cut injury	24
2.	Crush injury	43
3.	Avulsion	14
4.	Crush-avulsion	6
5.	Penetrating injury	2

In this study out of 89 patients maximum number of patients had crush injury (48.31%). Sharp cut injuries occurred in 26.96% patients(Table 3)

Table 4: Pattern of occupational injuries.

S.NO	SITEOFINJURY	NO. OFCASES	
		Right	Left
1.	Finger	14	21
2.	Hand	04	10
3.	Wrist	01	05
4.	Forearm	07	03
5.	Arm	04	01
6.	Thigh	01	01
7.	Leg	01	03
8.	Foot	05	00
9.	Head and neck	5	
10.	Thorax	0	
11.	Abdomen	0	
12.	Others	3	

Table 5:Types of machines causing agricultural hand injuries.

S.NO	MACHINES	NO. OF CASES
1.	Woodcutter machine	12
2.	Sugarcane machine	06
3.	Sanding machine	11
4.	Construction machine (concrete mixter/ stone cutting machines/others)	34
5.	Agriculture machines(Tractor/farming/gardening/thraser/ grinder machine	23
6.	Kutti chopper machine	03

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Table 6: Time of hospitalization after injury.

S.NO	TIME OFADMISSION	NO.OFCASES
1.	Within 6 hours	25
2.	6- 12 hours	29
3.	12-24hours	18
4.	Morethan24hours	17

From January to March 31 patients with occupational injuries were treated. 40 patients were treated between April and June. About 79.70% patients had treatment for occupational injuries between January and June (Table 7). Maximum number of cases was recorded in first half of the year corresponding to peak harvest period.

Table 7: Period of injury.

S.NO	PERIOD OFOCCURANCE	NO OFCASES	PERCENTAGE
1.	Jan–Mar	31	34.8%
2.	Apr–Jun	40	44.9%
3.	Jul –Sep	07	07.9%
4.	Oct–Dec	11	12.3%

Patients were treated with various flaps, nerve repair, tendon repair and vascular repair, replantation, debridement, amputation (Table 8). Groin flap, Cross finger flap, V-Y advancement, skin grafting and primary skin closure were the treatment modalities adopted for the wound coverage.

Table 8: Mode of treatment.

S.NO	MODEOFTREATMENT	NO.OFCASES
1.	Groinflap	2
2.	Hypogastricflap	1
3.	PosteriorinterosseousArteryflap	1
4.	Crossfingerflap	1
5.	V- Yflap	1
6.	FDMA flap	1
7.	FTG	2
8.	Skingraft (STG)	33
9.	Primaryskinsuturing	10
10.	Free ALT	1
11.	Cross leg flap	1
12.	GMMC flap	1
13.	Faciocutaneous flap	1
14	Propeller flap	1
15.	Temporoparietal flap	1
16.	Reverse sural flap	1
17.	Replantation	5
18.	Tendonrepair	37
19.	Vascularrepair	13
20.	Nerverepair	14
21.	Majoramputation	2
22.	Debridement	54

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Postoperative complications included oedema, wound infection and skin necrosis (Table 09). Staph. aureus, Pseudomonas and Klebsiella were the organisms isolated from the infected wounds.

Table 09: Post operative complications.

S.NO	COMPLICATIONS	N.OFCASES
1.	Edema	14
2.	Woundinfection	09
3.	SkinNecrosis	08
4.	Suturedehiscence	05
5.	Partial flapnecrosis	01

About 90 % of patients return to work between 3.5 to 4 month. 5.6 % of people those who having crush avulsion injuries had multiple fractures and wound infection, joint stiffness and secondary procedures needed prolonged time to recover(Table 10).

Table 10: Return to routine work.

S.NO	**DURATION**	**NO.OFCASES**	**PERCENTAGE**
1.	3-6weeks	18	20.2%
2.	7-10weeks	41	46.06%
3.	11-14weeks	25	28.08%
4.	15weeksandabove	5	5.6%

IV. DISCUSSION

Pediatric population of 0 - 12 years age group is about 7.8 % of total occupational injuries. This is mainly because of permitting the children to the farm and construction site and in adequate supervision of children while working. Most of injuries occur in persons having the productive potential in the age group of 20 - 50 years. This causes the significant loss of income. Males are most affected than females. Male to Female ratio isabout6.4: 1

Most of the people are Right handed individuals, so the cut injuries are more in left side (54.16%). The machinery crush injuries are common in right hand side (58.13%).Maximum number of cases (80%) recorded in 1st half of year corresponds to peak harvest period of agriculture and farming and heavy construction works in this period. Remaining occurs in 2nd half of the year which corresponds to winter season which was good period for wooden works, manufacturing and industrial works. Sanding machine injuries and wood cutting injuries present throughout the year. Putti chopper machine injuries are more in summer period. Most of these cases had thumb and finger injuries.

Due to the time-dependent nature of the farming activities like harvesting, farmers may work for long hours causing fatigue and carelessness which may lead to serious accidents.[8] There may be a seasonal dispersion pattern of the farm injuries depending on the harvesting time. Richter et al.[8] noticed in their study that January and February are the slow months for farmers. Our study revealed 79.7% patients had treatment for occupational injuries between January and June. Maximum number of cases was recorded in first half of the year corresponding to peak harvest period and farming period.

Agriculture related hand injuries are due to man, machine, crop, toxic chemicals or

environmental factors. Most of the injuries occur while working with spades, sickles, manual and power operated chaff cutters, bullock carts, tractors and diesel engines. The primary events of farm incidents (fatal and non-fatal) are (a) entanglement of loose garment, hair or limbs, in moving machines, (b) cut with hand tools, (c) fall from tractors or into wells, (d) run over by tractor, (e) overturning of tractor, (f) hit by moving machine parts or falling objects, (g) snakebites, (h) electrocution due to live electric wires, etc.

Occupational injuries are common in young and elderly members of the family.[6] In our study majority of the patients were in the age group 21-50 years. Most of the agriculture related injuries are experienced by males.[7] In our study 86.51% patients were male. People near to medical college, around Ahmedabad town get admitted early. People from adjacent districts and far places of our district are presented to the hospital late because lack of transport facility. 108 Ambulance free service in Gujarat government is useful in reducing the time of transport and cost. They are accompanied with trained person is an added advantage.

Awareness in preserving amputated limbs is poor, even though the people aware the amputated part can be reimplanted. The knowledge and method of preservation is lacking. In our study population fatal injuries are rare. In developed countries agro based machineries and tractors are common. So the incidence of agro related fatal injuries are significant.

Management of occupational injuries includes expedient administration of antibiotics, tetanus prophylaxis, wound debridement and delayed wound closure. Due to the high microbiological load and high incidence of crush-type injuries, repetitive debridement and long duration of hospital stay are needed. Hospitalization time should be minimized as much as possible, to limit secondary infections. This can be managed by aggressive initial debridement to reduce hospital stay and reduce the risk of secondary infection.

Most farm accidents and fatalities involve machinery. Proper machine guarding and equipment maintenance can help prevent accidents. An accident-prevention strategy must take into consideration issues regarding the high-risk times. High impact of farm accidents ends with physical and emotional disability.

V. CONCLUSION

Agricultural upper limb injuries can be reduced by shielding the rotating components of farming machinery that cause injuries, informing and educating farming families, forbidding the entrance of children to areas with agricultural machines, providing information about agricultural accidents and their prevention methods, and adjusting the working hours of farming personnel, especially in the hottest months of the year.

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