

Profile of trauma patients in the emergency department of a tertiary care hospital in South India

Kundavaram Paul Prabhakar Abhilash¹, Nilanchal Chakraborty¹,
Gautham Raja Pandian¹, Vineet Subodh Dhanawade¹, Thomas Kurien Bhanu¹,
Krishna Priya¹

¹Department of Emergency Medicine, Christian Medical College, Vellore, Tamil Nadu, India

ABSTRACT

Background: Trauma is an increasing cause of morbidity and mortality in India. This study was done to improve the understanding of the mode of trauma, severity of injuries, and outcome of trauma victims in our hospital. **Materials and Methods:** This was a retrospective observational study of all adult trauma patients more than 18-year-old presenting to our emergency department (ED). Details of the incident, injuries, and outcome were noted. **Results:** The ED attended to 16,169 patients during the 3-month study period with 10% (1624/16,169) being adult trauma incidents. The gender distribution was 73.6% males and 26.4% females. The mean age was 40.2 ± 16.7 years. The median duration from time of incident to time of arrival to the ED was 3 h (interquartile range [IQR]: 1.5–6.5) for priority one patients, 3 h (IQR: 1.5–7.7) for priority two patients, and 1.5 h (IQR: 1–7) for priority three patients. The average number of trauma incidents increased by 28% during the weekends. Road traffic accident (RTA) (65%) was the most common mode of injury, followed by fall on level ground (13.5%), fall from height (6.3%), work place injuries (6.3%), and others. Traumatic brain injury was seen in 17% of patients while 13.3% had polytrauma with two-wheeler accidents contributing to the majority. The ED team alone managed 23.4% of patients while the remaining 76.6% required evaluation and treatment by the trauma, surgical teams. The in-hospital mortality rate was 2.3%. Multivariate analysis showed low Glasgow coma score (odds ratio [OR]: 0.65, 95% confidence interval [CI]: 0.55–0.76, $P < 0.001$) and high respiratory rate (OR: 1.15, 95% CI: 1.07–1.24, $P < 0.001$) to be independent predictors of mortality among polytrauma victims. **Conclusions:** RTA and falls are the predominant causes of trauma. A simple physiological variable-based scoring system such as the revised trauma score may be used to prioritize patients with polytrauma.

Keywords: Accidents, emergency department, polytrauma, profile, trauma

Introduction

Trauma is a major cause of morbidity and mortality in both developed and developing countries. The usual causes are road traffic accidents (RTAs), fall from height, occupational injuries, and assault. According to the World Health Organization report on road safety, RTAs would be the fifth leading cause of death worldwide by the year 2030.^[1] Occupational injuries leading to

disability are also of major concern in a country like India as many industries continue to be unregulated. The majority of trauma deaths occur in the prehospital periods due to insufficient prehospital care where the first 60 min after trauma has been considered as the “golden hour” of trauma.^[2] It is therefore important to quickly assess the severity of the injury accurately and quickly. This study was done to improve the understanding of the mode of trauma, severity of injuries, and outcome in our hospital so that effective prevention and comprehensive management strategies could be made. We also studied the accuracy of physiologic variables such as respiratory rate,

Address for correspondence: Dr. Kundavaram Paul Prabhakar Abhilash,
Department of Emergency Medicine, Christian Medical College,
Vellore - 632 004, Tamil Nadu, India.
E-mail: dr.kppabhilash@gmail.com

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/2249-4863.197279

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Abhilash KP, Chakraborty N, Pandian GR, Dhanawade VS, Bhanu TK, Priya K. Profile of trauma patients in the emergency department of a tertiary care hospital in South India. *J Family Med Prim Care* 2016;5:558-63.

Glasgow coma score (GCS), and systolic blood pressure which are used in the revised trauma score (RTS) in predicting mortality.

Materials and Methods

The study was a retrospective, cohort study of trauma patients presenting to the adult emergency department (ED) of Christian Medical College, Vellore, which is a 45-bed department in South India with an average of 200 admissions daily. The department caters to all adult emergency cases (>15 years) as well pediatric trauma cases. All other pediatric emergency cases are taken care of by a pediatric ED. The study recruited all trauma patients more than 18 years of age presenting to the ED between October 2014 and December 2014. The inclusion criteria were all patients who had sustained trauma through RTA, industrial incidents, electrical injuries, fall from height or level ground, or trauma related to assault, sports, and animals. Patients aged below 18 presenting with trauma and adult patients who were dead on arrival were excluded from the study.

Data of the patients were obtained from the electronic hospital records. Details of history and physical examination findings of all patients were recorded on a standard data collection sheet. The following were extracted: Demographics, mode of injury, time of injury and time of presentation, triage priority, severity of injury, type of injury, presence of vascular injury, and proportion of patients undergoing operative intervention. Triage priority level was defined as follows:

- Triage priority 1: Patient with airway, breathing or circulation compromise, or head injury with GCS < 8
- Triage priority 2: Patient with stable airway, breathing and circulation with long bone injuries, dislocations, stable abdomino-thoracic injuries, head injury with GCS 9, or more
- Triage priority 3: Hemodynamically stable patients with minor trauma.

All patients had routine blood investigations and relevant radiological tests based on the initial primary and secondary surveys. The severity of injury was assessed using the RTS.^[3] The region of the body affected was noted, and injuries were classified as superficial and deep. All abrasions, superficial lacerations, and minor soft tissue injuries were considered as superficial injuries. All penetrating injuries, fractures, dislocations, head injuries, and other internal organ injuries were classified as deep injuries. After initial stabilization by the ED team, the patients were handed over to the necessary surgical departments for further management if necessary. Patients with minor injuries were discharged by the ED team after a short observation period and those who required surgery or prolonged observation were admitted in the respective wards. In-hospital outcome of all the admitted patients was noted.

Statistical analysis was performed using SPSS software version 16.0 (SPSS Inc. Released 2007, Chicago). Mean (standard deviation) or median (range) was calculated for the continuous variables and *t*-test or Mann–Whitney test was used to test

the significance. The categorical variables were expressed in proportion and Chi-square test or Fisher exact test was used to compare dichotomous variables. Univariate analysis was performed to identify the variables that predicted mortality among polytrauma patients and for predicting the severity of head injury. These variables were incorporated for multivariate logistic regression analysis to examine the relationship between the binary and continuous variables that could identify those that significantly differentiate the two groups. For all tests, a two-sided $P \leq 0.05$ was considered statistically significant. This study was approved by the Institutional Review Board and patient confidentiality was maintained using unique identifiers and by password protected data entry software with restricted users.

Results

The ED attended to 16,169 patients during the 3-month study period with 13% (2022/16,169) being trauma incidents. Pediatric (<18 years) trauma patients comprised 3% (398) while adult (>18 years) trauma patients comprised 10% (1624) of all the cases. The average adult trauma cases were 560/month. The gender distribution was 73.6% males and 26.4% females. The mean age was 40.2 ± 16.7 years [Table 1].

Fifty-two percent of the injuries occurred between 8 am and 5 pm. However, almost 52% of the patients presented to the ED between 5 pm and 12 am. The median duration from the time of incident to time of arrival to the ED was 3 h (interquartile range [IQR]: 1.5–6.5) for priority one patients, 3 h (IQR: 1.5–7.7) for priority two patients, and 1.5 h (IQR: 1–7) for priority three patients. However, 44% of the patients arrived in the ED within 3 h of the incident. The average number of trauma incidents increased

Table 1: Baseline characteristics

Characteristic	n	Percentage
Mean age (years)±SD	40.1±16.69	
Age distribution (years)		
18-25	390	24
26-40	542	33.4
41-60	464	28.6
>60	228	14
Sex distribution		
Male	1196	73.6
Female	428	26.4
Average admission/day		
Week days (Monday-Friday)	16.5	69
Weekend (Saturday-Sunday)	20.9	31
Triage priority level		
Priority 1	251	15.5
Priority 2	910	56
Priority 3	463	28.5
Median time delay in arrival from the time of injury (h) (IQR)		
Priority 1	3	1.5-6.5
Priority 2	3	1.5-7.7
Priority 3	1.5	1-7

SD: Standard deviation; IQR: Interquartile range

by 28% during the weekends (Saturdays and Sundays combined). There were 16.4 ± 8 cases during the weekdays compared to 20.9 ± 6 cases during the weekends. The triage priority distribution was as follows: Priority one (15.5%), priority two (56%), and priority three (28.5%). Most of the trauma incidents (65%) were the result of an RTA. Two-wheeler accidents (46%) were the most common followed by pedestrian injuries (7.8%), four-wheeler accidents (7.2%), autorickshaw accidents (2.7%), and other vehicular accidents (0.8%) which included trains, tractors, and large trucks. Sixteen percent (168/1058) of these RTA victims were allegedly under the influence of alcohol. Other modes of injury included fall on level ground (13.5%), fall from height (6.3%), workplace injuries (6.3%), assault (2.6%), electrical injuries (0.5%), sports (0.9%), and animal-related injuries (0.8%). The triage priority-wise distribution of these accidents is shown in Figure 1.

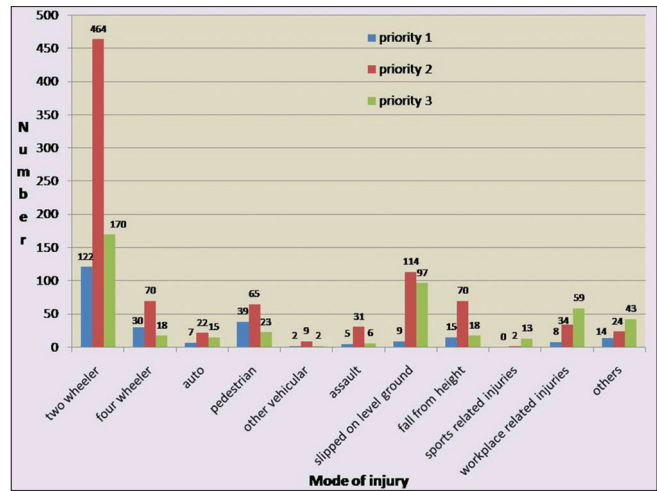


Figure 1: Mode of injury and triage priority level

Two-thirds of the patients (67%) were referred cases from other hospitals. Nine patients were intubated elsewhere and referred while a further 78 patients (4.8%) required intubation in our ED. Extremity injuries (upper and lower limbs) were the most common injuries seen in 44% of patients followed by traumatic brain injury (TBI) (17%), facial injuries (10%), thoracic injuries (4.6%), abdominal injuries (4.3%), and neck injuries (0.4%). Spinal injuries were seen in 3.2%, and vascular injuries were seen in 0.6% of the patients [Figure 2].

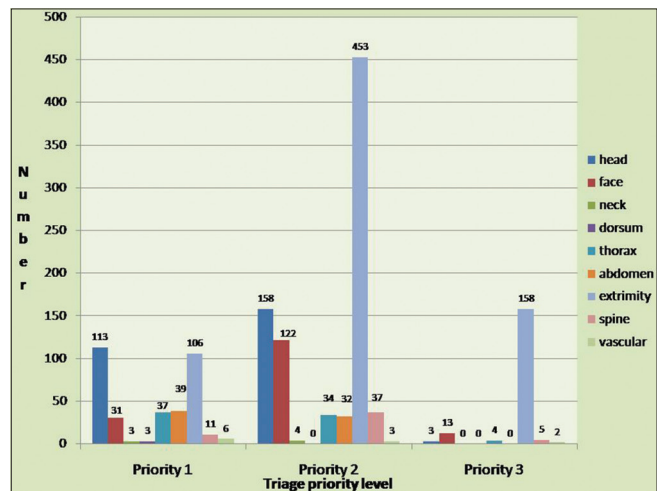


Figure 2: Region of the body with deep injuries and triage priority level

Seventeen percent (274/1624) of all trauma patients had a TBI. The majority (69%) of those with head injury had mild head injury (GCS: 13–15), 13% had moderate head injury (GCS: 9–12), and 18% had severe head injury (GCS \leq 8). We assessed the risk of TBI with different modes of injuries such as fall from height, two-wheeler accidents, pedestrian injuries, four-wheeler accidents, and assaults but did not find any statistical significance [Table 2].

Polytrauma cases comprised 13.3% of all adult trauma cases. The majority of these (60.3%) were due to two-wheeler accidents. The median delay in arrival to the ED from the time of incident among these cases was 3 (IQR: 1–8.5) h. The mortality rate among the polytrauma patients was 7.8% (17/217). Univariate analysis for predictors of mortality among polytrauma victims showed fall from height (odds ratio [OR]: 4.55), RTS score (OR: 0.31), GCS $<$ 9 (OR: 23.88), and respiratory rate (OR: 1.13) to be significant. Multivariate analysis showed low GCS (OR: 0.65, 95% confidence interval [CI]: 0.55–0.76, $P <$ 0.001) and high respiratory rate (OR: 1.15, 95% CI: 1.07–1.24, $P <$ 0.001) to be independent predictors of mortality [Table 3].

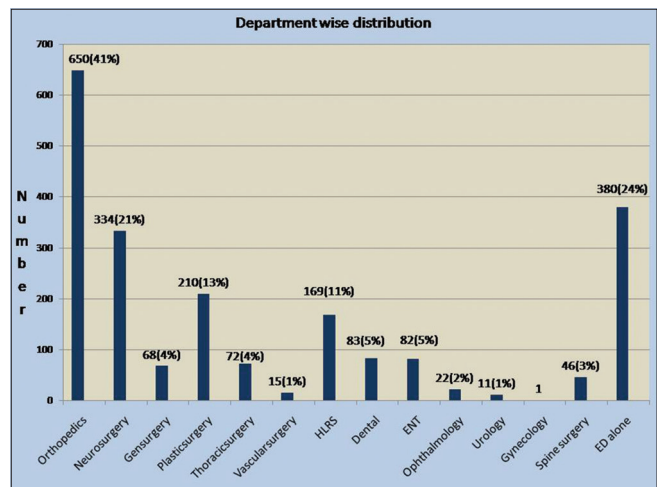


Figure 3: Departments involved in the management of patients in the emergency department

The ED team alone treated and discharged 380/1624 (23.4%) patients while the remaining 76.6% required evaluation and treatment by the trauma surgical teams. The trauma specialties that were commonly involved in the management were orthopedics (40%), neurosurgery (21%), plastic surgery (13%), hand-limb reconstruction surgery (HLRS) (10%), dental surgery (5%), ENT surgery (5%), general surgery (4%), and cardiothoracic surgery (4%) [Figure 3].

Among the adult trauma patients admitted to the ED, 56.5% (919/1624) were discharged in a stable condition, 0.6% (10/1624) died within the first 24 h, and 1.7% (29/1624)

died after 24 h of the injury. The remaining 41.2% of patients required admission for surgical intervention or conservative management.

Discussion

Trauma is a major problem in India with severe and wide-ranging consequences for individuals and society as a whole. In the United States, traumatic injuries account for 30% of life years lost.^[4] With rapid economic growth, there is a rapid increase in automobiles and industries across the length and breadth of

India, and hence, an increase in the incidence of trauma cases. In our ED, 10% of the patients were adult trauma victims. Although a male predominance among trauma victims is seen in most international studies; the sex ratio in our study was very heavily skewed toward males.^[5-7] This is explained by the fact that in our country, males are predominantly engaged in outdoor activities and operation of automobiles and hence are more vulnerable to injuries. Patients 18–45 years of age were more likely to sustain a traumatic injury. This is consistent with international findings. The mean age of 40 years in this study is also consistent with literature on trauma.^[8] The 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 in India.^[9]

Table 2: Severity of traumatic brain injury and mode of injury

Mode of injury	Mild (n=155) n (%)	Moderate (n=53) n (%)	Severe (n=59) n (%)	OR	95% CI	P
Two-wheeler	108 (59.02)	33 (18.03)	42 (22.95)	0.95	0.58-1.57	0.854
Four-wheeler	13 (72.22)	4 (22.22)	1 (5.56)	0.46	0.16-1.29	0.141
Auto	3 (60)	2 (40)	0 (0)	0.69	0.13-3.7	0.66
Pedestrian	21 (53.85)	6 (15.38)	12 (30.77)	1.37	0.71-2.66	0.351
Fall from height	3 (25)	6 (50)	3 (25)	2.33	0.87-6.21	0.092
Assault	7 (70)	2 (20)	1 (10)	0.55	0.14-2.09	0.379

OR: Odds ratio; CI: Confidence interval

RTAs was the predominant cause of trauma, a result consistent with other studies from India and abroad.^[8,9] 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.^[8] TBI is a major public health problem in India as well as in other developing countries resulting in significant morbidity and mortality among the young

Table 3: Predictors of mortality among polytrauma cases

Univariate analysis for predictors of mortality among polytrauma cases

Risk factors	Alive (n=200) n (%)	Dead (n=17) n (%)	Unadjusted OR	95% CI	P
Mean age±SD	36.95 (14.57)	39.71 (18.03)	1.01	0.98-1.05	0.464
Sex					0.798
Male	172 (86.00)	15 (88.24)	1.22	0.26-5.63	
Female	28 (14.00)	2 (11.76)			
Time of arrival to ED since injury median (IQR)	3 (2, 7.5)	3 (1.5, 5)	0.96	0.86-1.06	0.387
Two-wheeler	119 (94.44)	7 (5.56)	0.48	0.17-1.30	0.142
Four-wheeler	28 (93.3)	2 (6.7)	0.82	0.18-3.78	0.798
Pedestrian	20 (86.96)	3 (13.04)	1.93	0.51-7.29	0.325
Fall from height	9 (75)	3 (25)	4.55	1.10-18.72	0.023
Auto	9 (90)	1 (10)	1.33	0.16-11.14	0.794
Others	15 (93.75)	1 (6.25)	0.77	0.09-6.22	0.806
Vascular injury	4 (2.00)	1 (5.88)	3.06	0.32-29.05	0.330
GCS <9	9 (4.50)	9 (52.94)	23.88	7.45-76.43	<0.001
RTS					
Median (IQR)	7.84 (7.55, 7.84)	6.61 (4.09, 7.55)	0.31	0.19-0.48	<0.001
SBP					
Median (IQR)	110 (100, 190)	110 (80, 120)	0.99	0.98-1.01	0.291
RR					
Median (IQR)	22 (20, 24)	32 (22, 40)	1.13	1.07-1.19	0.010
GCS					
Median (IQR)	15 (15, 15)	5 (3, 15)	0.67	0.58-0.77	<0.001

Multivariate analysis for predictors of mortality among polytrauma cases

Variable	Adjusted OR	95% CI	P
Fall from height	2.17	0.19-24.04	0.529
RR	1.15	1.07-1.24	<0.001
GCS	0.65	0.55-0.76	<0.001
RTS	0.58	0.29-1.11	0.103

GCS: Glasgow coma score; RR: Respiratory rate; RTS: Revised trauma score; SBP: Systolic blood pressure; OR: Odds ratio; CI: Confidence interval; IQR: Interquartile range; ED: Emergency department

and productive people of our society. The economic losses to the individual and to the country are huge and immeasurable. We tried to correlate the mode of injury to the severity of TBI but did not find any statistically significant mode. However, more than two-thirds of these injuries were due to two-wheeler accidents, and one-fourth had severe head injuries. This is a serious concern and stresses the need to make use of helmets compulsory across the country. Compulsory use of helmets must be strictly enforced not only just by the government authorities such as the police but also voluntarily encouraged by the institutions people work for. Many roads in India are unsafe, and traffic regulations are rarely followed by drivers and seldom strictly enforced by the police. Alcohol is another evil that significantly impacts vigilance of the driver and is known to a factor in 15–20% of accidents causing TBI.^[10] In our study, a significant percentage of people was under the influence of alcohol, who contributed not only to their injuries but also caused significant harm to other vehicular passengers and pedestrians, which is consistent with other Indian studies.^[11] Seldom in India are breath alcohol levels monitored by traffic police. The need to improve road safety and to change the casual attitude of people and law enforcing agencies toward traffic regulations cannot be more overemphasized through this study.

Falls comprised one-fifth of all trauma cases in our study, which is similar to findings of other studies related to trauma.^[8] Most of the occupational injuries (6.3%) that presented to us were related to heavy machinery at the workplace and were predominantly hand injuries. Many of these patients required tendon reconstruction surgery. These injuries account for major financial loss from time away from work and may lead to permanent deformities and dysfunction of the hand without prompt surgical intervention.

Polytrauma victims are those patients subjected to multiple traumatic injuries. RTAs and fall from height are the usual causes among regular civilians. Other causes in areas of conflict across the world include blast injuries, bullet, and other warfare injuries. Polytrauma patients represent the ultimate challenge to trauma care team in any ED. The prevalence of polytrauma cases in our study (13.8%) is comparable to the prevalence from studies from North India.^[12] Similar pattern of injuries was noted by Goyal *et al.* in a study from rural Maharashtra.^[13] Studies in the past have used different scoring systems such as injury severity score (ISS), the new ISS, and the Acute Physiology and Chronic Health Evaluation II to predict early mortality. However, these are cumbersome and time-consuming. A simple physiological variable-based scoring system such as the RTS is more practical in resource-limited settings. Our study showed the RTS to be an accurate predictor of mortality (OR: 0.31; 95% CI: 0.19–0.48. $P \leq 0.001$). Previous studies have shown GCS, age and hypotension at presentation to be independent predictors of mortality among polytrauma patients.^[12,14] In our study, low GCS and high respiratory rate were found to be independent predictors of mortality.

In an advanced tertiary care center like ours, the trauma teams operating in the ED are highly specialized. Unlike in many hospitals, trauma cases after initial resuscitation by the ED team are managed by higher specialty departments such as plastic surgery, HLRS, vascular surgery, cardio-thoracic surgery, and spine surgery. This explains the relatively less involvement of general surgery department in managing acute trauma cases. This pattern of referrals is similar to the pattern in another advanced tertiary care ED in North India.^[12]

Our study highlights the burden of trauma in the EDs of India. Many primary and secondary health centers lack certain essential facilities such as computed tomography scan, blood bank and operating theatres for evaluating, and treating severe cases of trauma. Unlike in our hospital, specialists in trauma care are not available in most rural hospitals; hence, many patients need to be referred to higher centers. As shown in our study, a simple scoring system such as the RTS may be used by primary care physicians to assess the severity of trauma and to refer to higher centers after giving first aid and stabilizing the patient. Two-thirds of our patients were referred after receiving first aid from local physicians and primary/secondary health centers. This fact emphasizes the importance of all primary care physicians being able to provide acute management of trauma care to the victims as their early intervention could potentially save many lives.

Conclusions

Our study shows that RTA and falls are the predominant causes of trauma. Increasing awareness and proper training of primary physicians and the paramedical team about prevention and early management of trauma are the urgent need of the time. A simple physiological variable-based scoring system such as the RTS should be used in resource-limited settings to prioritize patients with polytrauma.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. World Health Organization. 2nd Global Status Report on Road Safety; 2011. Available from: <http://www.who.int/entity/violence/globalstatusreport/flyeren.pdf>. [Last accessed on 2015 Jan 03].
2. Carr BG, Caplan JM, Pryor JP, Branas CC. A meta-analysis of prehospital care times for trauma. *Prehosp Emerg Care* 2006;10:198-206.
3. Champion HR, Sacco WJ, Copes WS, Gann DS, Gennarelli TA, Flanagan ME. A revision of the trauma score. *J Trauma* 1989;29:623-9.
4. Center for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS); 2015. Available from: <http://www.cdc.gov/injury/wisqars>. [Last accessed on 2015 Nov 16].

5. Boyle MJ, Smith EC, Archer FL. Trauma incidents attended by emergency medical services in Victoria, Australia. *Prehosp Disaster Med* 2008;23:20-8.
6. Babatunde AS, Adedeji OA, Chima PK, Sulyman AK, Ukpong SU, Lukman OA, *et al.* Clinical spectrum of trauma at a university hospital in Nigeria. *Eur J Trauma* 2002;28:365-9.
7. Mishra B, Sinha Mishra ND, Sukhla S, Sinha A. Epidemiological study of road traffic accident cases from Western Nepal. *Indian J Community Med* 2010;35:115-21.
8. Rastogi D, Meena S, Sharma V, Singh GK. Epidemiology of patients admitted to a major trauma centre in northern India. *Chin J Traumatol* 2014;17:103-7.
9. Shameem AM, Shabbir KM, Agrawal D, Sharma BS. Outcome in head injured patients: Experience at a level 1 trauma centre. *Indian J Neurotrauma* 2009;6:119-22.
10. Gururaj G. Epidemiology of traumatic brain injuries: Indian scenario. *Neurol Res* 2002;24:24-8.
11. Kochar A. Road traffic accidents alcohol. *Int J Med Toxicol Leg Med* 2002;5:22-4.
12. Payal P, Sonu G, Anil GK, Prachi V. Management of polytrauma patients in emergency department: An experience of a tertiary care health institution of northern India. *World J Emerg Med* 2013;4:15-9.
13. Goyal S, Sancheti KH, Shete KM. Poly Trauma in Rural India- Changing Trends. *Indian J Orthop* 2006;40:259-61.
14. Strnad M, Lesjak VB, Vujanovic V, Pelcl T, Krizmaric M. Predictors of mortality and prehospital monitoring limitations in blunt trauma patients. *Biomed Res Int* 2015;2015:983409.