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Original Research Article

A descriptive study of patterns of traumatic hand injury cases in a tertiary care hospital

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ABSTRACT

Background: All patients who presented to the emergency and trauma with a clinical evidence of hand injury were assessed based on the history and examination, mechanism of injury, common patterns of the injuries, management of the injuries and their functional outcome. The aim and objective were to study the mode, pattern, management and early outcome of hand injury cases attending Department of Emergency Medicine and trauma.
Methods: This was a hospital based descriptive study, of patients presenting with hand injuries to the emergency department. The management plan was formulated and the outcomes of the treatment were assessed by limb function loss and Quick DASH 9 score.
Results: Majority of our study population belonged to 16 to 35 years age group comprising of mostly males. Most of the incidents occurred within 50 km from our hospital. The mean duration to arrival at our hospital from site of injury was 2.71±2.61 hours. Road traffic accident in males and thermal burns in females were common. Fractures to phalanges of index and middle fingers were the most common type of injury. The average calculated Quick DASH 9 score was found to be 51.24±9.89.
Conclusions: Hand injuries were found to be more prevalent in lower socioeconomic strata of the society with education status and occupation as major risk factors. Increased awareness and better implementation of traffic rules and better safety measures at workplace environment are the need of the hour to decrease the burden of hand injury.

Keywords: Hand injuries, Road traffic accident, Quick DASH 9 score

INTRODUCTION

The hand injury is a serious burden on society, with very high morbidity leading to loss of work and increased financial burden on the family. In India, workplace injuries contributed 2% of total death, 1.8% of total life years lost due to disabilities and 2% of disability-adjusted life years.[1]

Hand injury accounts for 5.5% of total trauma patients with road traffic accidents and machines as the most typical modes of injury.[2] Pre-hospital care in India is still in a nascent stage, being mostly available in metropolitan cities with only 4% of the ambulance workers having certified training. Only 56% ambulances have one or more paramedics even though most of have supplies for intravenous infusion and blood pressure measurements.[3]

Hand injuries are common in developing countries such as India due to recent increase in industrialization and motorization. According to Registrar General of India, 2001, of the total employed population in India, only

17.8% worked in an organized sector while 82.2% of the employed population worked in unregulated sectors such as agriculture, manufacturing, retail trade etc. This lack of safety measure has been well documented as an independent risk factor of occupational injuries.[4]

The mean age of the patients studied with Hand injuries was 28 years. In a study from North India, the mean age of the studied population with Hand Injuries was 31.13 years.[5] Pediatric populations as an age group are highly susceptible for hand injuries. Shrihari et al, in their study in Pondicherry observed that 15.3% of their study populations were below 15 years.[6]

Hand injuries are more common in men as compared to women, due to the cultural and professional gender distribution in Indian population as found in a study from North India.[1]

Among the categories affected by hand injury as found by a study from North India, most were laborers (23%), followed by students (23%), service class (9.84%) and others which constitutes agricultural workers (27.86%).[1]

Mean duration to presentation after hand injury has been found to be 2-6 hours in different studies. A study done in North Ireland found the mean duration of presentation after hand injury to be 2.9 hours while a study from hospital in southern India found the mean duration to arrival at hospital to be 3 hours.[7]

In low income countries like India, pedestrians, cyclists, motorized two wheeler vehicle users are exposed to a higher risk for hand injuries than 4 wheeler users.[4] Risk factors contributing to the higher rate of incidence were found to be excessive speed, use of alcohol and drugs, young male, poor visibility on roads, non- use of seat belts and helmets etc.[4]

Most common work-related hand injuries occurred in construction and extraction occupation (44.2%) while food preparation and serving related occupation (14.4%), transport and material moving occupation (12.5%) accounted for the rest of the major chunk of patients with workplace related hand injuries.[8]

In India, the custom is for domestic chores to be carried out on the floor. Sharp tools such as knives, scissors and mixers are often left behind, resulting in injuries. Broken glass pieces, door trap injuries, accidental and suicidal burns are the other common mode of hand injuries occurring in the domestic environment. During the festive season, a common cause of hand injuries is from the use of firecrackers.[9]

Among the zone to be involved in extensor tendon injury, most common zone of extensor tendon injured was found to be zone 3 followed by zone 2 and 5. Extensor tendons of index finger were more frequently involved than other fingers.[8] Flexors tendon injuries were found to be more common in younger age groups of children.[10] Most commonly injured flexor tendon was found to be Flexor Digitorum Profundus, while index finger was again the most common finger to be affected by flexor tendon injury. Zone 2 was the most common zone to be involved among flexor tendon injuries.[8]

Fractures occupied around 15-50% of hand injuries in various studies. Open fractures were more common than closed fractures. Fractures increased in incidence with increase in age as well as ligaments and tendon injuries. Nerve injuries and major vascular injuries occupied only around 2-3% of all traumatic hand injuries. In their study from South India, Ghiya et al observed 3.5% of their study population was affected by nerve injuries.[11]

The management protocols of these injuries are divided into early and definitive management. The early management includes resuscitation, cleansing the wound, achieving hemostasis, storage of the amputated parts. The definitive treatment strategies include wound suturing, neurovascular repair, tendon reconstruction, fracture fixation and splinting techniques.

Aims and objectives of the study were to assess the mode, pattern, management and early outcome of hand injury cases attending Department of Emergency Medicine and trauma

METHODS

This is a hospital based descriptive study done in Jawaharlal Institute of Post Graduate Medical Education and Research (JIPMER), Puducherry. The study period was from February 2017 to August 2018. All patients with clinical evidence of hand injury presenting to the emergency medical services were included in the study. The exclusion criterion was patients who presented to the emergency with infection, 72 hours post injury. As the study was a descriptive study, all cases who presented with clinical evidence of hand injury to Department of Emergency Medicine and Trauma during the study period were included. Injuries based on clinical evidence were recruited in the study. As per hospital records previous year, the expected sample size was 1200. However, our sample size was around 1075.

After obtaining consent from the patients and patients' guardian (if patients were minor), using a data collection proforma, the following details were collected. The outcome was assessed at the time of discharge and data was entered in Microsoft Excel format and analyzed using SPSS software.

The variables used for the analysis were based on demographic parameters, history, clinical features at presentation, hemodynamic parameters, type of hand injury, management parameters and clinical outcome variables. The outcome of the limb function post

management was assessed by Quick DASH 9 questionnaire score.[12]

For statistical analysis purposes, the data which were continuous variables were expressed in mean±standard deviations. For categorical data, it was expressed as numbers or proportions.

RESULTS

This study is a single centre descriptive study conducted in JIPMER, Pondicherry, India from February 2017 to August 2018. 1075 patients who presented to Department of Emergency Medicine with Hand Injury were included in the study. Most of the patients who presented to the emergency were in the range of 16-35 years, usually male gender which is the active working population in our country (Table 1).

Table 1: Age distribution (n=1075).

Age (in years)	N	%
≤5	122	11.3
6-10	63	5.9
11-15	70	6.5
16-35	465	43.3
36-60	312	29.0
>61	43	4.0
Mean±SD	28.75±17.23	

Of the patients who presented to the emergency many of them were around 50 km radius.

Majority of patients (430 patients) presenting to emergency department were educated up to secondary level (40.0%), while 28.6% (307 patients) of the total patients had educational qualification of higher secondary level, 7.7% (83 patients) of the patients were graduates. Of the pediatric patients presenting with hand injury, 11.4% (123 patients) of the total study population were in preschool group, 5.8% (62 patients) of the patients were in primary level and 6.5% (70 patients) of the total patient pool were in secondary level.

Majority of patients (663 patients) had income of less than 5000 rupees per month (61.7%), while 5000-10000 rupees per month income included 13.7% (147 patients) of the patient profile. Occupation of patients suffering hand injury included 390 patients (36.3%) as laborer's, with 311 patients (28.9%) as daily wage workers, 64 patients (6.0%) as work supervisors, 40 patients (3.7%) as masons. Whereas, the student patient pool constituted around 145 patients (13.5%) of the total population. The mode of the injury was usually road traffic accident (RTA) in case of men and thermal burns in case of females due to household chores (Figure 1 and 2). The majority of patients were reported with hand fracture which was seen in 253 patients (23.5%). Nerve injuries and major vessel injuries accounted for around 2% of the total hand injuries (Table 2, Figure 1 and 2).

Table 2: Patterns of hand injury (n=1075).

Details of hand injury: other features	N	%
Tendon injury	138	12.8
Fracture	253	23.5
Nerve injury	11	1.0
Major vessel injury	9	0.8
Crush injury	96	8.9
Traumatic amputation	65	6.0
Skin and subcutaneous tissue injury	503	46.8

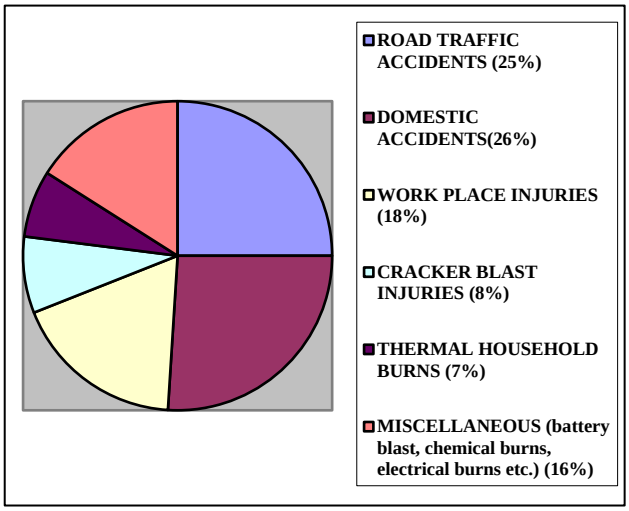

Figure 1: Distribution of mode of injury in male population.

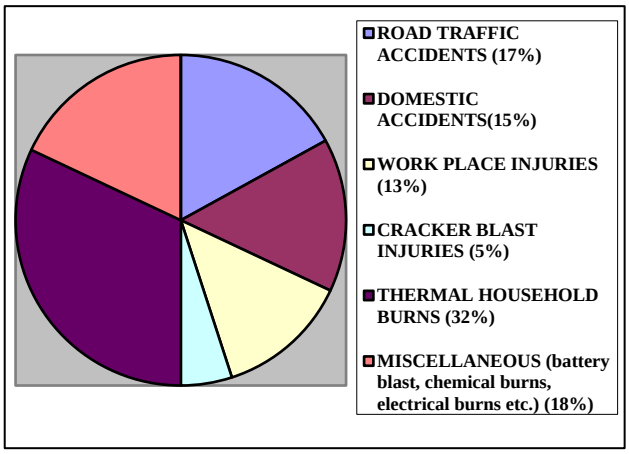

Figure 2: Distribution of mode of injury in female population.

Regarding the management of the hand injury presented, the main modalities used was wound exploration proceed suturing (46.9%) and splinting. Regarding morbidity, majority of participants suffered from loss of digits with

(98.3%) followed by loss of hand in 2 patients. Among the nerve injuries, median nerve (7 patients) was the most common nerve to get affected, while radial nerve (1 patient) was the least common nerve to be affected (Table 3).

Table 3: Details of management (n=1075).

Details of management	N	%
Collagen dressing	274	25.5
Dressing	807	75.1
Wound irrigation and suturing	504	46.9
Foreign body removal	4	0.4
Open reduction internal fixation	11	1.0
Closed reduction	20	1.9
K-wire fixation	143	13.3
Amputation	5	0.5
Tendon repair	134	12.5
Vascular repair	10	0.9
Nerve repair	14	1.3
Splinting	773	71.9

The mean Quick DASH 9 score for the rest of the study population was 51.24±9.89. The outcome of the scores represented that the majority of participants was found under the range 46 to 60 with 38.2%, followed by 30 to 45 with 37.1% and 61 to 75 with 24.7% (Table 4).

Table 4: Quick DASH 9 score (n=554).

Population	N	%
Quick DASH score (Mean±SD)	51.24±9.89	
Quick DASH score range		
30-45	202	37.1
46-60	208	38.2
61-75	134	24.6

DISCUSSION

In the present study, majority of people injured were 16 to 35 years age group (43.3%) while those in 36 to 60 years group accounted for 29.0% of the study population with the mean age of the population studies was 28.75±17.23 years. Similar results were obtained by Ghosh et al., in west Bengal, India (average age 31.13 years), Makobore et al, in Uganda (average age 28 years) and Dafiewhare and Ajibade in Nigeria (average age 25.69 years).[2,5,13]

Our study showed male gender (73.2%) more commonly affected than female gender (26.8%). A study by Sorrock et al done in a western population, showed the gender ratio to be 3:1.[14] While all other studies showed higher male preponderance. Dafiewhare et al from Nigeria had male-female gender ratio as 5.7:1, while Ahmed et al, from Ethiopia had 7:1.[13,15]

The relative time delay in hospital arrival and the time pattern of hospital arrival of the trauma patients are similar to those described in other tertiary care trauma centers as observed by Ahmed et al.[15] The reason for the late arrival of the patient to the Emergency was mainly due to the long distance of hospital facility. The other cause may be due to availing of some forms of preliminary treatment at some local government hospital or nursing home before presenting to hospital in the study.

In our study, we found most of our patients were educated up to secondary level accounting for around 40% our study population. Makobore et al, from Uganda found secondary level accounting for 73% of their study population to be affected by hand injury.[2] This higher prevalence of hand injury in this group may be explained by the limited job opportunities available to the under-educated persons.

In the present study RTAs were the predominant cause of trauma, a result consistent with other studies from India and abroad.[7,15] Four wheel vehicles offer a fair amount of protection to those inside unlike two wheeler passengers and pedestrians who are directly exposed to the elements of the road. This explains the overwhelming majority of the accidents involving two wheelers and pedestrians, consistent with other Indian studies.[16]

From our study, the majority of patients were reported with hand fracture which was seen in 253 patients (23.5%). In the study from Nigeria, Dafiewhare et al reported 31.7% of the study population affected with fractures.[13] Ghosh et al, from a study in west Bengal found fracture accounting for 42.1% of the total injuries while Shrestha et al found fractures accounting for 53.1% of total injuries in their study from Nepal.[5,17] This is probably because we excluded patients with traumatic amputations from the fracture group.

Nerve injuries and major vessel injuries accounted for around 2% of the total hand injuries. Among the nerve injuries, median nerve (7 patients) was the most common nerve to affected while radial nerve (1 patient) was the least common nerve to be affected. According to Ghiya et al, nerve injuries accounted for 3.5% of their study population.[11] Among major vessel injuries, radial artery was affected in 6 patients with the hand injuries while ulnar artery was involved in 3 patients with hand injuries.

From the present study, it was found that associated injuries seen with hand injury were head injury in 15 patients (55.6%), followed by long bone injury in 5 patients (18.5%) and chest and ocular injuries in 3 patients each (11.1%). Gupta et al, in their study showed similar distribution of associated injuries but with a higher incidence rate.[1]

The present study highlighted that in the series of parameter conducted for managing hand injury, splinting with 71.9%, suturing with 46.9% and then followed by

rest that is preferred less. Makobore et al observed that 36% of their study population underwent wound irrigation and suturing, followed by splinting in 18% of the study population while tendon repair was done for around 6% of their patients.[2]

In the present, on hand injuries, the early outcomes were differentiated into two parameters in which 115 patients had to undergo amputations. Among these patients, the majority of participants suffered from loss of digits with 113 (98.3%) followed by loss of hand in 2 patients (1.7%). In this study to asses for functional outcome post hand injury, we used Quick DASH 9 score.[12] The score could not be assessed for around half of the study population because most of them were in splints post-surgical management of their hand injuries or succumbed life due to excessive burns injuries. The mean Quick DASH 9 score for the rest of the study population was 51.24±9.89. The outcome of the scores represented that the majority of participants was found under the range 46- 60 with 38.2%, followed by 30-45 with 37.1% and 61-75 with 24.7%. Ghosh et al, 2013 in their study on fracture of hand observed the average Quick DASH score to be 24.3 in 45 fractures involving phalanges and metacarpals.[5]

No epidemiological data was available for hand injuries studies using Quick DASH 9 score for comparison. The result of the study while provided epidemiological data on hand injury for our regional population cannot be extrapolated to whole Indian population. The outcome variables were assessed at the time of discharge, so for many patients Quick DASH 9 score could not be assessed as the patients had prolonged splintage or had succumbed to death due to excessive burn injuries.

CONCLUSION

Hand injury is found to be more prevalent in lower socioeconomic strata of the society with education status and occupation as major risk factors. RTAs, domestic incidents and machine cut injuries were the reason for majority of our patients. Increased awareness and better implementation of traffic rules and better safety measures at workplace environment are the need of the hour to decrease the burden of hand injury.

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