ORIGINAL RESEARCH ARTICLE

Comparative Evaluation of Mortality Predictors in Trauma Patients: A Prospective Single-center Observational Study Assessing Injury Severity Score Revised Trauma Score Trauma and Injury Severity Score and Acute Physiology and Chronic Health Evaluation II Scores

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Received on: 01 January 2024; *Accepted on:* 03 February 2024; *Published on:* xx xx xxxx

Abstract

Aim: This prospective cohort study aimed to compare the predictive accuracy of outcome (survival/death) among trauma patients using various prognostic scores.

Methods: Over 3 months, 240 trauma patients in a tertiary care hospital were assessed for demographic details, trauma characteristics, vital signs, Glasgow coma scale, arterial blood gas values, and lab markers. Injury severity score (ISS), revised trauma score (RTS), trauma and injury severity score (TRISS), and acute physiology and chronic health evaluation II (APACHE II) were applied at admission, 24 hours, and 48 hours post-admission.

Results: Road traffic accidents (55.83%) were the primary cause of trauma, followed by falls (33.75%) and violence (10.41%). The all-cause mortality rate was 23.33%, with 34.16% requiring ICU admission. Head injuries (65.83%) were both the most frequent injury site and cause of mortality.

Conclusion: Analysis indicated that APACHE II outperformed other scores in predicting outcomes, with ISS following closely. The study concludes that trauma severity correlates with ICU admission and mortality, emphasizing APACHE II as a superior predictor, particularly for traumatic brain injuries leading to ICU admission and mortality.

Clinical significance: This study contributes to the existing body of knowledge by addressing the gap in comparing prognostic abilities among scoring systems for trauma patients. The unexpected superiority of APACHE II suggests its potential as a valuable tool in predicting outcomes in this specific patient population.

Keywords: Mortality, Road traffic accidents, Severity scores, Trauma.

Indian Journal of Critical Care Medicine (2024): 10.5005/jp-journals-10071-24664

Highlights

This article focuses on the prediction of outcome (survival/death) for trauma scoring systems. These systems have been in place since the last three decades. However, there has been a significant lack of comparison of prognostic abilities of these systems. This study aims to bridge that gap.

Introduction

Trauma stands as a major health concern, particularly affecting the younger population and being a leading cause of death among individuals under 45. Swift recognition and effective management are crucial for minimizing the substantial levels of illness and mortality. To improve trauma care systems and shape policies, it is essential to measure, document, and assess the severity of injuries.[1]

Over the past three decades, numerous efforts have been made to quantify the severity of injuries using numerical scales. These scoring systems are imperative for research and for analyses for quality assessment.[2]

In a pre-clinical context, a successful trauma indicator should adhere to certain standards. It must reliably differentiate between high- and low-risk cases, exhibit notable face validity, and display consistent inter- and intra-rater reliability. Moreover, the indicator should be user-friendly, facilitating swift, and precise measurements.[3]

Despite the continuous development of many scoring systems over time, there has been a lack of comparison and assessment of their prognostic value. This study aims to fill this gap by comparing the accuracy of outcome prediction (survival/death) among these

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How to cite this article: Gupta J, Kshirsagar S, Naik S, Pande A. Comparative Evaluation of Mortality Predictors in Trauma Patients: A Prospective Single-center Observational Study Assessing Injury Severity Score Revised Trauma Score Trauma and Injury Severity Score and Acute Physiology and Chronic Health Evaluation II Scores. Indian J Crit Care Med 2024;x(x):xx–xx.

Source of support: Nil

Conflict of interest: None

Injury Severity Score (ISS)

Variables used

- Based on Abbreviated Injury Scale grades of 9 anatomic regions
  1. Head and neck including cervical spine
  2. Face including facial skeleton, nose, mouth, eyes, and ears
  3. Chest including thoracic spine and diaphragm
  4. Abdominal and pelvic contents including abdominal organs and lumbar spine
  5. Extremities including the hip bone
  6. External injury

Calculations

- Abbreviated Injury Scales (AIS) grades
  - 0 – no injury
  - 1 – minor
  - 2 – moderate
  - 3 – Severe (not life-threatening)
  - 4 – Severe (life-threatening, survival probable)
  - 5 – Severe (life-threatening, survival uncertain)
  - 6 – Maximal, possibly fatal

ISS = Sum of squares for the three highest AIS grades

Scores can range from 1 to 75. Single score of 6 on any region results in an automatic score of 75.

Fig. 1: Injury severity score

Glasgow coma scale (GCS)	Systolic blood pressure (SBP)	Respiratory rate (RR)	Coded value
13–15	>89	10–29	4
9–12	76–89	>29	3
6–8	50–75	6–9	2
4–5	1–49	1–5	1
3	0	0	0

RTS = 0.9368 GCS + 0.7326 SBP + 0.2908 RR. Values for the RTS are in the range 0–7.841.

Fig. 2: Revised trauma score

scores in trauma patients. The ultimate goal is to identify the scoring system that demonstrates superior prognostic value.

Methods

This is a single center, prospective cohort, observational, comparative study designed to compare the accuracy of mortality prediction among four scoring systems, namely injury severity score (ISS, Fig. 1), revised trauma score (RTS, Fig. 2), trauma and injury severity score (TRISS, Fig. 3), and acute physiology and chronic health evaluation II (APACHE II, Fig. 4). After approval from institutional ethical committee, 240 trauma patients were selected from the Casualty/Emergency Department of tertiary care hospital in Pune, India. The sample size was calculated from a previous study based on a similar topic, using the formula for sample size calculation by comparing means.[4] We enrolled individuals, regardless of gender, aged from 15 to 65, who were admitted from the Emergency Department following blunt and/or penetrating trauma incidents from September 2023 to December 2023. We excluded individuals who were admitted to the trauma center beyond 24 hours following the traumatic incident or those who sustained injuries from burns or poisoning.

A total of 500 patients were screened over the specified time period of 3 months, of which 260 patients were excluded due to several reasons shown in Figure 5. Finally, 240 patients were selected for data collection and completion of the study (Fig. 5).

TRISS calculation formula

Ps = $1/1 + e^b$ where

$b = b_0 + b_1(\text{RTS}) + b_2(\text{ISS}) + b_3(\text{age})$

and where

RTS = Revised Trauma Score value

ISS = Injury Severity Score value

Age = age < 55 = 0 or age > 55 = 1

e = 2.7183 (natural log base)

Regression coefficients (from 1987 MTOS)

Injury	b_0	b_1	b_2	b_3
Blunt trauma	–1.2470	0.9544	–0.0768	–1.9052
Penetrating trauma	–0.6029	1.1430	–0.1516	–2.6676

Fig. 3: Trauma and injury severity score

All the patients were treated according to proper hospital treatment and antibiotic guidelines. Patients were assessed using the four scoring systems at the time of admission, 24 hours, and 48 hours after admission. The first assessment of patients was conducted in the Emergency room of the hospital. Subsequent follow ups were performed in their respective orthopedic or surgical wards, or in Trauma ICU. Outcomes such as death/discharge

APACHE Ⅱ scoring system

【A】Total acute physiology score (APS)

	4	3	2	1	0	1	2	3	4
Body Temp.(℃)	≦29.9	30〜31.9	32〜33.9	34〜35.9	36〜38.4	38.5〜38.9		39〜40.9	≧41
Mean BP (mmHg)	≦49		50〜69		70〜109		110〜129	130〜159	≧160
Pulse (/min)	≦39	40〜54	55〜69		70〜109		110〜139	140〜179	≧180
Respiratory Rate (/min)	≦5		6〜9	10〜11	12〜24	25〜34		35〜49	≧50
A-a DO2(FiO2≧0.5)					<200		200〜349	350〜499	≧500
PaO2(FiO2<0.5)	<55	55〜60		61〜70	>70				
Arterial blood pH	<7.15	7.15〜7.24	7.25〜7.32		7.33〜7.49	7.50〜7.59		7.60〜7.69	≧7.70
No ABG data; $HCO3^-$	<15	15〜17.9	18〜21.9		22〜31.9	32〜40.9		41〜51.9	≧52
Serum sodium(mmol/L)	≦110	111〜119	120〜129		130〜149	150〜154	155〜159	160〜179	≧180
Serum Potassium(mmol/L)	<2.5		2.5〜2.9	3.0〜3.4	3.5〜5.4	5.5〜5.9		6.0〜6.9	≧7.0
Serum Creatinine (mg/dL)			<0.6		0.6〜1.4		1.5〜1.9	2.0〜3.4	≧3.5
Hematocrit (%)	<20		20〜29.9		30〜45.9	46〜49.9	50〜59.9		≧60
WBC($\times 10^3/mm^3$)	<1		1〜2.9		3〜14.9	15〜19.9	20〜39.9		≧40
Glasgow coma scale	15− Glasgow coma scale								

【B】Age points

Age	Score
≦44	0
45〜54	2
55〜64	3
65〜74	5
≧75	6

【C】Chronic Health Points(CHP)

Chronic organ insufficiency	Score
And non operative	5
And emergent postoperative	5
And elective postoperative	2

APACHEⅡ score ＝【A】APS +【B】Age points+【C】CHP

Fig. 4: Acute physiology and chronic health evaluation II

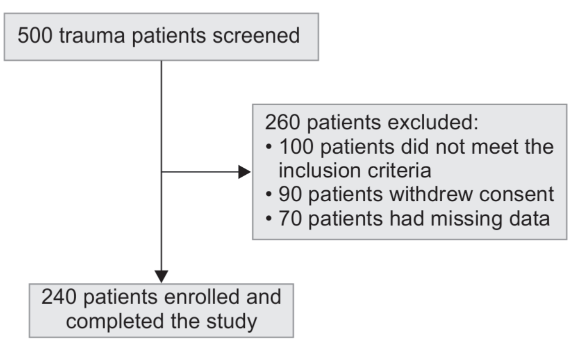

Fig. 5: Flowchart for patient selection

were noted. For data collection, a form was made enlisting all the parameters needed for the calculation of ISS (Fig. 1), RTS (Fig. 2), TRISS (Fig. 3), and APACHE II (Fig. 4). The evaluated parameters encompassed patient demographic traits (age and sex), mechanism and mode of trauma, area of body injured, comorbidities present, vitals [pulse, blood pressure, oxygen saturation in blood, respiratory rate (RR), and body temperature], Glasgow coma scale (GCS), arterial blood gas values, and lab markers (hemoglobin, hematocrit, total leukocyte count, platelet count, serum creatinine, serum sodium, and serum potassium). In each area of the body, severe injury was defined as having an abbreviated injury scale (AIS) ≥4 points.

We conducted a descriptive analysis for all the parameters using Microsoft Excel and 27th version of the SPSS software. The receiver operating curve (ROC) was used to identify the most effective scoring system for predicting mortality among the four and to determine the optimal cut-off point.[5] To determine the strength of the association, odds ratios with 95% confidence intervals (CIs) were calculated. All the statistical tests conducted were two-tailed, and p-value of less than 0.05 was deemed significant.

Results

Age

Among the 240 patients assessed during the study, the maximum number (73.7%) of patients were aged under 45 years. Out of these, 62 patients (25.83%) fell within the age range of 15–25 years, another 62 patients (25.83%) were in the 26–35 years age group, and 53 patients (22.08%) belonged to the 36–45 years age group.

Out of these 177 patients, 143 (80.79%) suffered from severe trauma (AIS ≥4), most of them belonging to the age of 26–35 years (57 patients), and 60 patients (33.89%) were admitted to the Trauma ICU.

A total of 63 patients (26.25%) were aged over 45 years, out of which 54 patients (85.71%) had suffered from severe trauma, and 22 patients (40.74%) had to be admitted to the Trauma ICU.

Gender

During the entire study period, 197 males (82.08%) were assessed, while only 43 females (17.91%) had suffered from trauma severe enough to ensure hospital admission.

Mechanism and Mode of Injury

The highest number of trauma cases recorded during the study period were due to road traffic accidents (RTAs). A total of 151 patients (55.83%) had suffered a traumatic injury due to some kind of RTA, out of which 107 patients (70.86%) were less than 45 years old. A total of 53 patients (33.75%) had suffered from trauma due to fall, and 25 patients (10.41%) had been victims of violence. There was a small percentage of patients (six patients, 2.5%) who had sustained injuries at workplace, and a yet smaller percentage of patients (five patients, 2.08%) suffering from trauma due to railway accidents.

Regarding the mode of trauma, 230 patients (95.83%) had suffered from blunt trauma.

However, when analysis was conducted on these variables, it was observed that the mechanism (Chi-square statistic 0.19567, p-value 0.37424) or the mode (Chi-square statistic 0.1937, p-value 0.659814) of trauma did not significantly influence the final outcomes (survival/death) in the studied cases at the specified level of significance ($p < 0.05$).

Yet another variable that was studied was the presence of co-morbidities. There were several kinds of co-existing conditions recorded, namely hypertension including history of stroke (11 patients), diabetes mellitus 2 (nine patients), Neuropsychiatric disorders (8 patients), HIV/AIDS (two patients), hepatitis B (one patient), hemiparesis post spine surgery (one patient), cellulitis (one patient), rheumatoid arthritis (one patient), hypothyroidism (one patient), history of pregnancy (one patient), history of alcohol abuse (26 patients), and history of cigarette smoking/tobacco abuse (10 patients). But, there was no significant impact on the final outcomes of the patients based at the specified level of significance ($p < 0.05$). The Chi-square statistic was 0.9441, and the p-value was 0.331233.

Area of Body Injured

Among the 240 patients assessed for the study, 148 patients (61.67%) had suffered from multiple injuries at different parts of the body (Polytrauma). A total of 158 patients (65.83%) had suffered from head injury, of which 121 patients (76.58%) had severe injuries. A total of 72 patients (45.57%) with head injuries had to be admitted in the Trauma ICU, of which 55 patients (34.81%) died.

A total of 91 patients (37.91%) had facial injuries, among which 40 (43.95%) of them were categorized as severely hurt. Most of these patients had head injuries with trauma to face. A total of 32 (35.16%) among these were admitted to TICU, of which 22 (24.17%) could not survive.

There were 50 patients (20.83%) with injury to thorax, 26 (52%) among them had severe trauma to chest. The TICU admission was given to 21 patients (42%), and 16 patients (32%) succumbed to death.

A total of 43 patients (17.91%) had succumbed to abdominal trauma along with trauma to pelvis, including 28 (65.11%) severely hurt. A total of 20 patients (46.51%) had to be admitted to the ICU, among which 9 (20.93%) succumbed.

A total of 137 patients (57.08%) had injuries to their extremities, and 82 patients (59.85%) among them had severe injuries to their limbs. However, only 32 patients (23.35%) had to be admitted to TICU, and 17 patients (12.41%) succumbed to their injuries. External injuries accounted for nearly 156 patients (65%); however, only 20 (12.82%) could be categorized as having severe injury.

Comparison of Scoring Systems

The accuracy of GCS, ISS, RTS, TRISS, and APACHE II was compared for mortality prediction at the time of admission, 24 hours, and 48 hours after admission using ROC curve. The GCS has also been considered for analysis as it is one of the most commonly used scoring tools in triage.

At the Time of Admission

The mean ISS was 32.18 among survivors and 45.36 among non-survivors. Mean RTS among survivors was 7.4744, and among non-survivors was 5.42106. The mean score for TRISS was 0.8401 for survivors and 0.5206 for those who died. The APACHE II showed a mean of 3.6648 among discharged patients, and 15.5 among non-survivors (Table 1).

Table 2 displays the accuracy of various severity scores for predicting mortality. APACHE II seemed to show higher accuracy toward better prediction of mortality (AUC 0.913 with a std. error of 0.024), followed by ISS (AUC 0.684 with std. error 0.038). The TRISS (AUC 0.188 with a std. error of 0.031), RTS (AUC 0.159 with std. error 0.034), and GCS (AUC 0.121 with a std. error 0.032) showed to have a lower accuracy toward mortality prediction.

The 24 Hours after Admission

The mean ISS was 32.18 among survivors and 45.36 among non-survivors. Mean RTS among survivors was 7.6323, and among non-survivors was 4.8474. The mean score for TRISS was 0.8576 for survivors and 0.4754 for those who died. APACHE II showed a mean of 2.9231 among discharged patients, and 17.6379 among non-survivors (Table 1).

Table 3 displays the accuracy of various severity scores for predicting mortality. APACHE II seemed to show higher accuracy toward better prediction of mortality (AUC 0.964 with a std. error of 0.013), followed by ISS (AUC 0.684 with std. error 0.038). The TRISS (AUC 0.137 with a std. error of 0.026), RTS (AUC 0.087 with std. error 0.027), and GCS (AUC 0.065 with a std. error 0.024) showed to have a lower accuracy toward mortality prediction.

The 48 Hours after Admission

The mean ISS was 32.18 among survivors and 45.36 among non-survivors. Mean RTS among survivors was 7.7412, and among non-survivors was 4.8876. The mean score for TRISS was 0.8711 for survivors and 0.4783 for those who died. The APACHE II showed a mean of 2.7088 among discharged patients, and 17.3793 among non-survivors (Table 1).

Table 4 displays the accuracy of various severity scores for predicting mortality. The APACHE II seemed to show higher accuracy toward better prediction of mortality (AUC 0.965 with a std. error of 0.012), followed by ISS (AUC 0.684 with std. error 0.038). The TRISS (AUC 0.116 with a std. error of 0.022), RTS (AUC 0.036 with std. error 0.018), and GCS (AUC 0.056 with a std. error 0.023) showed to have a lower accuracy toward mortality prediction.

Following this analysis, we conferred that APACHE II consistently has the highest AUC among the tests across all time points, indicating it's a stronger predictor of the outcome (death) compared to the other tests compared. This is closely followed by ISS.

Final Outcome

Out of 240 patients assessed, 82 patients (34.16%) were admitted in Trauma ICU. A total of 56 patients (23.33%) among these succumbed to death.

Discussion

Trauma is a significant global contributor to mortality, causing over 5 million deaths annually, and leading to medical care requirements for almost 1 billion individuals each year. To emphasize its impact, the global burden of injury results in 32% more deaths compared

Table 1: Group statistics for ISS, RTS, TRISS, APACHE II at the time of admission, 24 hours after admission, and 48 hours after admission

	Group statistics				
Final outcome	*N*	*Mean*	*Std. deviation*	*Std. error mean*	*p-value*
NISS (Admission)					
Survival	182	32.1868	17.50290	1.29740	0.000
Death	58	45.3621	20.20483	2.65302	
RTS (Admission)					
Survival	182	7.4744	0.84564	0.06268	0.000
Death	58	5.4216	1.70926	0.22444	
TRISS (Admission)					
Survival	182	0.8401	0.22818	0.01691	0.000
Death	58	0.5206	0.32068	0.04211	
APACHE II (Admission)					
Survival	182	3.6648	4.09727	0.30371	0.000
Death	58	15.5000	7.41087	0.97310	
NISS (Day 1)					
Survival	182	32.1868	17.50290	1.29740	0.000
Death	58	45.3621	20.20483	2.65302	
RTS (Day 1)					
Survival	182	7.6323	0.64620	0.04790	0.000
Death	58	4.8474	1.68542	0.22131	
TRISS (Day 1)					
Survival	182	0.8576	0.20324	0.01507	0.000
Death	58	0.4754	0.31081	0.04081	
APACHE II (Day 1)					
Survival	182	2.9231	3.80819	0.28228	0.000
Death	58	17.6379	6.54726	0.85970	
NISS (Day 2)					
Survival	182	32.1868	17.50290	1.29740	0.000
Death	58	45.3621	20.20483	2.65302	
RTS (Day 2)					
Survival	182	7.7412	0.42038	0.03116	0.000
Death	58	4.8776	1.42295	0.18684	
TRISS (Day 2)					
Survival	182	0.8711	0.18185	0.01348	0.000
Death	58	0.4783	0.31256	0.04104	
APACHE II (Day 2)					
Survival	182	2.7088	3.99694	0.29627	0.000
Death	58	17.3793	6.38482	0.83837	

Table 2: Area under the curve at the time of admission

				Asymptotic 95% confidence interval	
Test result variable(s)	*Area*	*Std. error*[a]	*Asymptotic sig.*[b]	*Lower bound*	*Upper bound*
GCS (Admission)	0.121	0.032	0.000	0.057	0.185
ISS (Admission)	0.684	0.038	0.000	0.610	0.759
RTS (Admission)	0.159	0.034	0.000	0.093	0.226
TRISS (Admission)	0.188	0.031	0.000	0.128	0.248
APACHE II (Admission)	0.913	0.024	0.000	0.867	0.960

[a]Under the nonparametric assumption; [b]Null hypothesis: true area = 0.5. The test result variable(s): GCS (Admission), ISS (Admission), RTS (Admission), TRISS (Admission), APACHE II (Admission) has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased

Table 3: Area under the curve at 24 hours after admission

				Asymptotic 95% confidence interval	
Test result variable(s)	*Area*	*Std. error*[a]	*Asymptotic sig.*[b]	*Lower bound*	*Upper bound*
GCS (Day 1)	0.065	0.024	0.000	0.018	0.112
ISS (Day 1)	0.684	0.038	0.000	0.610	0.759
RTS (Day 1)	0.087	0.027	0.000	0.034	0.140
TRISS (Day 1)	0.137	0.026	0.000	0.087	0.187
APACHE II (Day 1)	0.964	0.013	0.000	0.938	0.989

[a]Under the nonparametric assumption; [b]Null hypothesis: true area = 0.5. The test result variable(s): GCS (Day 1), ISS (Day 1), RTS (Day 1), TRISS (Day 1), APACHE II (Day 1) has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased

Table 4: Area under curve at 48 hours after admission

				Asymptotic 95% confidence interval	
Test result variable(s)	*Area*	*Std. error*[a]	*Asymptotic sig.*[b]	*Lower bound*	*Upper bound*
GCS (Day 2)	0.056	0.023	0.000	0.011	0.101
ISS (Day 2)	0.684	0.038	0.000	0.610	0.759
TRS (Day 2)	0.036	0.018	0.000	0.001	0.071
TRISS (Day 2)	0.116	0.022	0.000	0.072	0.159
APACHE (Day 2)	0.965	0.012	0.000	0.941	0.990

[a]Under the nonparametric assumption; [b]Null hypothesis: true area = 0.5. The test result variable(s): GCS (Day 2), ISS (Day 2), TRS (Day 2), TRISS (Day 2), APACHE (Day 2) has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased

to the combined toll of malaria, tuberculosis, and HIV/AIDS. India shoulders more than 20% of the world's trauma-related deaths, underscoring the substantial public health challenge posed by injuries in the country. An examination of injury-related deaths in India through a Delphi study indicated that over half of these fatalities could potentially be prevented.[7]

The ISS has been regarded as the definitive measure for assessing anatomical injury since its inception in 1974. Computed by summing the squares of the highest abbreviated injury scale score for each of the three most severely affected body regions, the ISS is often referred to as the "gold standard" index (Fig. 1).[8]

Globally employed in pre-hospital practice and emergency settings to triage trauma cases, The RTS is comprised of three key physiological parameters: Systolic blood pressure (SBP), respiratory rate (RR), and the GCS (Fig. 2).[9]

Developed from insights gained in the 1982 Major Trauma Outcome Study (MTOS), the TRISS is a tool designed to estimate the likelihood of survival in trauma cases. Its calculation involves key factors such as the RTS, ISS, the patient's age, and the nature of the trauma (blunt or penetrating). The TRISS proves useful in identifying cases with unforeseen outcomes and allows for the comparative analysis of results across different groups of patients (Fig. 3).[10]

The APACHE II system is extensively utilized in intensive care units (ICUs). It incorporates a 12-point acute physiology score, an age point, and a chronic health evaluation. These elements are readily accessible in most casualty departments, establishing the APACHE II system as a widely embraced tool for assessing patient conditions in the ICU setting (Fig. 4).[11]

It is a well-known fact that trauma basically affects the youth population.[12] In this study, most of the patients were aged below 45 years (73.7%), with the median age being 36 ± 14 years. These data are similar to other studies conducted on this topic.[4,6,10,12–19] There is a clear majority of male patients suffering from traumatic events (82.08%), which can also be seen in several other studies.[4,6,9,10,12–18,20–22]

The leading cause of traumatic events (55.83%) was RTAs, followed by falls (33.75%). These data were also confirmed from other studies conducted on similar topics.[4,6,10,12–15,18–20] The WHO report on road traffic injury prevention identifies various risk factors associated with RTAs. These factors include those related to exposure, such as economic and demographic considerations, land-use planning practices, and the integration of road functions with speed and design. Additionally, factors influencing crash involvement encompass aspects like excessive speed, alcohol and drug usage, young age, male gender, poor visibility, and vehicle-related issues. The severity of the crash is influenced by factors like human tolerance, non-use of seat belts and helmets, the presence of objects on the road, and insufficient vehicle protection. Post-crash injury severity is affected by inadequate pre-hospital and emergency care, deficient trauma care in facilities, and delays in care. These factors collectively contribute to the occurrence and severity of RTAs.[21]

A few studies also showed that violence/assault was a major cause of trauma, as is confirmed by this study.[4,13] Blunt trauma was more common than penetrating, and this data is similar to other studies.[4,10,13,15–17,20] Regarding the part of body injured, head injury accounted for the highest number of patients (65.83%), and also lead to the highest number of deaths. This has also been shown previously.[4,6,10,12,13,18,20,23,24]

Trauma scoring serves as a fundamental aspect of interventions aimed at improving trauma care. Utilizing standardized trauma scoring systems enables effective triage and categorization of trauma patients, facilitating the prediction of patient outcomes and risk adjustment when evaluating case outcomes and hospital performance.[25]

This study aims to compare five prognostic scores to find which score shows a better prediction of mortality. There are other studies that have also compared these scores. The APACHE II, a general severity score, not commonly used in patients of trauma, has been a stronger predictor of outcome across all the specified time periods. This is in line with some studies.[17,24,26,27] However, some studies contradict this.[4,28] The APACHE II was followed by ISS, which is considered as the "gold standard" indicator for anatomical injury severity. Some studies confirmed this finding, while others seem to demonstrate the opposite.[4,8,13,18,29,30] On the other hand, physiological scores such as RTS and GCS seemed to be poor predictors of mortality even though they are pretty commonly used. There are several studies to confirm these findings, and several others that contradict them.[4,13,15,16,26,29] The TRISS also performed weekly for outcome prediction. However, there are almost an equal amount of studies confirming and contradicting this.[1,4,10,12,13,26,31–35]

Limitations

This study has several limitations. First, the duration of this study was relatively small (approx. 3 months). As a result, only immediate outcome (survival/mortality) could be assessed. Outcomes like morbidity and disability adjusted life years (DALY) could not be evaluated. Additionally, the size of the patient cohort evaluated for this study was relatively small, considering that our hospital is among the largest healthcare centers in a prominent city in India. Third, only five prognostic scores were compared. There are a lot more scores that are commonly used in triage. Lastly, there were a few patients who had been intubated, or had received preliminary treatment during pre-hospital transport, which interfered with data collection.

Conclusions

In summary, severity of trauma seemed to have a direct co-relation with ICU admission and mortality. Since, RTAs are the most common cause of injury among the admitted patients, prevention programs and safety strategies focusing on the use of helmets, seatbelts, driving under a speed limit should be incorporated. The results also showed that APACHE II was a superior score in predicting mortality among injured patients, followed by ISS. Traumatic brain injury was an important cause of ICU Admission and mortality.

Clinical Significance

Since the last 30 years, a lot of scoring systems have been developed, and are commonly used in the emergency room. However, there has been a lack of comparison and assessment of prognostic ability of these systems. This study aims to fill that gap by comparing their accuracy for outcome prediction. This study also established the superiority of APACHE II, which is not commonly used for trauma patients, to predict outcomes in such patients.

Ethical Approval

Ethical approval was provided by the Institutional Ethics Committee of B. J. Govt. Medical College & Sassoon General Hospitals, Pune on 07-07-2023 in the letter BJGMC/IEC/Pharmac/ND-Dept. 0723116-116.

CTRI Registry

This study was registered with CTRI registry (CTRI Trial No. CTRI/2023/10/058254 dated 4/10/2023).

Data Availability Statements

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contributions Statement

Janhvi Gupta contributed to conceptualization, data curation, formal analysis, investigation, methodology, resources, software, validation, writing original draft and writing review/editing.

Sujit Kshirsagar contributed to conceptualization, formal analysis, investigation, methodology, supervision, validation, writing original draft, and writing review/editing.

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