Assess The Accuracy Of Predictive Scores TRISS, NISS, And APACHE II In Predicting Mortality Among Trauma Patients In Tertiary Care Hospital In South India.

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KEYWORDS	ABSTRACT
Trauma Scores Predictive Scores, NISS, TRISS, APACHE II, Mechanism of Injury, survival	**AIM:** To evaluate and compare the efficacy of TRISS, NISS, and APACHE II scoring systems in predicting mortality among trauma patients. **Obejctives:** To assess the accuracy of the TRISS, NISS, and APACHE II scores in predicting mortality among trauma patients.To identify different trauma subgroups based on injury mechanism with Status of Patient Survivor.**Methodology: Study Design:** A retrospective cohort observational study (based on data availability) to evaluate and compare the predictive efficacy of TRISS, NISS, and APACHE II scoring systems among the trauma patient's mortality. **Study Area:** Conducted at the Tertiary Care Centre in south India, SRIHER, Chennai. **Sample Size:**70 Samples doing has a pilot study. **Study Population:** Patients who admitted with aged 18 years and above within 24 hours of the traumatic event or traumatic injuries, regardless of the mechanism (blunt, penetrating, or others). **Result:** The study analysed the demographic, trauma scores, and mechanisms of injury data for 70 patients to assess their association with survival outcomes. Age showed no significant association with survival status ($p = 0.98$), suggesting it does not significantly contribute to trauma score prediction in this cohort. Gender was found to be significantly associated with survival ($p = 0.05$), with males showing a higher survival rate compared to females. Trauma Scores: The NISS score did not show a significant association with survival ($p = 0.91$), indicating it is not a reliable predictor in this context. The TRISS score demonstrated borderline statistical significance ($p = 0.05$), suggesting it has better predictive capabilities compared to the other scoring systems. The APACHE II score showed a trend toward significance ($p = 0.06$), but it did not meet the threshold for statistical significance. Among the trauma scoring systems, the TRISS score outperformed the NISS and APACHE II scores in predicting mortality, as indicated by the ROC curve analysis. Mechanism of Injury: The mechanism of injury showed a trend toward statistical significance ($p = 0.07$). Blunt trauma was associated with the only non-survivor in the study, while penetrating and other injury types were linked exclusively to survivors. **Conclusion:** The TRISS score was the most reliable tool for predicting survival outcomes among trauma patients in this study, with borderline significance. Gender and mechanisms of injury showed potential associations with survival status, while age, NISS, and APACHE II scores were not strong predictors in this sample. Future studies with larger samples may help clarify these trends and improve predictive accuracy for trauma care.

Introduction:

The leading cause of trauma creating people life with morbidity and mortality in worldwide, particularly in young individuals. Accurate with timely prediction of mortality among trauma patients is critical for optimal resource allocation, clinical decision-making, and improving patient outcomes. Over the years, various predictive scoring systems take been developed to assess the severity of trauma then forecast patient prognosis. Among these, the BIG (Base deficit, International normalized ratio, Glasgow Coma Scale)**,** TRISS (Trauma and Injury Severity Score)**,** NISS (New Injury Severity Score) and APACHE II (Acute Physiology and Chronic Health Evaluation II) are widely used tools in clinical practice.

Each scoring system has its strengths and limitations, and their efficacy can vary based on patient demographics, trauma mechanisms, and healthcare settings. While the TRISS model incorporates physiological parameters, injury severity, and age, the BIG score emphasizes simplicity and rapid assessment. NISS provides a more comprehensive measure of injury severity compared to the traditional ISS (Injury Severity Score), while APACHE II, though initially developed for critical care patients, has been adapted for trauma scenarios.

However, there is limited evidence comparing the predictive accuracy of these scores in trauma patients, especially in diverse healthcare environments.

Traumatic injury is a broad term used to describe physical damage caused to the body due to exposure to environmental energy beyond the body's capacity to endure. It is a global issue and one of the primary reasons for illness and death worldwide. Trauma is especially prevalent among young individuals and remains the primary cause of mortality in the first four decades of life[1].

The development of trauma severity indices has been a crucial area of focus for trauma researchers. Over 50 scoring systems have been published for the classification of trauma patients. The large number of scoring systems highlights the need for such systems but also underscores their limitations in meeting all requirements[2].

The BIG, APACHE II,TRISS, and NISS scores are commonly used in medical research to assess the severity of injuries or illness and predict the prognosis or outcome for patients[3].

The scoring systems include various factors such as injury severity, physiological parameters, and other clinical variables. They are designed to provide clinicians and researchers with a standardized way to evaluate patient conditions[4]. The BIG score had previously been validated and shown to accurately predict mortality in a cohort of paediatric trauma patients. However, its applicability and accuracy in adult trauma patients are unknown[5].

AIM:

To evaluate and compare the efficacy of TRISS, NISS, and APACHE II scoring systems in predicting mortality among trauma patients.

Objectives:

To assess the accuracy of the TRISS, NISS, and APACHE II scores in predicting mortality among trauma patients.

To identify different trauma subgroups based on injury mechanism with Status of Patient Survivor.

Methodology
Study Design:

A retrospective cohort observational study (based on data availability) to evaluate and compare the predictive efficacy of TRISS, NISS, and APACHE II scoring systems among the trauma patient's mortality.

Study Area:

Conducted at the Tertiary Care Centre in south India, SRIHER, Chennai.

Sample Size: 70 Samples doing has a pilot study

Study Population:
Patients who admitted with aged 18 years and above within 24 hours of the traumatic event or traumatic injuries, regardless of the mechanism (blunt, penetrating, or others).

Inclusion Criteria:
Trauma patients aged ≥18 years admitted to the study centre.
Patients with complete medical records for TRISS, NISS, and APACHE II score calculations.
Patients admitted within 24 hours of trauma incident.

Exclusion Criteria:
Patients with incomplete medical records.
Patients with pre-existing terminal illnesses (e.g., advanced malignancy).
Patients discharged against medical advice before stabilization.

Ethical Committee Approval: IEC-NI-/21/JUN/699/703 obtaining ethical clearance from the Institutional Ethical Committee, this prospective study was carried out at Tertiary Care Hospital from July to August 2019.

Data Analysis:
The demographic variables are summarized with descriptive statistics i.e. mean, standard deviation, Non parametric chi square analysis. The software used for data analysis was SPSS version 25.

Results
Table 1-Demography Age, Gender with Status of Patient survivor

Variable		Mean ± SD	Status of Patient Survivor		P value
			Yes	No	
Age		38±17	69	1	.98
Gender	Male	55	55	--	.05
	Female	15	14	1	

Table 1: The study Participate were 70- among the mean age of survivors and non-survivors 38 stands deviation where 17 also 69 patient is survivor irrespective any age 1 patient non-survivors but not get significant so age is not contributing for trauma score predicting in trauma patient (P -value: 0.98). in same gender male 55 and female 15 were the 55-patient status is survivor in female 14 is survivor 1 patient non-survivors as per chi-square result the gender have significant with Status of Patient Survivor (P -value: 0.05)

Table 2- Trauma Score with Status of Patient survivor

Variable	Categoric	Status of Patient survivor		P value
		Yes	No	
NISS	Mild	59	1	0.91
	Moderated	9	--	
	Severe	1	--	
TRISS	Very Mild	1	--	0.05
	Mild	1	--	
	Moderator	19	1	
	Sever	24	--	
	Serious	12	--	

	Critical Ill	12	--	
APACHE II	Very Mild	26	--	0.06
	Mild	19	--	
	Moderator	17	--	
	Sever	4	--	
	Serious	2	1	
	Critical Ill	1	--	

Table 2: Status of Patient survivor with trauma score for 70 samples did chi-square analysis to find significant The high p-value (0.91) indicates there is no significant association between the NISS score and patient survival, also suggests that NISS, in this context, does not reliably differentiate between survivors and non-survivors.Next score for trauma assessment p-value of 0.05 indicates a borderline significant relationship between TRISS score and survival, also the appears of TRISS show some differentiation between survivors and non-survivors. APACHE II p-value 0.06 suggests a trend toward significance but does not meet predictable limits. TRISS is the most statistically significant scoring system for differentiating survivors and non-survivors, with borderline significance (p = 0.05), NISS and APACHE II do not show strong statistical associations with survival.

Fighter 1 ROC Curve for NISS, TRISS, APACHE II
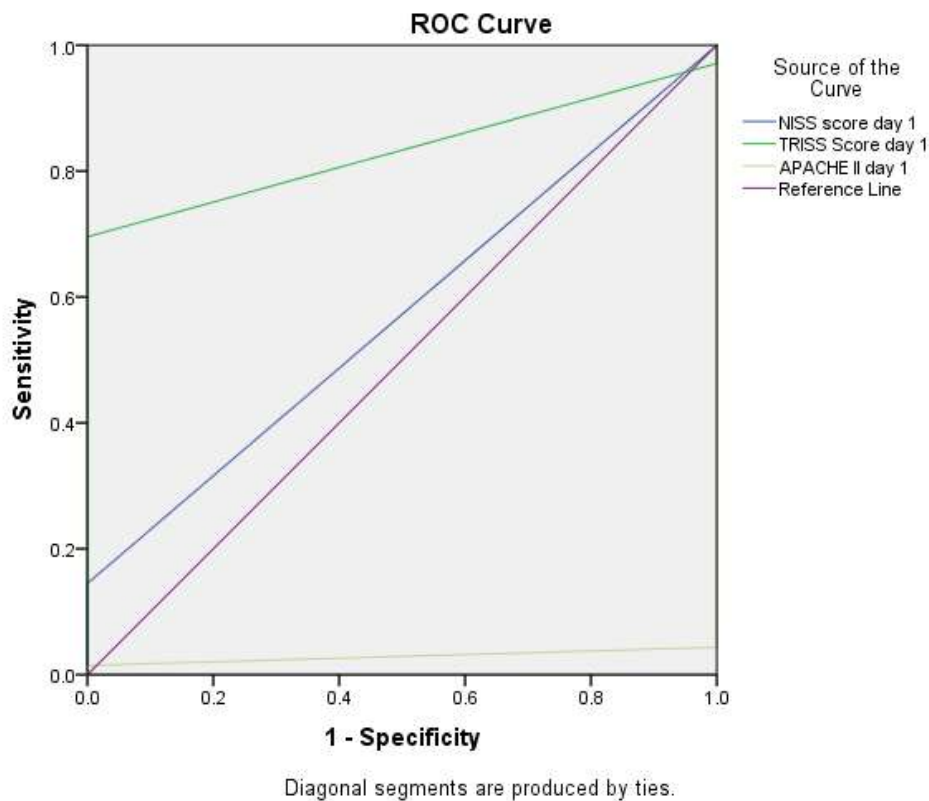

Diagonal segments are produced by ties.

Fighter 1 ROC curve shows that he NISS score appears closer to the diagonal (reference line), suggesting a lower ability to predict survival or mortality accurately. Curve (AUC) is likely closer to 0.5, indicating that the NISS score does not perform significant. TRISS score curve in the ROC is the most prominent and rises sharply towards the top-left corner, indicating better predictive accuracy compared to NISS and APACHE II. AUC for TRISS is likely the highest among the three scores, suggesting it has a sensitivity (true positive rate) with specificity of (true negative rate). APACHE II score curve overlaps significantly with the diagonal reference line, indicating it has poor predictive performance in this context. Out of threes trauma score TRISS score outperforms than the NISS &

APACHE II in the trauma patient mortality predicting. The cure shows that NISS and APACHE II scores show limited predictive capability, as their curves are closer to the diagonal reference line.

Table3 - Mechanism of injury with Status of Patient survivor

Variable	Injury types	Status of Patient survivor		P value
		Yes	No	
Mechanism of injury	Blunt	45	1	0.07
	Penetrating	20	--	
	Other	4	--	

Table 3 shows that p-value of **0.07** suggests that there is a trend toward no significant association between the mechanism of injury and survival status, but it does not reach the conventional level of significance ($p < 0.05$). Blunt trauma appears to be associated with most of the non-survivor cases (1 non-survivor out of 46 total cases), indicating a potentially higher risk of mortality in this category compared to penetrating or other injuries.

Penetrating and other types of injuries show no non-survivors, suggesting these types of injuries are associated with better survival outcomes.

Discussion

As stated by Davis AL et al, there was a significant positive correlation between BIG score values and mortality rates observed in the study. This means that as the value of the BIG score increased, the incidence of mortality also increased. Our study revealed a positive correlation between the BIG score and mortality rates in an adult trauma population. In the study done by Singh et al, the analysis revealed that the BIG score was an effective predictor of mortality in the penetrating trauma population, outperforming its performance in the blunt-trauma population. In our study, we did not segregate the blunt and penetrating trauma[6].

In Park et al study, the predictive value of the BIG score for mortality was significantly higher than that of ISS. The BIG score also showed a better AUROC for predicting in-hospital mortality compared with the revised trauma score. The present study is also compatible with Park et al study showing the importance of the BIG score in predicting mortality for adult trauma patients[7].

In a study conducted by Kıhtır HS et al, the BIG score positions itself as a more useful and powerful predictor of morbidity and mortality in pediatric high-energy trauma but in our study, the BIG score has proven its efficacy in adult trauma victims[8]. In a study by Bai X et al, the prognostic model incorporating the BIG score is beneficial for clinicians, aiding them in making early triage and treatment decisions in adult traumatic brain injury patients. In our study, the BIG score predicts mortality better in adult polytrauma victims[9].

A study conducted by Tian Y et al revealed that the APACHE II score was the best predictor of Intensive care unit and hospital outcomes in critically ill trauma patients. Similarly, in our study, the BIG score is better than the APACHE II[10]. In Servia et al. 's study, the physiological models perform better than the anatomic scores, which is compatible with our study also[11].

Farajzadeh et al found that the mean APACHE II score in discharged patients was significantly lower than 20, also the mean APACHE II in expired patients was significantly higher than 20; in our study, we have taken the mean value of 70 and above to predict mortality in trauma victims[12]. Rio TG et al found that the TRISS score performed slightly better than the APACHE II score in predicting mortality in the trauma population, which is compatible with our study - TRISS predicts better than the APACHE II score[13].

Höke MH et al concluded that TRISS is the best-performing score in determining mortality when compared with NISS, BIG, ISS, and RTS. In our study, the BIG score is found to be a strong scoring predictor for the trauma population[14]. In Patil et al study, TRISS was the strongest predictor of mortality in elderly trauma patients when compared to the ISS, NISS, and RTS; whereas in our study, the BIG score is the best predictor for mortality interpretation[15].

Conclusion

The TRISS score was the most reliable tool for predicting survival outcomes among trauma patients in this study, with borderline significance. Gender and mechanisms of injury showed potential associations with survival status, while age, NISS, and APACHE II scores were not strong predictors in this sample. Future studies with larger samples may help clarify these trends and improve predictive accuracy for trauma care.

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