DOI: 10.7860/JCDR/2021/49103.15225

Original Article

Surgery Section

Study of Trauma Profile and its Outcomes at a Tertiary Care Centre: A Cohort Study of 1000 Cases

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ABSTRACT

Introduction: Trauma has been the leading cause of mortality and morbidity. However, there are changes in pattern of trauma and their outcomes with time.

Aim: To study the mode and nature of injury and mortality associated with trauma of head, chest and abdomen.

Materials and Methods: A prospective cohort study was conducted on 1000 individuals that presented to emergency surgery ward from 2014 to 2019. Patients presented to emergency surgery of Government Medical College, Amritsar, Punjab, India were observed for various characteristics i.e., age group, mode of injury, site of injury, outcomes and management.

Results: The mean age of patients was 33.91±16.29 years with significant male predominance (n=794, 79.4%) (p-value 0.00001). Road Traffic Injuries (RTIs) were the most common mode of trauma affecting 490 patients (49%). Head injury was the most common of all injuries (n=834). Overall mortality was 3.6% (n=36). Mortality was higher in males (p-value 0.00933) and mortality rate of 25% was seen in age group of 61-70 years.

Conclusion: RTIs followed by assaults are the most common cause of trauma and it significantly affects young male population. However, mortality rate increases with increase in age group with higher rates in older age groups.

Keywords: Assault, Mortality, Road traffic injuries

INTRODUCTION

Trauma is one of the leading threats to human life in this century involving all ages, sex, race and economic status. Injuries represent 12% of global burden of disease, making it the third most important cause of overall mortality and main cause of death in the age group of 1-40 years [1]. Trauma is defined as physical injury which is due to the adverse effect of a physical force upon a person. These forces can be mechanical, thermal, ionising radiation and chemical [2]. Approximately, a quarter of the 5.8 million deaths that occur from injuries are due to 'RTI' while suicide and homicide account for another quarter [3]. Other main causes are falls, drowning, burns, poisoning and war [3]. Globally, more than 90% of injury related deaths occur in low- and middle-income countries and almost twice the men die of injuries than women [3]. RTIs are the 9th overall leading cause of Disability-Adjusted Life Years (DALYs) loss. The RTIs cause around 1.2 million deaths each year while number of injured could be as high as 50 million [1]. In India, an estimated one million people die and 20 million are hospitalised due to trauma related injuries. National Crime Records Bureau (NCRB) reported that there were 413,457 deaths in road accidents in India in 2015 [4].

Majority of traumatic injuries are not life threatening but they impose a substantial burden on their families, communities, and society and health services/healthcare systems. Those who survive, it leaves life-long disabilities, pain and sufferings, time lost from work or family responsibilities and profound change in life style [2]. In traumatic care and management time plays a very important role in shaping and providing a basis for initial medical response to the injured patient. The early assessment and management of the injured is largely protocol driven. Advanced Trauma Life Support (ATLS) system is commonly used worldwide as standardised protocol. The structure of ATLS include primary survey with simultaneous resuscitation, and identify and treat what is killing patient and sequence followed is airway, breathing, circulation and disability (Neurological). Then comes secondary survey to identify all other injuries and in the last definitive care to develop definitive management plan [4]. The care of acutely injured people is public health issue that should involve bystanders and community members, healthcare professionals and healthcare systems. By identifying risk factors present within a community and creating solutions to decrease the incidence of injury, trauma referral systems can help to enhance the overall health of its population [5].

The aim of study was to know the incidence of surgical trauma, mode of injury, nature of injury, and mortality caused by traumati injuries.

MATERIALS AND METHODS

The prospective cohort study was conducted on 1000 patients admitted in emergency surgery ward in Department of General Surgery, Government Medical College, Amritsar, Punjab, India during a period of five years (November 2014 to October 2019). Approval from Institutional Ethics Committee was obtained (BFUHS/2k12/p-TH/1714). Non-probability sampling method was used.

Inclusion criteria: All cases of trauma of head, chest and abdomen presented to emergency surgery ward were included in the study.

Exclusion criteria: Exclusive injuries of extremities (injuries limited to extremities only) were excluded from the study.

Study Procedure

The study was focused on traumatic injuries of head chest and abdomen. Detailed history was taken regarding, mode of injury, nature of injury, site of injury and time of injury.

Investigations performed were:

1. Haemogram, Renal function tests, Blood grouping.
2. Radiological investigations:
   - (i) X-ray chest
   - (ii) Focused Assessment Sonography in Trauma (FAST)
   - (iii) Computed Tomography (CT) (if required)
   - (iv) X-ray of pelvis and limbs (if indicated).

Following surgical interventions were employed during this period for cases of head, chest and abdominal trauma:

1. Suturing of local lacerated wounds under local anaesthesia
2. Insertion of intercostal tube
3. Exploratory laparotomy under general anaesthesia.

STATISTICAL ANALYSIS

The statistical analysis was performed on Statistical Package for the Social Sciences (SPSS) software windows version 21.0. Association between the variables was done using Chi-square test keeping 0.05 significance level. The p-value <0.05 were considered significant.

RESULTS

A total of 1000 patients who presented to emergency surgical ward with traumatic injuries were observed for various parameters.

Demographic profile: There were 794 (79.4%) male patients and 206 (20.6%) female patients and majority of them belonged to age group of 21-30 years. Only four cases were above 80 years of age [Table/Fig-1]. There was significant association with regard to demographic profile with p-value of 0.00001. The youngest patient was 11-month-old female and oldest was an 89-year-old male. The mean age of patients was 33.91±16.29 years; 33.74±15.75 years for males and 34.50±18.27 years for females.

Age group (years)	Males	Females	Total
0-10	46	28	74 (7.4%)
11-20	80	34	114 (11.4%)
21-30	308	42	350 (35%)
31-40	152	28	180 (18%)
41-50	106	40	146 (14.6%)
51-60	66	22	88 (8.8%)
61-70	24	8	32 (3.2%)
71-80	8	4	12 (1.2%)
81-90	4	0	4 (0.4%)
Total	794 (79.4%)	206 (20.6%)	
p-value 0.00001*			

[Table/Fig-1]: Demographic profile.
*Chi-square test

Mode of injury: Most common mode of injury were RTIs accounting for 49% followed by assaults {n=394 (39.4%)} [Table/Fig-2]. Most commonly affected were males. However, no significant association was found with gender (p-value 0.237691).

Mode of injury	Males (n=794)	Females (n=206)	Total
Road traffic injuries	376 (47.35%)	114 (55.34%)	490 (49%)
Assaults	326 (41.06%)	68 (33.01%)	394 (39.4%)
Falls	74 (9.32%)	22 (10.68%)	96 (9.6%)
Railway accidents	10 (1.26%)	0 (0%)	10 (1%)
Machinery injuries	6 (0.76%)	2 (0.97%)	8 (0.8%)
Animal attacks	2 (0.25%)	0 (0%)	2 (0.2%)
p-value 0.237691*			

[Table/Fig-2]: Mode of injury.
*Chi square test

Site of injury: It was observed that head injury was the most common site (83.4%) followed by extremities (41.6%) [Table/Fig-3].

Type of head injury distribution: Majority of patients had sustained lacerations (n=496) [Table/Fig-4]. Majority had minor injuries while those with associated severe head injuries were referred to higher centre.

Site of Injury	No. of cases
Head injury	834 (83.4%)
Facial injury	308 (30.8%)
Chest injury	188 (18.8%)
Abdominal injury	162 (16.2%)
Extremity injury	416 (41.6%)

[Table/Fig-3]: Site of injury.

Type of chest injury distribution: Most of the patients sustained abrasions [Table/Fig-5]. Out of 48 patients who had pneumothorax and haemothorax, 30 were managed with intercostal chest tube drainage.

Type of abdominal injury distribution: Most of the patients presented with blunt trauma (n=134). Thirty patients had solid organ injury in form of liver and splenic injury while 12 patients had small bowel injury in form of perforation of gut [Table/Fig-6]. Overall 22 patients underwent exploratory laparotomy under general anaesthesia- 12 patients with history of penetrating trauma and 10 with blunt trauma. Out of 28 patients of penetrating trauma, eight left against medical advice.

Type of injury	No. of patients
Bruises	64
Abrasions	212
Lacerations	496
Haematoma	132
Skull fracture	306
Cerebral oedema	52
Epidural haemorrhage	96
Subdural haemorrhage	76
Subarachnoid haemorrhage	36
Haemorrhagic contusions	152

[Table/Fig-4]: Type of head injury.
Patients had more than one injuries in certain cases.

Type of injury	No. of cases
Bruises	40
Abrasions	118
Lacerations	46
Fracture of ribs	40
Fracture clavicle	22
Flail chest	6
Pulmonary contusions	14
Pneumothorax	16
Haemothorax	32

[Table/Fig-5]: Type of chest injury.
Patients had more than one injuries in certain cases.

Type of injury	No. of cases
Bruises	30
Abrasions	86
Lacerations	28
Liver injury	20
Splenic injury	10
Small bowel injury	12
Colonic injury	12
Omental injury	6
Anorectal injury	8

[Table/Fig-6]: Type of abdominal injury.
Patients had more than one injuries in certain cases.

Time taken from injury to arrival to hospital: Majority of patients arrived to hospital within 1-4 hours of injury. Only 10 patients reported to hospital after 2-3 days [Table/Fig-7].

Time (hours)	No. of cases
<1	218
1-4	554
>4-8	176
>8-12	30
24-48	12
>48-72	10

[Table/Fig-7]: Time taken for arrival to hospital.

Management profile and outcome in head injury patients: Most of patients were managed conservatively and discharged after 72 hours. 126 were referred to higher centre due to non-availability of neurosurgeon and 28 patients died [Table/Fig-8].

Management and outcome	No. of patients
Suturing under local anaesthesia	496
Conservative management	338
Discharged	440
Referred	126
Left Against Medical Advice (LAMA)	240
Died	28

[Table/Fig-8]: Management of head injury patients.

Management profile and outcome in chest injury patients: Out of 188 patients of chest trauma 30 patients required Intercostal Chest tube Drainage (ICD). Ten patients referred to higher centre due to associated head injuries [Table/Fig-9].

Management and outcome	No. of Cases
Suturing under local anaesthesia	26
Conservative management	132
Intercostal chest tube drainage (ICD)	30
Discharged	146
Referred	10
Left Against Medical Advice (LAMA)	32
Died	0

[Table/Fig-9]: Management of chest injury patients.

Management profile and outcome in abdominal injury patients: Out of 162 patients, eight patients died and four were referred due to associated head injuries. Twenty two patients underwent exploratory laparotomy [Table/Fig-10].

Management and outcome	No. of cases
Suturing under local anaesthesia	28
Conservative management	112
Exploratory laparotomy	22
Discharged	122
Referred	4
Left against medical advice (LAMA)	24
Died	8

[Table/Fig-10]: Management of abdominal injury patients.

Mortality rate distribution: [Table/Fig-11] reveals majority of deaths occurred due to road traffic injuries. Out of 36 mortalities 32 were males and four were females, making mortality rate to be 4.03% in males and 1.94% in females (p-value 0.00933).

Age and sex mortality rate distribution: Majority of deaths have occurred in 5th decade followed by 7th and 6th decades of life

Mode	Males	Females	Total (N, %)
Road traffic injuries	28	0	28 (77.77%)
Falls	2	4	6 (1.66%)
Railway accidents	2	0	2 (5.55%)
p-value is 0.00933*			

[Table/Fig-11]: Mortality distribution (N=36).
*Chi-square test

[Table/Fig-12]. Percentage mortality rate was higher in older age groups. However no significant association was found (p-value of 0.087074).

Age (years)	Males	Females	Total (n=36)
0-10	0	4	4 (5.4%)
11-20	2	0	2 (1.75%)
21-30	0	0	0 (0%)
31-40	2	0	2 (1.11%)
41-50	12	0	12 (8.21%)
51-60	6	0	6 (6.82%)
61-70	8	0	8 (25%)
71-80	2	0	2 (16.6%)

[Table/Fig-12]: Mortality distribution with respect to age (percentages calculated out of total injured patients in specific age group as per [Table/Fig-1]).

DISCUSSION

The study was conducted on 1000 patients of trauma who presented to emergency surgery ward between 2014-2019 and the pattern of injury in terms of aetiology, management and outcome of head, chest and abdominal trauma were evaluated. In this study, majority of patients were males (n=794). This preponderance of males among those injured was consistent with data from World Health Organisation (WHO) [3]. Other studies also showed a male predominance among injured as shown in [Table/Fig-13]. The reason could be because mostly outdoor activities are carried out by males.

Study	Male: Female	Age group affected commonly	Most common mode of trauma	Most common site of injuries	Mortality
Sogut O et al., [6]	3.8:1	30-44 years	RTI (38.7%)	Craniocerebral (49%)	3.8%
Osime OC et al., [7]	2:1	21-40 years	RTI (54.3%)	Head and neck (53.4%)	2.3%
Chalya PL et al., [8]	5.5:1	21-30 years	RTI (70.8%)	Head and neck (95.5%)	32.7%
Bolandparvaz S et al., [9]	2.7:1	23-44 years	RTI (36.6%)	Head and neck (15.7%)	1%
Present study	3.8:1	21-30 years	RTI (49%)	Head (83.4%)	3.6%

[Table/Fig-13]: Comparison of studies [6-9].

Majority of the patients belonged to age group of 21-40 (53%) [Table/Fig-1] [6-9]. In the study, conducted by Sogut O et al., most of injuries were suffered by those between 16-44 (57.6%) years of age and specifically in 30-44 age group (37.46%) [6]. In another study, conducted by Kobusingye OC et al., majority of the injured patients were in age group of 21-40 years (51%) [10]. The studies of Abhilash KP et al., and Kashid M et al., showed mean age to be 40.2±16.7 years and 42.45±15.7 years, respectively [11,12]. RTIs were the most common cause of traumatic injuries accounting for 49% followed by assaults (39.4%) and falls (9.6%) [Table/Fig-2]. Similarly, another study conducted by Mitchell VT et al., showed road traffic crashes (45%) remain the leading cause of severe trauma, but there was a high prevalence of intentional and interpersonal violence too (42%) [13]. However, Abhilash KP et al., and Kashid M et

al., showed RTI followed by falls as common cause of trauma [11,12]. Beck B et al., also reported transport events and hangings were the most common cause of injury (32% and 24%, respectively) [14]. In the present study, the assault cases were found to be common in male population (n=326) as compared to female patients (n=68) reflecting the aggressive behaviour of young male population.

Head injury remains the most common nature of injury constituting (n=834) [Table/Fig-3], while chest and abdominal injuries occurred in 188 and 162 patients, respectively. In study of Kashid M et al., most common part injured was head (n=1000; 37.7%) followed by chest (12%) [12]. Most frequent cause of deaths reported by Osime OC et al., were head and neck trauma i.e., 53% of all deaths [7]. Chalya PL et al., Kobusingye OC et al., also stated the same findings with head and injury seen in 95.5% cases and 44% cases, respectively [8,10]. In study conducted by Wang T et al., 77.86% of total fatality in RTIs were due to head trauma [15]. Head injuries are common may be due to use of two wheelers in India is common and many drive without helmets.

Most of the head injury patients received scalp laceration. Majority are managed conservatively and discharged in satisfactory condition (n=440) [Table/Fig-8]. Patient who required neurosurgical intervention had to be referred to higher centres (n=126). In study conducted by Bajracharya A et al., most cases were of haemorrhagic contusions and skull fractures which were 20.5% and 18.4% respectively [16]. A 9% cases had epidural haematoma, 8.4% had subdural haematoma and 5.4% had traumatic subarachnoid haemorrhage [16]. Kashid M et al., reported diffuse axonal injury as most common presentation of head injury [12].

In this study, 28 patients expired due to head injury which corresponds to mortality rate of 3.36%. Yattoo GH and Tabish A, showed mortality rate of 6.4% in head injury patients [17]. In present study, 18.8% (n=188) had chest injury [Table/Fig-3]. Most patients were managed conservatively. Out of 54 patients of haemothorax, pneumothorax and flail chest only 30 required ICD. These correspond to study conducted by Dalal S et al., where they managed 198 (out of 295) patients with ICD only [18].

Total patients in present study with abdominal trauma were 162 [Table/Fig-3]. Most of them managed conservatively and only 22 required exploratory laparotomy. However, there were eight deaths which correspond to mortality rate of 4.94%. Bajracharya A et al., reported 14 cases of solid organ injury and 56 cases of gastrointestinal tract perforation [16]. However, in present study there were 24 cases of gastrointestinal perforations and 30 cases of solid organ injury. Most of them were result of RTIs and falls. Only four cases of assault and one case of animal attack presented with abdominal injury.

The mortality was significantly higher in male population ($p<0.05$) [Table/Fig-11]. RTIs were the commonest mode of injury leading to deaths. Mortality rate was higher in old age [Table/Fig-12]. Study conducted in 2015 in Eastern Mediterranean Region showed overall mortality rate of 43.6 (Uncertainty Interval (UI) 38.5-48.5) per 100,000 in males, compared to a rate of 11.36 (UI 10.1-12.9) per 100,000 for female in transport injuries [19]. Sogut O et al., reported mortality rate of 3.8% with males had 4.7% mortality as compared to females who had 1.8% [6]. Bolandparvaz S et al., reported higher case fatality rate in males as compared to females ($p<0.01$) [9]. Mitchell VT et al., showed that advancing age is risk factor for death, with mortality rates of 44.4% in those over 60 years and 25% in those who <60 years [13]. In study conducted to see the mortality rates due to road injuries in Indian states it was found that deaths were higher in males (23.5-27.4 per 100000) as compared to females (7.2-9.1 per 100000) with overall age standardised death rates of 17.2 deaths per 100000. The global death rate for road injuries has decreased substantially from 1990 to 2017 but not much in India. Instead India's share in global death rate has increased. To meet the Sustainable Development Goal (SDG) target by 2030 India needs to implement evidence-based road safety interventions, promote strong policies and traffic law enforcement, have better road and vehicle design, and improve care for road injuries [20].

Limitation(s)

The long-term follow-up and loss of function could not be assessed for the cases. The study was limited to few districts which are catered by the study centre.

CONCLUSION(S)

Trauma is becoming leading cause of death in developed and developing nations. RTIs are the most common causes followed by assaults. Also, violence among young individuals is on rise. It erodes sense of security and safety so essential to the well-being of families and communities. Creating a society and environment that discourage aggressive and risky behaviours can curb this problem.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Feb 25, 2021
- Manual Googling: Jun 16, 2021
- iThenticate Software: Jul 07, 2021 (11%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Feb 22, 2021**
Date of Peer Review: **May 21, 2021**
Date of Acceptance: **Jun 16, 2021**
Date of Publishing: **Aug 01, 2021**