

Injury Pattern and Outcome of Assault Victims: An Emergency Department Perspective

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Abstract

Background: Violence-related injuries top the list as a cause of mortality in the 15–40 years' age group in India. In contrast to the West, the spectrum of assault injuries in Southeast Asian countries is different. Our main aim was to profile intentional injuries due to interpersonal violence treated in the emergency department (ED) and to describe the severity, pattern, etiology, and outcome in such patients. **Materials and Methods:** We conducted a case-series analysis of assault victims who presented to the ED of Christian Medical College and Hospital, Vellore, India, from January 2017 to December 2018. Data were retrieved electronically from the clinical workstation. Categorized variables were summarized using counts and percentages. Quantitative variables were summarized using mean and standard deviation (SD). **Results:** During the study period, a total of 381 patients with a mean age of 36.16 (SD: 13.9) years presented to the ED. Male (81.9%) predominance was noted among these victims. A majority of them, i.e., 257 (67%) victims, were assaulted by people that were known to them, of which 66 (17.3%) victims were reported as domestic violence. Blunt objects were used in most, i.e., 234 (61.4%) cases. A spike in the incidence of assault, in general, was noted in the month of September during the South Indian festival season. Approximately one-fourth (21.3%) of the victims required hospital admission. Overall, 15.74% of the victims had to undergo major surgical procedures. There were no mortalities recorded among these study participants. **Conclusions:** Violence and its consequences lead to severe injuries and levy a heavy burden on health care. There is an urgent need to address the social and emotional needs of adolescents and young adults who are most at risk of being the victims of assault.

Keywords: Assault, blunt object injuries, domestic violence, interpersonal violence, profile of assault injuries

INTRODUCTION

Violence is defined as, “the intentional use of physical force or power, threatened or actual, against oneself, another person or against a group or community, that either results in or has high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation.^[1,2] Domestic violence is referred to as an abusive expression secondary to stress (financial, mental, fear and patriarchy).^[1,2] The experience of assault or violence-related injuries has a negative psychological impact on any individual. Depression, anxiety, fear, hypervigilance, and anger are common reactions.^[2]

Studies done in the West and in India have shown that assault-related injuries as a leading cause of preventable injuries.^[3,4] These studies also demonstrated that injury

rates secondary to assault or violence are 3.6 times higher in low-to-middle-income countries than high-income countries, whereas mortality rates are 13.8 times higher in low-to-middle-income countries. In Europe, assault-related injuries kill approximately 237,000 people annually, whereas India reports one of the highest incidences of assault among the South East Asian countries.^[2,5-8] After thorough literature search, we noted that there is a discrepancy in the spectrum

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of these incidents between various geographical locations, even within the country, and this may be related to the political atmosphere, religious freedoms, alcohol and drug consumption, financial backgrounds, and other socioeconomic factors.^[4,6,9] The weapons available in our locality are vastly different from other parts of the country as well as the world; hence, the type and severity of the injuries also tend to be different.^[3,10-12]

These forms of preventable physical injuries lead to the victim's economic loss and contribute to disability-adjusted life year (DALY).^[13,14] The severity of these injuries may vary from simple soft laceration to complex fractures. The World Health Organization (WHO) has provided guidelines to initiate violence prevention activities in all countries, the first step for which is the surveillance of violence-related deaths and injuries. These victims usually require a multidisciplinary team for management, where the emergency department (ED) physician plays an important role. This reiterates the need for adequate training of all ED professionals including physicians, nurses, and technicians with emphasis on quick identification of problems, targeted diagnosis, and immediate resuscitation. The WHO has recommended for ED data as the source to measure interpersonal violence-related morbidity and mortality.^[15]

This study aims to assess the profile of assault victims, those present to the ED, profile of perpetrators, spectrum of weapons used by the assaulter in our locality (Vellore, Tamil Nadu), and the severity of injury based on the New Injury Severity Score (NISS). To our knowledge, this is the first study that focuses on the profile and outcome of assault victims in South India.

MATERIALS AND METHODS

This is a case-series analysis conducted in the ED of Christian Medical College and Hospital, Vellore, Tamil Nadu, a large tertiary medical care center of South India. Our ED is a 49-bed department and tends to about 300 patients per day including trauma and nontrauma patients. We recruited all assault victims based on their history and clinical findings at presentation to the ED during January 2017 to December 2018. The study size was based on a retrospective cohort study done in Central India, in which the prevalence of assault victims among trauma patients was noted to be 31.3%.^[11] With a 5% precision and a 95% confidence interval, the required sample size of the study was calculated to be 344. We reviewed a total of 381 patients over a period of 24 months to assess seasonal variation. Charts with missing data were excluded from the study.

The charts of these victims were reviewed from the clinical workstation and the triage registry software, and the relevant details of history, clinical examination, laboratory, and radiological investigations were documented in a standard spreadsheet. Perpetrator profile, weapon (s), and history of consumption of alcohol at the time of the incident (if documented) used were documented and analyzed.

Further, triage priority level, NISS, ED management, and hospital outcome were noted. NISS is an anatomical scoring system of severity of trauma and is calculated by the sum of the squares of the Abbreviated Injury Scale scores of three of the patient's most severe injuries irrespective of the body region in which they occur.^[16] Triage of trauma victims was done by standard Canadian triage system and is summarized as follows:

- Triage Priority I: Patients with compromised airway, breathing or circulatory status, and/or severe head injury with Glasgow Coma Scale (GCS) ≤ 8
- Triage Priority II: Patients with a patent airway and no breathing or circulatory compromise. These included patients with long bone injuries, stable abdomino-thoracic injuries, and mild-to-moderate head injury
- Triage Priority 3: Patients with minor trauma without any hemodynamic instability.

All patients had relevant radiological tests and routine blood investigations based on the initial primary and secondary surveys. The outcome of these patients from the ED with regard to admission-requiring major/minor surgical intervention, discharge, and leave against medical advice was documented separately.

All these categorical variables were expressed as frequencies and percentages. The data were then analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows software released 2015, version 23.0, Armonk, New York, USA. These data were hereafter summarized using mean along with standard deviation (SD) for continuous variables, and frequencies along with percentages were calculated. The factors associated with severity of injuries in terms of NISS in these victims were determined by univariate analysis.

Before the commencement of the study, approval from the Institutional Review Board Ethical Committee was obtained (IRB Min no: 12222 dated August 22, 2019). Patient confidentiality was maintained using unique identifiers and by password-protected data entry software with restricted users.

RESULTS

A total of 143,621 trauma patients presented to the ED during the study period from January 2017 to December 2018. Among them, 381 (2.80%) were assault victims [Figure 1]. These

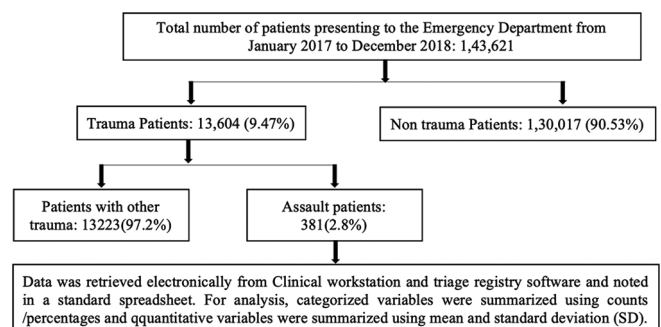


Figure 1: Grade checklist

patient's charts were screened and included in the study. There were many anticipated and unanticipated outcomes of the study that became significant to conclusions drawn by the research.

Demographic profile

The age of the patients varied from 7 to 77 years, with a mean age of 36.16 (SD: 13.9) years. Male predominance was observed as expected with 312 (81.9%) victims. There was a positive history of alcohol consumption at the time of the incident in 21 (5.5%) cases [Table 1]. The triage priority was classified based on GCS, hemodynamic stability, and severity of injury [Table 1]. The triage priority level and regions of the body involved in these incidents are shown in Figure 2.

Profile of perpetrator, weapons used, and injury profile

We noticed that two-thirds, 257 (67.4%), of the perpetrators or the offender who has committed the act of assaulting the victim were close relatives, friends, or neighbors. Among these groups, the alleged history of domestic violence was reported in 66 (17.3%) cases, as given in Table 1. The details of the types of weapons are given in Figure 3. Most of the patients sustained laceration injuries or cut injuries, i.e., 261 (68.5%) victims, that were mostly over the extremities or face probably due to self-defense. Facial injuries were seen in 116 (30.4%) victims, head-and-neck injuries in 90 (23.7%) victims, thoracic injuries

in 33 (8.7%) victims, abdominal and perineal injuries in 45 (11.8%) victims, injury to extremities in 81 (21.3%) victims, and other external injuries such as sprains, abrasions, small lacerations, etc., in 134 (35.2%) victims. Among these, there were 33 (8.7%) penetrating injuries mainly to the abdomen and thorax requiring urgent emergency surgical interventions. All fractures, irrespective of site (cranial bones, facial bones, long bones, etc.), amounted to 139 (36.5%), whereas dislocations to 21 (5.5%) injuries [Figure 3].

Monthly variation of incidents

There was an increasing trend in the number of incidents 14.44% (55) in the month of September as portrayed in details in Figure 4, probably due to the various religious festivals celebrated in South India, when violence usually spikes.

Predictors of severity of injury based on the New Injury Severity Score

The univariate analysis for predictors of severity of injury based on NISS in Priority 1 and 2 patients is given in Table 2. Patients in the age group of 15–30 years (unadjusted odds ratio [OR]: 6.96 [2.27–21.41]; $P < 0.001$), and the time of the incident (10.00 pm–6.00 am) (unadjusted OR: 4.14 [1.65–10.34]; $P = 0.001$) were the independent risk factors associated with high severity of injuries based on the anatomical scoring system.

Management, emergency department, and hospital outcome

The ED team alone treated and discharged around one-third, 108 (28.3%), of the total victims, while the remaining required evaluation and treatment by various trauma surgical teams, details of which are given in Figure 5. Most of the patients, i.e., 170, were taken up for minor emergency procedures such as wound wash, debridement, suturing, or nailing of the fractures in the minor theater of the ED itself. There were 81 (21.3%) of all the study patients who were admitted into the ward; 60 patients had to undergo major surgical interventions, and the rest were managed conservatively. Most of the patients who were not admitted were discharged 285 (74.8%) stable with advice to follow-up in the outpatient department or plan for elective surgical procedures at a later date. The rest left against medical advice 15 (3.9%) after primary care. There were no mortalities recorded among these study participants.

DISCUSSION

Violence has drastic physical, psychological, social, and economic impacts. Violence-related injuries have been the subject of much interest as a public health issue in developing countries due to the DALYs associated with it.^[8,12-14] In previous studies, this was found to be as high as 8.4%, and this reiterates the need for effective preventive strategies.^[17] For this to be successful, accurate surveillance data are critical but are lacking in our country. Furthermore, these incidents vary significantly between regions, depending on various sociocultural and economic factors.^[3,8,12,18] This study focused

Table 1: Baseline characteristics

Variables	Frequency (n=381), n (%)
Age, mean (SD) years	36.16 (13.9)
1–18	22 (5.7)
19–35	182 (47.8)
36–50	113 (29.7)
>50	64 (16.8)
Sex	
Male	312 (81.9)
Female	69 (18.1)
Domestic violence	66 (17.3)
Positive history of alcohol consumption	21 (5.5)
Time of incident (h)	
Morning (800–1700)	92 (24.2)
Evening (1700–0000)	211 (55.4)
Night (0000–800)	78 (20.5)
Triage priority levels	
Priority 1	71 (18.6)
Priority 2	170 (44.6)
Priority 3	140 (36.8)
Perpetrator's profile	
Known person (spouse/friends/relatives/neighbors)	257 (67.4%)
Domestic violence (n=257)	66 (17.3%)
Unknown person	124 (32.6%)
Emergency department outcome	
Admitted	81 (21.3)
Discharged	285 (74.8)
Left against medical advice	15 (3.9)

SD: Standard deviation

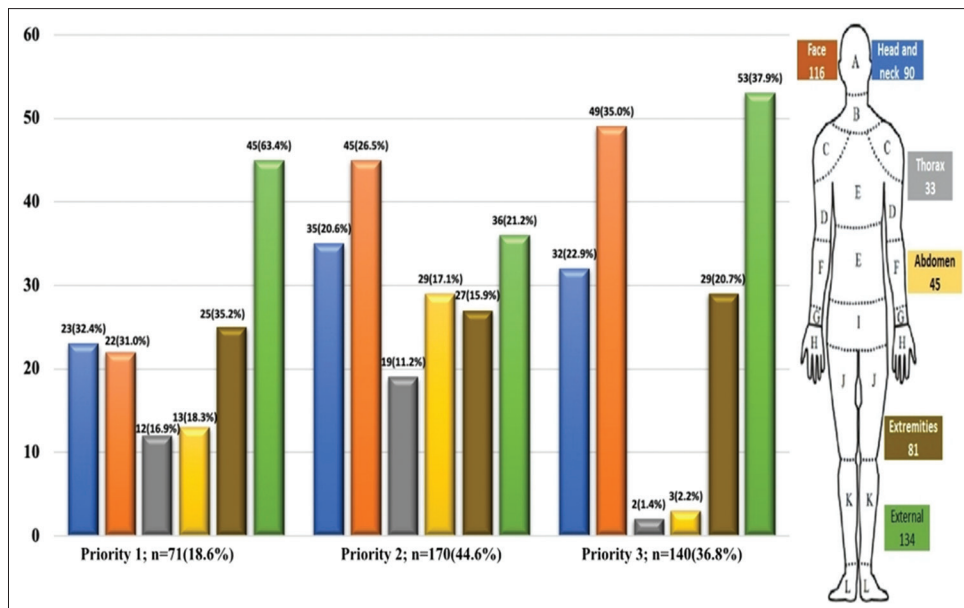


Figure 2: Triage priority level and regions of the body involved

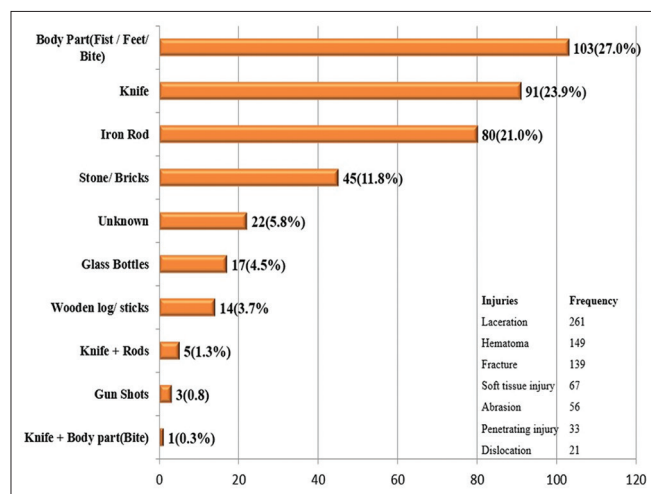


Figure 3: Object used and injuries

on assault-related injuries with the objective of describing the demography of victims and assailants, the nature and circumstances of the assault, object used to cause harm, areas of the body injured, severity of injuries, management in ED, and outcome of their hospital stay.

The proportion of violence-related injuries in our study accounted for 2.8 of all the trauma patients. It was noted that the victims of assault were frequently young males, belonging to the 15–34 year age group, and assaults were most common in late evenings and nights, both of which were expected as like in other studies.^[19] Majority of the incidents, i.e., 211 (55.4%), occurred in the late evening from 1700 h to 0000 h. The aggravating causes were usually land ownership-related issues seen in the the older age group, domestic violence against the spouse, heated arguments among college students, injuries inflicted during theft, etc.

It must also be noted that the rate of domestic violence is likely to be underreported in our country due to cultural and social pressures.

Contrary to other studies in the West and in India, we did not come across victims of sexual assault, though it goes to reason that they have a low rate of reporting these incidents due to social taboo.^[20-22] Another probable explanation could be that sexual assault is usually more rampant in the lower socioeconomic classes, which would preclude them from presenting to a private tertiary center such as ours. We also did not elicit any political-inspired motive for assault which was differing from previous studies done in India. This was probably due to relatively less political unrest in a small town like ours, or the likelihood of the involvement of the police in such instances wherein the victims are taken to a government hospital setup.

We also found a variation within the year regarding the incidence of assault, with a clear spike seen in the months of August/September. The cause for this was thought to be the rampant public celebration of festivals such as Muharram, Ganesh Chaturthi, Navratri, etc., in large crowds where alcohol consumption, especially among young adults, is common.^[23,24] These incidences can be decreased to an extent by ensuring better crowd control, increasing security, and restricting the sale of alcohol during this season. Our study demonstrated that in majority of the victims, the mechanism of assault was by blunt objects, in which the use of body parts such as fist and feet was most common. In many cases of violence-related injuries in the West, as well as in some parts of India, gunshot injuries were highly prevalent.^[10,25] On the contrary, the spectrum of weapons used in our region were mostly blunt objects such as rods and sticks, with a surprisingly low rate of gun-related violence. This is likely due to the limited access to guns and

Table 2: Univariate analysis for predictors of severity of assault injuries in Priority 1 and 2 patients based on new injury severity score ≥ 8

Variables	NISS ≥ 8 (Priority 1 and 2) (n=33), n (%)	NISS <8 (Priority 1 and 2) (n=208), n (%)	P	Unadjusted OR
Male sex	28 (84.8)	172 (82.7)	0.76	1.17 (0.42–3.24)
Female sex	5 (15.2)	36 (17.3)		
Age group: 15–30 years	17 (51.5)	83 (39.9)	<0.001	6.96 (2.27–21.4)
Other age groups (<15 or >30 years)	16 (48.5)	125 (60.1)		
Assaulted by known person	15 (45.5)	151 (72.6)	0.81	0.88 (0.22–2.39)
Assaulted by unknown person	18 (54.5)	57 (27.4)		
Use of sharp objects	5 (15.2)	77 (37.0)	0.29	0.57 (0.20–1.63)
Use of other or unknown objects	28 (84.8)	131 (63.0)		
Time of assault (10.00 pm–6.00 am)	11 (33.3)	46 (22.2)	0.001	4.14 (1.65–10.3)
Other time of incidents (6.01 am–5.00 pm and 5.01 pm–09.59 pm)	22 (66.7)	162 (77.8)		
Positive history of alcohol consumption	3 (9.1)	16 (7.7)	0.07	0.83 (0.23–3.03)
Negative or unknown history of alcohol consumption	30 (90.9)	192 (92.3)		

OR: Odds ratio, NISS: New Injury Severity Score

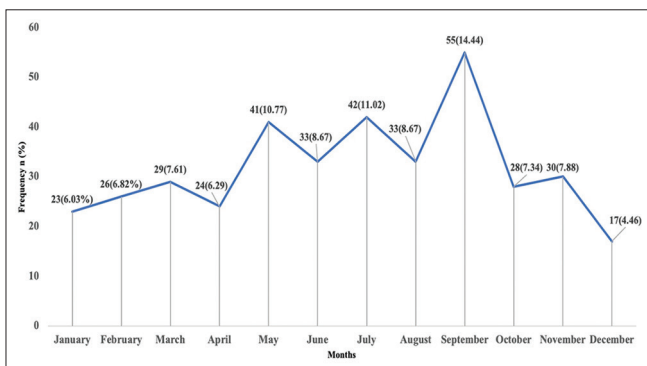


Figure 4: Monthly variation of incidents

explosives or financial constraints that prevent them from owning these weapons.

Soft-tissue injuries (contusions, bruises, abrasions, and lacerations) and fractures were the most frequent injuries seen with the head, neck, face, and extremities most commonly affected. This could be due to the natural self-defense posture taken by the victims at the time of the incident. Moreover, the assailants would be more likely to strike more accessible areas of the body to cause grievous injury. The type of injury could be co-related with the type of weapon used, and the increased incidence of fractures and soft-tissue injuries could be explained by the more common use of blunt objects/body parts to cause harm. Further, penetrating injuries to the thorax and abdomen were less commonly seen as was the use of sharp objects.

Significant univariate analysis for predictors of severity of injury based on NISS among Priority 1 and 2 patients, demonstrated that the likelihood of victims having a severe injury (NISS ≥ 8) were between the ages of 15–30 years and if victims were assaulted at night between 2200 h and 0600 h.

Majority of the patients could be discharged directly from the ED after primary care. This was possible due to qualified

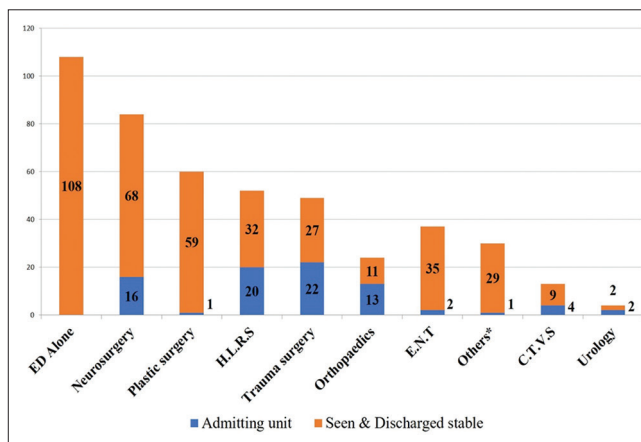


Figure 5: Departments managing patients in the emergency department and admission

and efficient ED professionals, aided by the backbone of a multispecialty team of trauma surgeons, neurosurgeons, orthopedics, plastic surgeons, ear, nose, and throat surgeons, and orthodontists. This study demonstrates that there is an urgent need to address the social and emotional needs of adolescents and young adults in our country. Efficient law enforcement, especially at nights and during festivals, will also go a long way toward decreasing the incidence of assault.

Strengths of our study

Owing to the comparatively larger study population, our analysis can contribute to our understanding of assault injuries, severity on NISS, and outcome as well as aid in highlighting region-specific needs that are to be met in order to alleviate some of this burden.

Limitations

This is data from a single large tertiary care center which may have resulted in patient selection and an inherent referral pattern bias. Missing patient records and incomplete data were other limitations of our case-series study.

CONCLUSIONS

Prevention should be focused on high-risk populations, which according to these data include young adults and men. ED professionals should be equipped to administer prompt and potentially life-saving management to these victims. Assault cases are sensitive and should be dealt with as such, with mandatory police intimation. Education programs, regulating availability of alcohol, and development of support groups for the at-risk are promising interventions.

Research quality and ethics statement

The authors of this manuscript declare that this scientific work complies with reporting quality, formatting, and reproducibility guidelines set forth by the EQUATOR Network. The authors also attest that this clinical investigation was determined to require Institutional Review Board/Ethics Committee review, and the corresponding protocol/approval number is IRB Min no: 12222 dated August 22, 2019. We also certify that we have not plagiarized the contents in this submission and have done a Plagiarism Check.

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Conflicts of interest

There are no conflicts of interest.

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