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Original Article

A Comprehensive Study and Creation of Profile of Trauma Patients Admitted in ICU of a Tertiary Care Hospital in India

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ABSTRACT

A comprehensive study was conducted on trauma patients admitted in ICU of a leading tertiary hospital. The study was based on evaluation of head injury taking care of studying epidemiological aspect also. In a total case of patients (N=149) 130 (87.25%) sustained head injury. Tools of analysis was primarily CT scan, diagnosis thus made revealed cranio cerebral injury 95 (63.76%). Detailed analysis revealed the following acute SDH (8.46%), EDH (7.69%), Contusion (29.23%), Brain edema (26.92%), #skull (27.69%), SAH (6.15%), ICH (15.38%), Pneumo cephalus (5.39%), Granulomatous lesion (2.31%), diffuse axonal injury (3.84%), foreign body (1.54%). Detailed discussion about this manifestation is discussed in this research paper.

Keywords: *neuro trauma, intensive care unit, SDH, brain injury, skull trauma, medical emergency, surgical emergency*

INTRODUCTION

Trauma is one of the leading causes of preventable death and has major health and social impact[1] and is also the leading cause of death, hospitalization, and long-term disabilities in the first four decades of life[2]. Majority of trauma victims are young group of people, and it account for loss of more years of life than lost due to heart, cancer and other disease summed together. Further with the advancement of civilization and leaps in transport, incidences of trauma have assumed gigantic proportion. Global statistic has revealed that death due to trauma comes just before myocardial infarction, Among trauma only road traffic injuries are the leading cause of death among young people, aged 15–29 years[3,5] and Injuries

due to trauma account for 12% of the total burden of disease worldwide[4], 9% of worlds deaths[4'5] and 90% in LMICs[5] (lower & middle income countries).Trauma involve all parts of body depending on modes of trauma especially head, thorax, abdomen, extremities and perineum etc

Trauma to head occurs every 15 seconds and a patient dies from head injury every 12 minutes. A day does not pass that an emergency physician is not confronted with a head injured patient[6]. It accounts for one quarter to one third of all accidental deaths, and for two thirds of trauma deaths in hospitals[7] .Trauma that causes severe Traumatic Brain injury (TBI) results in prolonged hospital stay and is the most common cause of traumatic deaths[8,9]. Severe TBIs are mainly due to falls or motor vehicle-related incidents[10]. According to WHO data, by the year 2020, head trauma will be third largest killer in the developing world.[11]

MATERIAL AND METHODS

For the purpose of study, the cases of trauma that were reported to the ICU of J.N. Medical College Hospital, A.M.U., Aligarh, were included in the study. It is one of the tertiary referral hospitals in the country and serves as a teaching hospital for JNMC and other paramedics. It has a 12-bed multi-disciplinary Intensive Care Unit (ICU) which is headed by a consultant anesthesiologist and run by residents, trained ICU nurses. The ICU provides services to all patients (trauma and non-trauma, medical and surgical) requiring advanced airway support, mechanical ventilation, hemodynamic support, and electronic monitoring which are usually not available in the open wards in our hospital. The majority of trauma patients admitted in the ICU come from the Emergency section, Emergency operating theatre (EOT), wards, other peripheral hospitals and very few come from routine surgical operating theatre (SOT).

This is a prospective study conducted over a period December 2014 to November 2015.

Method of selection of data for prospective study

After initial resuscitation of the victims, thorough assessments for injuries were performed in all victims. Documentation on prescribed Performa has been done, that included GCS scoring at the time of reporting, history, physical findings, diagnostic tests for proper evaluation (CT scan), tracheostomy, length of stay, modes of injury with body part involvement. Data collected also included the age, sex, occupation, residential address, time of incidence of injury, reporting to hospital, timing of admission, type of admission, treatment modality and outcome.

Inclusion criteria

The study subjects included all patients with traumatic injuries admitted to ICU.

Exclusion criteria

Patients who were readmitted to the ICU during the same hospital stay and destitute were excluded from the study

Statistical Analysis

Data collected was analyzed using SPSS software version 20.0. We chose binary logistic regression as we have two outcome variables (Alive/death). we did univariate analysis on all seven (7) predictors and look for odd ratio (OR), confidence Interval (CI-95%) and p value. Student‘t’ test (unpaired) was applied to compare the mean duration of ventilation and length of stay in ICU. A value of $p<0.05$ was considered to be statistically significant and other simple descriptive test is also used during study.

Ethical approval

Ethical approval for the study was granted by Institutional Ethics & Research Advisory Committee, Faculty of Medicine, AMU, Aligarh.

OBSERVATION:

Table-1: Outcome of Trauma Victims

No of victims	Outcome	Percentage (%)
98	Discharged	65.77%
04	Higher center	2.68%
04	LAMA	2.68%
43	Expired	28.86%

Table-2: Mortality According To Age and Sex

Age (years)	Total no of Patients	Total Expired	Total no of Male Patients	Expired Male	Total no of Female Patients	Expired Female
1 to 14	19(12.75%)	06 (31.58%)	12	05	07	01
15 to 44	73(64.43%)	25 (26.04%)	73	20	23	05
45 to 64	31(20.81%)	11 (35.48%)	20	07	11	04
≥65	03(02.01%)	01 (33.33%)	01	01	02	0
TOTAL	149	43 (28.86%)	106 (71.14%)	33 (31.13%)	43 (28.86%)	10 (23.26%)

Table 1 shows out of 149 cases admitted in ICU, 43 (28.86%) expired, 4 (2.68%) referred to Higher center (HC), 4(2.68%) Leaving against medical advice (LAMA) and rest 98 (65.77%) are discharged and Table 2 shows mortality among male 33 (31.13%) is higher than mortality in female (23.26%) and mortality in elderly (>44) victims is greater than younger victims and most of the victims belonged to 15-44 years accounting to 64.43% followed by 45-64 years(20.81%). 19(12.75%) victims were with age of 4-14 years . 3(2.01%) victims were older than 65 years(≥65). Out of 149 victims majority were male106 (71.14%) and 43(28.86%) were female.

Table-3: **Socio-Economic Status**[53]

S.No	Socioeconomic class	Cases (n=149)	Percentage
1.	Upper class	14	9.40%
2.	Middle class	65	43.62%
3.	Lower class	70	46.98%
	Total	149	100

Table 3 shows socio-economic distribution of trauma victims, out of 149 cases, maximum numbers of victims of trauma were from the lower class, i.e. 46.98% of the total cases. Next common victims were from middle class (43.62%) followed by the cases from upper class (9.40%).

Table-4: Occupation-Wise Distribution Of Trauma Victims

Occupation	No. of patients	Percentage
Laborers	29	19.46%
Student	33	22.15%
Farmer	19	12.75%
Housewife	25	16.78%
Government Employee	08	05.37%
Businessman	11	07.38%
Others	24	16.11%

Table 4 shows majority of trauma victims admitted were student 33 (22.15%) followed by Labourers 29 (19.46%) and then housewife 25(16.78%)

Table-5: Modes Of Injuries Among ICU Trauma Victims

Age group (Years)	Total no of patients	Percent age	RTA	FFH	Assault	Fall of Heavy Object	Bullhorn Injury	Hanging	Fall from moving Train	Others
1-14	19	12.75	10(52.63%)	07(36.84%)	01	01	00	00	00	00
15-44	96	64.42	59(61.46%)	13(13.54%)	15	02	01	03	02	01
45-64	31	20.80	18(58.06%)	06(19.35%)	03	01	00	00	01	02
≥65	03	02.01	01(33.33%)	02(66.66%)	00	00	00	00	00	00
TOTAL	149	100	88(59.06%)	28(18.79%)	19(12.75%)	04	01	03	03	03

Table 5 shows that RTA was the commonest mode 88 (59.06%) of injury. Next in the category is fall from height 28(18.79%) cases which is followed by assault 19(12.75%) cases. Other cases had trauma due to different other causes which is shown above.

Table-6: Type of Offending Veichle In Road Traffic Accidents Cases

Offending Vehicle	Cases (n=88)	Percentage (%)
Motorcycle	53	60.23%
Light motor	09	10.23%
Heavy motor	16	18.18%
Other	06	6.82%
Unknown	04	4.55%
Total	88	100%

Table 6 shows that two wheelers (scooters/ motorcycles) caused maximum accidents, i.e., 54 which amount to 60.23 % of the total cases. The second major offending vehicles were the heavy motor vehicles (buses and trucks) which caused 16 accidents, i.e., 18.18% of cases. Light motor vehicles injured 10.23% of total cases and bullock cart caused injury to 6(6.82%) cases. In another 4(4.55%) cases, the offending vehicle could not be identified.

Table-7: Type of Victim In RTA Cases

Victims status	Cases(n=88)	Percentage (%)
Motorcyclist	50	56.81%
Pedestrian	11	12.50%
Occupant of light motor vehicle	08	9.09%
Occupant of heavy motor vehicle	12	13.64%
Others	07	7.95%

Table 7 shows that majority of the victims 50 (56.81%) were two wheeler occupants (motorcyclist) followed by Occupant of heavy motor vehicle 12 (13.64%) whereas Pedestrian in 11 (12.05%) cases and followed by light vehicle occupants were involved in 8 (9.09%) cases.

Table-8: Length of Stay IN ICU

Duration of stay (Days)	Cases (n=149)	Percentage (%)
1-3	71	47.65%
4-10	51	34.23%
11-21	25	16.78%
>21	02	1.34%

Table 8 shows that majority of victims 71 (47.65%) stayed in ICU between 1 to 3 days, 51 (34.23%) stayed for 4 to 10 days, 25 (16.78%) stayed for 11 to 21 days and only 2(1.34%) stayed for longer than 21 days.

Table-9: Length Of Stay In ICU For Survivors And Non Survivors

Total Patient(n=149)	Total length of stay(days)	Mean ± SD
Survivor(106)	425	4.009±3.081
Non survivor(43)	222	5.162±4.064

Table 9 shows that mean duration of length of stay in nonsurvivor (5.162±4.064) is greater than survivor (4.009±3.081)

Table-10: Manner of Injuries In Trauma Victims

Manner of injuries	Cases (n=149)	Percentage (%)
Accidental	124	83.22%
Homicidal	20	13.42%
Suicidal	05	3.36%

Table 10 shows that out of n=149, majority of victims (124) 83.22% cases were accidental, 20 (13.42%) cases were homicidal 5(3.36%) cases were suicidal.

Table-11: Time Interval Between Incidence And Reporting To Hospital

Time interval between incidence and reporting	Cases(n=149)	Percentage (%)
<2hrs	15	10.07%
2-6hrs	57	38.25%
6-10hrs	40	26.85%
10-24hrs	22	14.76%
≥24hrs	15	10.07%

Table 11 shows that maximum number of victims 57 (38.25%) were brought to the hospital between 2-6 hours after accident, only 15 (10.06%) victims were brought within 2 hours, 40 (26.85 %) were brought between 6-10 hours and another 22 (14.77%) were between 10-24 hours. And 15 (10.07%) cases were brought after 24 hours. Total no of patients reported within 6 hours (early group) is 72 after 6 hours (delay group) is 77.

Table-12: Glasgow Coma Scale of Trauma Patients at The Time of Reporting and Outcome

Category	GCS Score	No of Patients	Percentage (%)	Improved	Expired	Percentage of Mortality
1.	13-15	20	13.42%	19	1	5%
2.	9-12	28	18.79%	25	3	10.71%
3.	3-8	101	67.79%	62	39	38.61%

Table 12 shows that majority of victims 101 (67.79%) admitted to ICU with the GCS score range 3-8 is 101 (67.79%), 28 (18.79%) with the GCS score range 9-12 and 20 (13.42%) with the GCS score range13-15. Out of which maximum mortality 39 (38.61%) is seen in the GCS score range 3-8.

Table-13: Type Of Injuries Among ICU Trauma Victims

Type of Injury	Frequency	Percentage
Soft tissue injuries (wounds)	136	91.27%
Craniocerebral injury	95	63.76%
Fractures	46	30.87%
Visceral injury	37	24.83%
Burns(electrical)	02	1.34%
Other injuries	13	8.72%

Table 13 shows that soft tissue injuries 91.27% (i.e. bruises, laceration, abrasion and contusions) is the commonest type of injury found in trauma victims. Cranio cerebral injury 95 (63.76%) were the second commonest type of injury followed by fracture 30.87% (long bones, spines, pelvis, ribs, and skull).

Table-14: Results Of CT Scan Of Head (N=130)

Nature of Injury	No of patients	Percentage (%)
Acute SDH	11	8.46%
EDH	10	7.69%
Contusion	38	29.23%
Brain edema	35	26.92%
≠ skull	36	27.69
SAH	8	6.15%
ICH	20	15.38
Pneumocephalus	07	5.39%
Granulamatous lesion	03	2.31%
Diffuse Axonal Injury	05	3.84%
Foreign body	02	1.54%
Normal study	35	26.92%

Table 14 shows that 38 (29.23%) victims having contusion, 36 (27.69%) skull fracture, 35 (26.92%) brain edema, 20(15.38%) ICH and 35 (26.92%) having normal CT scan finding.

Table-15: Percentage of Patient Who Require Ventilator Support

Length of Stay	Total no of Patients	Ventilation support required	Percentage
Group I (≤3day)	71	61	85.92%
Group II (4days-3week)	76	71	93.42%
Group III (>3week)	02	02	100%

Table 15 shows that in group I (≤3day) 61(85.92%), group II (4days-3 week) 71 (93.42%) and in group III (>3week) 2(100%) required ventilator support.

Table-16: Mean±Sd Duration Of Ventilation

	Total no of patients	Duration of ventilation(days)	Mean ± SD	
Survivor	106	425	4.009±3.081	p=0.605
Non Survivor	43	183	4.255±.621	

Table 16 shows mean ± S.D. duration of ventilation in survivor is 4.009 ± 3.081 days and in non survivor is 4.255 ± .621 days.

Table-17: Tracheostomy In Trauma Victims (N=21)

Day of tracheostomy	No of Patients	Percentage
3rd day	5	23.81%
4th day	9	42.86%
5th day	7	33.33%

Table-18: Mean±Sd, Duration Of Tracheostomy

Total no of patients	Mean duration± SD (days)
21	4.025±.832

Table 17 shows that tracheostomy were performed in 10 (25%) cases on 3rd day, 17(42.5%) on 4th day and rest 13(32.5%) on 5thday. Mean ± S.D. duration of tracheostomy is 4.025 ± .832 days as shown in Table 18.

Table-19: Management Of Trauma Cases

Treatment modality	Cases (n=149)	Percentage (%)
Operative	79	53.02%
Medical	70	46.98%

Table 19 shows that out of 149 cases, 79 (53.02%) required surgical intervention while rest 70 (46.98%) victims were managed conservatively

Table-20: Predictors Of Mortality According To Univariate Analysis

Independent (predictor) variable	Number of patients (N/%)	Univariate analysis		
		OR	(95%C.I)	pvalue
1.Age				
> 44	34 (22.82%)	1.39	0.604-3.207	0.438
≤ 44	115(77.18%)	1		
2. Sex				
Male	106(71.14%)	1.492	0.658-3.381	0.338
Female	43 (28.86%)	1		
3. Timing of admission				
Delayed	77(51.68)	13.056	4.743-35.939	<.001
early	72(48.32)	1		
4. GCS				
<9	101(67.78%)	9.101	2.645-31.311	<.001
≥9	48(32.22%)	1		
5. Need for ventilatory support				
Yes	134(89.93%)	6.391	.814-50.213	.078
No	15 (10.07%)	1		
6. CT scan brain findings of SOL (n=130)				
Yes	95(73.08%)	10.526	2.387-46.502	.002
No	35(26.92%)	1		
7. Type of admission				
Emergency	139(93.24%)	3.897	.478-31.472	.204
Elective	10(06.76%)	1		

Abbreviations: O.R.= Odds ratio; C.I.= confidence interval; GCS = Glasgow coma scale; SOL = space occupying lesion

Table 28 shows that Significant predictors of mortality according to univariate analysis is GCS, Timing of admission (early ≤ 6 hrs and delay > 6hrs), CT scan SOL.

DISCUSSION

Trauma is one of the major causes of ICU admission worldwide and it is one of the prime causes of morbidity and mortality. Incidence is rapidly increasing due to many factors relating to life style modifications and basic needs arising out in the era of industrialization and globalization which can be explained by absence of strategy for proper planning and failure on the part of responsible authority to face hazards and its consequences. Reducing trauma related morbidity and mortality is among the main challenges for national and international public health agencies as injuries are preventable and many effective strategies are available[12, 13]. Majority of deaths and disabilities due to trauma have medico-legal implication[14, 15]. It is therefore necessary to establish the cause and circumstances leading to death and disability to get compensation from the State or from insurance companies.[16, 17, 18] Despite significant social, economical as well as ecological impact of trauma, few reliable epidemiological data are available for the study of trauma in India. Thus need arises out to have comprehensive study on profiling of trauma patients admitted in Intensive Care Unit in tertiary care Hospital, to analyze the etiology, modes of presentation, complication and outcome to give insight into the burden of trauma.

Incidence and problem

The present study is prospective type observational study conducted between December 2014 and November 2015. A total number of 149 patients were admitted in the ICU, JNMC Hospital, AMU, Aligarh. Determinable factors of trauma admission are increased RTA[19], increase in construction of high levbuildings[16], industrialization[20] and rise in crimes due to personal disputes, marital discord, and domestic violence etc[16] ·In a study done by Ruikar M[21], RTA related deaths were highest in number of deaths annually; Tamil Nadu with 11.6% deaths following RTA topped the list. Next in the category is Uttar Pradesh where it is 10.9% of total deaths due to RTA, in case of Andhra Pradesh it is 10.8% and for Maharashtra 10.0% etc.

Factors assigned to increasing in the number of trauma in Aligarh region include multiple variety of vehicles running over same road at same time, population explosion as well as urbanization leading to crowding of roads and markets. All of these were due to rash and negligent driving with lack of traffic sense and lack driving skills, especially among motorcycle riders. Times of India reported on 20th Feb. 2012 regarding situation of road in Aligarh leading to accident and trauma[22]. Another report related to pathetic condition of roads in areas adjoining to Aligarh.[23] A case of rash and negligent driving of a loaded truck in Qwarsi, Aligarh dated 21st March 2013 which ploughed into huts and injured 8 persons.[24] Unsafe crossing of roads by pedestrians and temporary makeshift of shops in footpath by vendors and hawkers, have also contributed to increased incidence of accidents. A report dated 19th April 2013 of police brutality and assault of women in Aligarh leading to multiple injuries[25]

Epidemiological Factors

In agreement with previous studies[26-30], trauma patients admitted to our ICU were mostly young males, and had a better previous health status than most other ICU patients. However, the mortality was higher among them compared to the non-trauma patients. This group represents the economically active age and portrays an economic lost both to the family and the nation and the reason for their high incidence of traumatic injuries reflects their high activity levels and participation in high risk activities. Male predominance in the present study is due to their increased participation in high-risk activities. The fact that the economically productive age-group were mostly involved calls for an urgent public policy response.

Age of the patients

In the present study, it was observed that majority of the cases belonged to age group 15-44 years as shown in Table-1. Our study is consistent with the study of Solhem K[31], Chandulal R[32], Chandra J

and Dogra TD[33], Bergvist D et al [34], B.W. Sathiyasekaran[35], and E.O. Odelowo[36]. Allen et al[37] reported in their series that 28% of patient belonged to age group 20-29 years and 68% were in the age range 10 to 39 years. Fitzgerald et al[38] showed highest incidence (55%) between the ages 21 to 50 years.

Large number of cases 96 out of 149 (64.43%) in the age group 15-44 years as shown in Table-2, can be interpreted by the fact that young individuals are at crown of their

mastery and ability and have the habit to take unwarranted liability, thereby directing themselves to the risk of trauma. Children of age <14 years were affected in 19 cases (12.75%) as shown in Table-2, this low incidence can be explained by the fact that parents provide special attention to children, these children get better education and health facilities.

Sex of the victims

Male victims dominated over females. Male to female ratio is 2.47:1. In total there were 106 (71.14 %%) cases of male victims that of female 43 (28.86%) as shown in Table-2. Allen et al[39] showed 75.4% male victims in his study while Perry[40] reported 78%. There are many studies which reported dominancy of males as victim of trauma over females. Some of these studies conducted by authors like Williams RD and Zollinger RM[41], Solhem K[31], Chandra J and Dogra TD[33], Bergvist D et al[42], Brainard BJ et al[43], Guirguis EM et al[44], Sathiyasekaran BW[35], Brandt ML et al[45], Pachter HL et al[46], Liu M et al[47], Mazurek AJ[48] and Solovei G et al[49]. Male dominance is easily understandable by the fact that males are main earning members of family particularly in the Indian / Asian culture. They are more susceptible to peril of damaged roads, vulnerable industry, interpersonal or planned violence and sports related trauma.

The aim of the study was to evaluate the mortality as the primary outcome and factor influencing the mortality as the secondary outcome.

Mortality

Mortality rate (28.86%) in the present study (Table-2-3) was higher than the mortality rate of 26.4% reported by Mitchell et al[93] in Jamaica but lower compared to mortality rate of 53.2% reported by Adenekan et al[50] in Nigeria and mortality rate of 32.7% reported by Chalya PL et al[51] in ICU of North-western Tanzania. Higher mortality rate in our study may be attributed to severity of injuries, lack of advanced pre-hospital care in our setting, ineffective ambulance system for transportation of patients to hospitals. This observation calls for improved pre and in-hospital care of trauma victims so as to improve the outcome of trauma patients admitted to ICU. In our study mortality rate in elderly group is higher than younger due to diminished physiologic reserve and deficiencies in management contribute to higher rates of morbidity and mortality as compared to the younger patient with equivalent trauma as quoted by Lonner JH et al[52]

Socio-economic status

In the present study, socio-economic classification of the trauma patients admitted in ICU was done according to the system developed by Aggarwal OP et al[53]. Maximum numbers of victims were from the lower economic class 70 (46.98%) as shown in Table-3. These findings were comparable with the report published by CSIR CRRI, New Delhi in the year 2011-12[54]. Higher magnitude of problem in people belonging to lower socio-economic strata is due to poorly organized surroundings, improper and unhygienic residential conditions associated with meager income with deficient educational system provides condition which makes them more prone to injuries.[55-57] Laborers were the commonest victim of trauma followed by farmers.[58-60]The reason for this being most of the Indians are engaged in the unorganized sector, most of them are involved in agricultural work followed by workers and laborers in various medium and small scale industries[55].

Occupation of trauma patients

The classification of trauma patients according to occupation reveals certain occupational groups are more risk of getting injuries. As per present study (Table-4) students comprised greater number of trauma victims which is 33 (22.15%) out of total 149 studied cases. Next in the series is laborer 29 (19.46%) followed by house wives 25 (16.78%). In one of the study conducted by Yatoo GH et al[61], most of the victims of trauma in their study were laborers followed by students.

Students are more prone to accident and trauma due to the fact of rash and negligent driving owing to young age. Laborers remain involve in variety of works ranging from low life threatening risk work to dangerous work. Due to handling of heavy instruments laborers many times get injured. Low profile and unskilled workers due to illiteracy and other social customs and their habitual drinking state remain in risk of trauma and accidents.

Housewives many times face domestic violence due to marital and family discord and also their sitting habit in motor bikes more prone to get injured.

Seasonal and Monthly variation of trauma patients admitted in ICU

The public health "toll" of traffic injuries, measured as total number of people injured, varies substantially by season. Although it is important to reduce all injuries, the safety of pedestrians and cyclists, as unprotected road users, needs particular attention. Owing to the fact that seasonal variation plays an important factor in accident, trauma related admission and we studied more RTA related trauma in winter season due to bad lightening condition due to fog and in raining season due to higher speeding vehicle slippage risk trauma and accident. Overcrowded road and more movement of people in the morning and evening of summer season also probably contributed in our study.

In one of the study conducted by Gill M et al[62], they also found significant seasonal variation and risk of accident and trauma.

Mode of injuries in trauma patients admitted in ICU

In the present study, RTA is most common cause of trauma which was present in 88 (59.06%) cases as shown in Table-5. Similar observations were also reported by Allen and Curry[63], Meyer[64], Chandra J et al[65], Bergvist D et al[34], Cass AS[66], Guirguis EM et al[44], Orsay EM et al[67], Sathiyasekaran BW[35], King PM et al[68], Ong CL et al[69], Regel G et al[70] and Aaland MO et al.[71] Most of the victims of RTA were motorcycle riders (56.81%) followed by heavy motors occupants (13.64%) as shown in Table-7. This is explained by the fact that most of the motor cycle riders in young age groups are negligent in driving and traffic rule. Probably they enjoy speed but in crisis are not able to control. Alcohol intoxication as well as continuous very long distance driving of heavy motors directs driver of these vehicles at risk of accident and trauma.

In cases of fall from height 28(18.79%), fall from roof was the commonest mode with 15 (53.57%) victims, followed by the fall from ladders 6 (21.43%) and fall from tree 4 (14.29%) while rest 3 (10.71%) victims of miscellaneous cause of fall from height injuries as shown in Table-8 similar results have also been shown in the other studies as well. Fall from roof is more common in people who use to sleep on the roof during summers, construction workers who remain engaged with works for long duration and also in children and adolescents who use roofs for recreational purposes like kite flying during summers and old age persons as most of the roofs do not have protective boundaries. Peoples in rural India depend most of the time on trees for food, fodder and fuel. In such background fall from tree constitutes common mode of injuries. In three cases, victim sustains injury due to fall from moving train. This can be explained by the fact that most of the trains are overcrowded. Passengers are at risk of getting injured as some passengers use place near exit gate that are at risk of falling down.

Injury from firearms is not uncommon among the trauma patients as per the study reported by Lustenberger T et al[72]. These patients sustain a high burden of injury and a high rate of mortality, which increases with advancing age.

In our study assault cases 19 (12.75%), firearm use constitute commonest mode of injury 13 (68.42%) which included 3(23.08%) unintentional (accidental) and 10 (76.92%) intentional (homicidal). Khan I et al[73] total of 198 cases of firearm relate injuries reported and 50 were found to be due to unintentional causes and rest 148 cases are intentional injury. Firearm accident rate in India is 0.26% and found to increase owing to the rapid proliferation of illegal firearms[74]. It may be either due to unintentional or intentional (homicidal) injury. Unintentional firearm related injury were reported during months of March, April and July, which are considered as marriage season and also playing with firearm by children. Singh BP has reported hunting or mishandling of firearm to be the most common cause of accidental firearm injury in northern India[75]. Karger B noticed that human themselves are responsible for their actions rather than technical faults[76], followed by assault with blunt object direct blow or kicks on to head and abdomen 3 (15.79%). Assault cases are common due to the reason of domestic conflict, marital discord, prevalence drug and alcohol intoxication, hyperinflation leading to increase in the cost of essential commodities and increase in cases of sexual assaults, majority of them were presented with assault as mode of injury 3 (15.79%).There is associated health and social issues with the use of alcohol. Easy availability of alcohol is one factor responsible for increase in alcohol intoxication leading to trauma.

Type of offending vehicles in RTA cases

Type of vehicle involved in accident depends on mode of transport in a particular locality [55, 59, 77]. In our study (Table-6) motorcycle 53 (60.23%) was the most common vehicle involved, followed by the heavy motors (18.18%). It has been observed in the present study which is in accordance with other studies that showed knocking down and falling off vehicles as most common mode of injury. This is best explained by the fact that major vehicles involved in the study were motorcycle.[59]

Type of victim in RTA cases

In the present study, most of the victims of RTA were motorcycle riders 50(56.81%) as shown in Table-7. Research has shown that the two wheeler occupants are among the majority to be affected in RTA.[78] In one the study reported by Shetty BKS et al, [79] most of the victims who sustained injuries in the RTA were two wheeler occupants. This increase in fatal events among motorcycle riders can be described by the factors like lack of awareness in traffic rules and regulations especially not wearing helmet and obeying traffic rule, pathetic condition of lightening in streets and roads, inoperability of traffic light signals, drunken driving etc. The more number of two wheelers and its utility in this region possibly can be directly related to these injuries. Findings in the present study are similar to the study by Jha et al.[124]But according to study of McCarroll JP[80], Solhem K[31], Chandulal R[81], Chandra J et al[65], Bergvist D et al[34], Ghosh PK[82] and Sharma AK[83], there is increased incidence of trauma among pedestrians. In the present study pedestrians constitute 11 (12.50%) of total RTA victims as shown in Table-7. The study conducted in 2011-12 by CSIR CRRI, New Delhi[54] says that pedestrians constitute around 75% of all road fatalities in India.

Length of stay in ICU

ICU trauma patients are a heterogeneous group with severe illnesses. A systematic evaluation of LOS information being a challenging task provides information of practical and operational significance that is essential for strategic planning. In the present study, prospective collection and analysis of demographic and clinical data on ICU patients helps in identification of predictors of prolonged ICU stay, and evolve pragmatic strategies for decreasing the ICU LOS. This has

profound implications for the quality of health care in the ICU, as well as its efficiency. Such systematic and well planned studies can provide valuable inputs for providing quality care for more patients through better targeted and more effective services.

In this study length of stay in ICU ranges from 1 to 26 days and maximum of victims having length of stay in between 1-3 days 71(47.65%) as shown in Table-8.Mean ± SD length of stay in ICU in non-survivors (5.162±4.064 days) is longer than survivors (4.009±3.081days) (Table-9) which is in agreement with the study of developed countries which reported that non-survivors staying longer and consuming more resources than survivors[84-85], but contrary to other studies in developing countries[28,29,50], This difference in longer LOS in developing countries in survivor group is probably due to a combination of factors including severity of injuries, poor pre-hospital care, lack of emergency medical services, and lack of appropriate diagnostic and therapeutic facilities including drugs for the care of these patients in the hospital and the ICU. These factors have been adequately addressed in developed nations.

According to a study by Nogueira et al[86] mean length of stay in ICU (16.55 days). This is high in comparison with our study and other similar studies. Ulvik A et a[87] in international research describing trauma victims at ICU indicated lower averages, between 4.9 and 10 days and in our study less length of stay is due to proper hospital care, efficient emergency medical services, and appropriate diagnostic and therapeutic facilities including drugs for the care of these patients in the hospital and the ICU.

Manner of injuries in trauma patients

Out of 149 cases, 5 (3.36%) cases were suicidal, 20 (13.42%) cases were homicidal and rest 124 (83.22%) were accidental as shown in Table-10. This shows accidental cases were most common among victims of trauma. According to Modi[88] and other foreign writers like Simpson[89], accidental cause of trauma is most common, that was also found in present study.

Reporting of trauma patients to ICU

In keeping with other studies[90, 91], our study has demonstrated an association between delay(>6 hrs) to ICU admission and higher mortality rate reflecting worsening of organ dysfunction during this period. Despite the care provided by ward healthcare workers while patients were waiting for ICU bed availability, these healthcare providers were not trained in critical care and were not as experienced in caring for ICU patients. Furthermore, hospital wards are neither designed nor staffed to provide extended longitudinal care for the critically ill patient. These patients have better outcomes when treated in ICUs with close and continuous involvement by critical care physicians[92,93] and other data also show improved outcome when nurse-to-patient ratios in the ICUs are properly maintained[94]. Caring for critically ill patients outside the ICU may also imply an increased burden and high stress level experienced by hospital wards staff.

Maximum numbers of patient 57 (38.25%) cases were brought to hospital between 2-6 hours after injury. Only 15(10.06%) of cases brought to hospital within 2 hours. 40 (26.85 %) of cases brought between 6-10 hours and other 22 (14.77% cases brought to hospital between 10-24 hours and 15 (10.06%) cases after 24 hours of injury. This is shown in the Table-11. The delay in admission was due to the fact that unavailability of resources, difficulty in transportation, poor socioeconomic status and delay in referral from other primary health centres. Delay in hospital admission was also reported by many Indian authors as well as by Tripathi et al.[95] Most of the victims in the present study were taken to the hospital by relatives and friends, volunteers of self help groups and NGO and police personnel who are not much trained to tackle during transportation. Only very few patients were brought in by equipped ambulance. With special reference to developing countries some authors reported similar situations. These authors are Odero et al.[96], Museru et al.[97], Kobusingye et al.[98], Alicoglu et al.[99] Pre hospital trauma care is an

important aspect in treatment of trauma victims. This determines outcome after the injury. Importance of pre hospital trauma care has been reported by Chalya et al.[30] There is inadequacy of well organized pre hospital trauma care and incompetent ambulance system for immediate shifting of patients to higher centres. Studies done by Tan et al.[100], and Chalya et al.[51] have shown that delayed interval between time of incidence and arrival time in hospital adds much to poor outcome of the trauma victims. Early presentation to hospitals and definitive treatment of these trauma patients has been reported to reduce mortality and morbidity as reported in the studies of Al-Qahtani[102], Khan et al[103]. Tan et al[100]. Chalya et al[101].

Glasgow Coma Scale of trauma patients at the time of reporting and outcome

In our study (Table-12) trauma patients with lower GCS score were having poor prognosis. Mortalities are more with lower GCS as shown in my study that with Categorie 1 (GCS=13-15) mortality is 5%, Catagorie 2(GCS=9-12) mortality is

10.71%, Categorie 3(GCS=3-8) mortality is 38.61%. Our findings are consistent with other studies like Bishara et al[104], Changaris et al [105], Lieberman et al.[106]

Most studies reported positive outcomes in patients who presented with high initial GCS scores. Young's and associates found that 72 of the 76 patients with initial GCS scores of 8-15 had a good recovery. Similarly, 99% of patients with GCS scores of 13-15 had good recovery (Pal et al.), while 89%–96% of patients with a GCS score of 8 or above (Bishara et al.) and 75% of patients with GCS score 6 and above (Changaris et al.) also had good recovery or moderate disability outcomes. Similar patterns were noted among the studies describing the relationships between low GCS scores and patient outcomes. Continuing to the previous study showed 14% of patients with GCS scores of 3–5 were found to have good recovery, while 85% were reported as having moderate disability (Bishara et al.). However, the sample size for patients with these values was small (n= 7), which should be considered when attempting to generalize from these findings. In studies with slightly larger sample sizes, patients with GCS scores of 3-4 had primarily poor outcomes. Changaris and associates reported that 50 of the 51 patients with GCS scores of 3-4 died, while in a separate study 20 of the 21 patients with GCS scores of 3-4 were either in a persistent vegetative state or had died (Young et al.). All of the patients in one study who presented to the emergency department with a GCS of 3 and had fixed and dilated pupils died, while 67% of those who presented with GCS scores of 3 but did not have fixed and dilated pupils also died within 72 hours (Lieberman et al.).

The research findings reviewed here support the obvious assumption that patients with high GCS scores will tend to have better outcomes, while patients with low GCS scores will most likely have poor outcomes. Studies examining GCS scores of 4–9 describe various patient outcomes (Pal et al., 1989; Young et al., 1981). In one study, patients with GCS scores of less than 9 were classified as having either good outcome (35%) or death (41%; Pal et al.). In a separate study, 36 of 73 patients with GCS scores 5-7 had good recovery or moderate disability (Young et al.). Because of the range of outcomes for head injury patients with these GCS scores, outcome prediction in this patient population by using GCS scores remains difficult.

Type of trauma patients admitted in ICU

Major trauma was the most common indication for admissions into our ICU (18.63%) of which 95.97% patients came directly from emergency and rest as an elective patient. Study done by Chalaya et al[51] reported that 37.1% of total ICU admission due to trauma which higher than the reports by Mitchell et al[28]. Amanor-Boadu et al[29] respectively.

ICU admission has been reported to be the most important factor in determining the ultimate outcome of critically ill and major trauma patients and to be successful requires adequate logistic and

financial support, supporting disciplines (e.g. laboratories, radiology and surgery) and basic infrastructure such as good roads, regular electricity, water supply, availability of drugs by the patient's bedside and regular oxygen and compressed air supply[107]. Many of these are not regularly available in many low resource settings. It has been suggested that the inadequate medical and technical equipment of most ICUs in low resource economies substantially contribute to the high mortality rate of critically ill patients in such countries [84]. Facilities in our ICU are limited and obviously insufficient to cope with the number of patients being admitted.

Body part involvement in trauma

In our study majority of our patients sustained head and musculoskeletal injuries, which is in keeping with previous studies [27-29,108-110]. Severe road traffic crashes are usually associated with significant head, musculoskeletal and multiple injuries, which explain why they are the leading cause of our ICU admissions, unlike in the wards.

Type of injuries in trauma victims

In majority of our patient isolated injuries occurred in 91(61.07%) patients while 58 (38.93%) patients had multiple injuries. Soft tissue injuries (i.e. bruises, laceration, abrasion and contusions), Cranio cerebral injury and fractures (long bones, spines, pelvis, ribs, and skull) were the most common type of injuries accounting for 91.27% ,63.76%and 30.87% respectively as shown in Table-13. Chalya PL et al[51] reported that out of 312 patient, 208(66.7%) presented with isolated injury while 104 (33.3%) patients with poly trauma.

Nature of injuries in Head Trauma patients based on CT scan

Head injury due to trauma is a major public health problem worldwide. Several reports point automobile accident as the most important cause of head injury. Motor vehicle accident causes head injury about 35% to 60% in diverse series, and is usually a leading cause of serious injuries with head trauma in youth and middle age people and a common cause of morbidity and mortality related to trauma[111]. They are also the most frequent cause of death in individuals from 1 to 35 years of age[112, 113]. Previous studies of head trauma in the US demonstrated traffic accidents accounting for about half the fatal cases[114-115]. Other series show automobile accidents as a major cause of head injury. In Massachussets, USA, 33.4% of causes were related to automobile accidents[116]. In our study motorcycle is the commonest cause of RTA. Automobile accidents may be less common in low socioeconomic populations due to limitation of owning a car. In fact, a study of Taiwan did not find very significant figures for automobiles, because motorcycle is the most common means of transport in that country[111].

Stein and Ross recommended routine and immediate cranial CT scanning of all head injury patients who have lost consciousness and were amnesic, even if all other physical findings were normal[117].

In our study out of 149 patients admitted in ICU due to trauma, 130 underwent CT scan investigation. Out of which 95 patients have CT finding as shown in Table-14.

In the study series of Bordignon KC et al[118] 518(25.9%) out of the 2,000 patients presented CT-scan findings related to head trauma .Two other studies observed 17.2%[117] and 18%[119] of abnormal CT-scan in head trauma.

However, another study found a higher frequency (46%) [120] of abnormal CT. On the other hand, Jeret et al.[121] found 9.4% of abnormality on the CT-scan, but they excluded lineal fractures and isolated soft tissue swelling. Regarding lesion types, soft tissue swelling was the most common (178 cases - 34% cases out of 518 abnormal CT scans). Bordignon KC et al[118] shows skull fractures were also important, accounting for 74 (14.3%) cases. In other reports, the rates of skull fractures were much lower (8.5% and 4.1%) [117, 121]. Only 2% of attenders at Scottish accident departments for recent head injury have a skull fracture[122]. But, Shackford et al.[120] observed 19.3% of skull fractures, closer to our study 27.69%.

Intracranial hematoma after head trauma is a frequent cause of death and disability. Expeditious evaluation and adequate management of patients who initially seem at low risk are the most important factors to reduce their mortality[123]. Jeret et al.[121] found 10.4% of intracranial bleeding in his study with mild head trauma and GCS score of 15. Stein and Ross[117] found 4.2% (11 cases) of intra cerebral hematomas, 7 of them with skull fracture. In our study 20 (15.38%) patient having ICH.

Stein and Ross[117] found 6.8% of epidural hematoma (EH), 5.7% of subarachnoid hemorrhage (SAH), and 4.5% of subdural hematoma (SH). Our study showed 6.15% of SAH, % 8.46%of SH, and7.69% of EH.

Cerebral contusions were seen in 25%[121] to 26.8%[117]. The present study showed 29.23%. The other series[117, 124] only included patients with loss of consciousness or amnesia, therefore selecting patients at higher risk of intracranial injuries. Stein and Ross[117] obtained 30.9% for the brain swelling and the literature varied from 5%[120] to 11%[125], and our study found 26.92%. We had a frequency of pneumocephalus 5.39%, when compared to Shackford[120] (5.4%) and Feuerman et al. (13.2%) [126]. The present study shows Granulamatous lesion (2.31%), Diffuse Axonal Injury (3.84%) and Foreign body (1.54%).

VENTILATOR SUPPORT

As the cases of severe trauma are on the rise, it is important to familiarize the physicians attending to trauma emergencies to the various aspects of respiratory support in cases of trauma as ventilator strategy is aimed at preserving the brain tissue and the respiratory system takes a second place[127].

Head trauma

Head trauma patients usually require ventilator support due to respiratory failure secondary to impaired consciousness, decreased respiratory drive, chest injury, or ARDS. In case of isolated brain injury a degree of vulnerability is present in the lung tissue secondary to the pro inflammatory state[128-130].

The main goal of ventilation in head injury patients has been to keep a low $PaCO_2$ so as to prevent an increase in intracranial pressure (ICP) secondary to cerebral vasodilatation.

Chest trauma

Trauma to the chest can lead to conditions like flail chest, pneumothorax, broncho pleural fistula, trachea bronchial rupture, and pulmonary contusion. Bony injury of chest wall may lead to respiratory failure due to malfunction of the respiratory muscles or inadequate voluntary breathing due to pain. In most cases of flail chest; adequate analgesia in the form of thoracic epidural, inter costal nerve blocks, paravertebral blocks, pleural catheter, and chest physiotherapy with regular clearance of secretions is sufficient. Mechanical ventilation is reserved for patients with pulmonary contusion and/or respiratory distress and blood gas abnormality (pO_2< 60 mmHg and pCO_2> 60 mmHg) [131-132]

Abdominal trauma

Abdominal trauma can cause severe pain and lead to shallow breathing and non clearance of secretions and hence increased risk of pneumonia. Use of mechanical ventilation early on in these patients has been shown to decrease the incidence of pneumonia. However, mechanical ventilation for longer than 5 days increases the risk of the late onset pneumonia[133] Epidural analgesia helps to reduce these complications both by providing pain relief as well as by decreasing pro inflammatory cytokines. Adequate suctioning and clearance of secretions is mandatory.

In our study mean duration of ventilation among survivor and non survivor is 4.009±3.081 and 4.255±.621 is almost same (Table-16). Mullick Pet al [134] studied 107 patient and found no difference in mean duration of ventilation between survivor and non survivor and in group III >3week) required 100% ventilation (Table-15).

Tracheostomy

Tracheostomy is necessary in all those cases where an oral or nasal intubation is contraindicated such as maxillofacial trauma. Also in cases of upper airway obstruction such as neck

hematoma or damage to vocal cords, vocal cord palsy it may be the only way to secure the airway. In other cases if more than 2 weeks of ventilator support is anticipated, a tracheostomy should be considered within 4-7 days [135].Study conducted by Arabi Y et al [136], out of 653 trauma admissions to the ICU, only 136 (21%) required tracheostomy, 29 patients had tracheostomy within 7 days of mechanical ventilation and the remaining 107 underwent tracheostomy after 7 days.

In our study mean duration of tracheostoy is 4.025±.832 days as shown in Table-18. The no of patient required tracheostomy is 21(26.58%). Among which 5(23.81%) on 3rd day, 9(42.86%) on 4th day and rest 7(33.33%) on 5th have a tracheostomy (Tab-17)

Management of patients

In our study 79 (53.02%) patient required surgical intervention (Table-19) and surgical intervention has better outcome than conservative management especially in severe head injury cases (GCS<8). Among surgical procedure performed, Wound debridement, treatment of fractures, tracheostomy and craniotomies were the commonest surgical procedures performed in 88.60%, 30.37%, 26.58% and 24.05% of patients respectively (Table-28). Patients whose injuries are serious but not immediately fatal benefit the most from treatment in designated trauma centres. Hospitals that have special staff and protocols to provide immediate care to critically injured patients[137]. Sick and severely traumatized patients are admitted in ICU for better recovery and stabilization of vitals, proper monitoring and resuscitation. Specific management protocol is decided depending on the condition of the patients like presence of internal finding in the body such as parenchymal, intracerebral bleed, intraperitoneal haemorrhage, injury of major organs, pneumothorax, haemothorax, flail chest etc. Other procedures required most of the time in ICU like blood transfusion, wound debridement, limb salvage operation etc.

Shere-Wolfe R Fet al[138] reported that ICU team must be prepared to receive patients in varying degrees of stability and be ready to take over and complete the resuscitative process. In some cases "fine tuning" may be all that is required before addressing long-term critical care needs. In others, they must be prepared to undertake immediate resuscitation and correction of severe physiologic derangements if the patient is to survive the first 24 hours of admission. How well the ICU team is prepared to meet these challenges may critically affect 24 hour survival after severe injury, and also the development of potentially life-threatening complications. As the patient becomes more stable, the ICU physician can then transition priorities towards longer-range management issues.

During study we found that all mortality predictor variables (Age, Sex, Timing of admission, GCS, Ventilator support, CT scan SOL, Type of admission) have influenced the study with characteristic odd ratio (Table-20). In univariate analysis GCS, Timing of admission, CT scan SOL have significantly influenced the mortality. In our study elderly and male trauma victims have more mortality than younger and female (Table-2).We also found that alcohol intake during driving influenced RTA related morbidity and mortality and surgical treatment of modality especially in case of severe head injury has better chances of survival.

SUMMARY AND CONCLUSION

The present study was undertaken to focus the light upon the pattern of trauma in relation to various factors in Aligarh and adjoining regions. A total number of 149 cases were studied from December 2014 to November 2015. The results of the present study are summarized as follows:

1. Majority of the victims were male (71.14%).
2. Most of the victims belonged to age group of 15-44 years (64.43%).

3. People from lower socio-economic background were mostly affected with 46.98% of total 149 cases.
4. RTA was most common mode that is 59.06% of 149 cases of trauma, followed by fall from height.
5. Among RTA cases, majority of the victims 56.81% of 88 cases were two wheeler occupants (motorcyclist) followed by occupant of heavy motor vehicle.
6. Among fall from height victims, most common cause was fall from roof which constituted 53.57% of 28 cases.
7. In the present study, two wheelers (scooters/ motorcycles) caused maximum accidents, i.e., 53 which amount to 60.23% of the total cases.
8. Most of the victims of trauma that 38.25% of 149 cases reported to ICU between 2 to 6 hours after sustaining injuries.
9. Majority of the victims that is 47.65% of 149 cases, stayed in hospital between 1 to 3 days.
10. Head was involved in majority of the victims (87.25%) followed by musculoskeletal 43.62 % and abdomen 20.13% of the cases.
11. Multiple injuries (poly trauma) were present in 58 (38.93%) cases.
12. CT was performed in 130 (87.25%) cases in which contusion was associated in 38 (29.23%) cases, # skull in 36 (27.69%) followed by brain edema in 35 (26.92%) etc and 35 (26.92%) have normal study
13. Majority of the cases (83.22%) of trauma were accidental in nature. This is due to fact that most common mode of injury is RTA.
14. Significant predictors of mortality according to univariate analysis was GCS, Timing of admission (early and delay), CT scan SOL
15. Management of cardiovascular parameters is of prime importance in the initial 3 days of ICU stay, since trauma patients are haemo-dynamically unstable at that time. Subsequently we should aim at decreasing the incidence of chest infection, anaemia and bedsores in patients who stay for a longer period of time. This will not only shorten their ICU stay but also decrease the subsequent morbidity and mortality of trauma victims.
16. The present study showed a mortality of 28.86%. At the end, it may be said that head trauma cases are potential factor in increasing the amount of death and disability and therefore proper attention is required towards their accurate diagnosis and satisfactory management. Above summary will help in preparing a comprehensive strategy to formulate plan for timely implementation of schemes to minimize occurrence of trauma There is need of appropriate and goal oriented preventive measures aiming to reduce the occurrence of RTAs is necessary to minimize the incidence of trauma in Aligarh and adjoining regions.

Trauma as a result of RTAs is in rise due to variety of factors described above which constitute significant morbidity and mortality and preventive measures include increased public education, enforcement of road safety rules, improvement in socioeconomic situation and employment opportunities in our country. Improved pre- and in-hospital care of trauma victims will improve the outcome of major trauma patients admitted to our ICU. Timely recognition of injuries and early diagnosis with immediate decision for management plan is of extreme importance if death and disability are to be minimized. It is required to have multidisciplinary approach to treat trauma victims in order to prioritize treatment according to severity of injuries. All the poly trauma victims need immediate evaluation and management for associated multiple injury. Patient with head trauma presenting with coma with shock must be considered as having visceral injury.

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