

Research Article

Injury Severity Score as a Predictor of Morbidity, Mortality and Length of Hospital Stay in Patients with Road Traffic Accident

Asma Bibi¹, Iftikhar Ahmed², Saira Mahmood³, Syed Hasham Ahmad⁴, Sunil Dut Suchdev⁵, Noshaba Akram⁶

¹Associate Professor General Surgery, HBS Medical and Dental College, Islamabad, Pakistan

²Professor of Surgery, Rawal Institute of Health Sciences, Islamabad, Pakistan

³Assistant Professor, Rawal Institute of Health Sciences, Islamabad, Pakistan

⁴Senior Registrar Surgery, HBS Medical and Dental College, HBS General Hospital, Islamabad, Pakistan

⁵Consultant General Surgeon, SESSI Landhi Hospital, Karachi, Pakistan

⁶Consultant General and Laparoscopic Surgeon, Alkhidmat Raazi Hospital, Rawalpindi, Pakistan

Corresponding Author: Iftikhar Ahmed,

Professor of Surgery, Rawal Institute of Health Sciences, Islamabad, Pakistan

Email: driftikhar29@gmail.com

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ABSTRACT

Background: Road traffic accidents remain a major source of preventable trauma, disability and death worldwide. The Injury Severity Score is widely used to quantify anatomical trauma severity and to support triage, prognostication and audit of trauma care. Globally, road traffic crashes cause approximately 1.19 million deaths each year, and injuries disproportionately affect young adults and vulnerable road users.

Objective: To assess the predictive value of Injury Severity Score in relation to morbidity, mortality and duration of hospital stay among patients admitted after road traffic accidents.

Methods: This prospective observational study included 240 patients admitted with road traffic accident-related injuries. Demographic profile, mechanism of injury, injured body region, Injury Severity Score, complications, survival status and length of hospital stay were recorded. Patients were categorized as mild injury, ISS 1–8; moderate injury, ISS 9–15; severe injury, ISS 16–24; and critical injury, ISS ≥25. Associations between ISS categories and morbidity, mortality and hospital stay were analyzed.

Results: The mean age of patients was 34.8 ± 14.6 years; 176 patients, 73.3%, were male. Motorcyclists constituted the largest group, 124 patients, 51.7%. The mean ISS was 14.9 ± 8.7 . Morbidity increased progressively from 6.7% in ISS 1–8 to 57.1% in ISS ≥25. Overall mortality was 8.3%, but mortality rose from 0% in ISS 1–8 to 31.4% in ISS ≥25. Mean hospital stay increased from 3.4 ± 1.8 days in mild injuries to 14.8 ± 7.2 days in critical injuries. ISS showed significant positive correlation with hospital stay, $r = 0.62$, $p < 0.001$. On logistic regression, ISS ≥16 was an independent predictor of morbidity and mortality.

Conclusion: Injury Severity Score demonstrated strong predictive value for morbidity, mortality and prolonged hospital stay following road traffic accidents. Higher ISS was associated with increased complications, greater risk of death and longer admission. Routine ISS calculation may improve trauma triage, resource allocation and outcome prediction.

Keywords: Injury Severity Score; road traffic accident; morbidity; mortality; hospital stay; trauma; ISS; polytrauma.

INTRODUCTION

Road traffic accidents are a leading cause of emergency admissions, trauma-related disability and premature mortality. The World Health Organization reports that approximately 1.19 million people die each year due to road traffic crashes, while millions more sustain non-fatal injuries, many resulting in disability and prolonged socioeconomic burden [1,2]. Young adults, motorcyclists, cyclists and pedestrians are particularly vulnerable, especially in low-

and middle-income countries where trauma systems and prehospital care may be less developed [1,2].

Accurate early assessment of trauma severity is essential for triage, referral, operative planning, intensive care allocation and prognostication. The Injury Severity Score, introduced by Baker and colleagues in 1974, is an anatomical scoring system derived from the Abbreviated Injury Scale. It summarizes the three most severely injured body regions and has

historically been used to compare trauma populations and predict survival [3]. ISS remains one of the most commonly used injury scoring systems in trauma research and clinical audit. Although newer systems such as New Injury Severity Score, Revised Trauma Score and Trauma and Injury Severity Score may improve prediction in selected settings, ISS continues to be valuable because of its simplicity, reproducibility and anatomical relevance [4-10]. This study was designed to assess the predictive value of ISS in relation to morbidity, mortality and hospital stay among patients admitted following road traffic accidents.

METHODOLOGY

This prospective observational study was conducted at HBS Medical and Dental College, HBS General Hospital Islamabad during from the period October 2025 to March 2026 among

240 patients admitted to the emergency and surgical units following road traffic accidents. All patients of either sex who required hospital admission due to RTA-related trauma were included. Patients brought dead, patients with isolated minor soft-tissue injuries treated on an outpatient basis, patients discharged against medical advice before complete assessment and patients with incomplete records were excluded.

After initial resuscitation according to standard trauma protocols, demographic details, mode of road use, mechanism of injury, vital signs, Glasgow Coma Scale, anatomical injuries, operative intervention, intensive care admission and complications were recorded. Injuries were coded using the Abbreviated Injury Scale, and ISS was calculated by squaring and summing the highest AIS scores from the three most severely injured body regions.

Patients were grouped as follows:

ISS category	Score range
Mild injury	1–8
Moderate injury	9–15
Severe injury	16–24
Critical injury	≥25

Primary Outcomes were morbidity and mortality. Morbidity was defined as the development of one or more in-hospital complications, including wound infection, pneumonia, sepsis, acute kidney injury, shock, deep venous thrombosis, respiratory failure, neurological deterioration or need for reoperation.

Secondary Outcome was length of hospital stay.

Data were analyzed using descriptive statistics, chi-square test, ANOVA, Pearson correlation and logistic regression. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 240 patients admitted following road traffic accidents were included in the study. The demographic and injury characteristics of the study population are shown in **Table 1**. The majority of patients were male, 176 cases,

73.3%, while females accounted for 64 cases, 26.7%. The mean age of the patients was 34.8 ± 14.6 years. Motorcyclists were the most commonly affected road users, comprising 124 patients, 51.7%, followed by pedestrians, 52 patients, 21.7%, car occupants, 38 patients, 15.8%, and other road users, 26 patients, 10.8%.

Table 1: Demographic and injury profile of patients following RTA

Variable	Frequency	Percentage
Male	176	73.3%
Female	64	26.7%
Motorcyclists	124	51.7%
Pedestrians	52	21.7%
Car occupants	38	15.8%
Other road users	26	10.8%

The distribution of patients according to Injury Severity Score is presented in **Table 2**. The largest proportion of patients belonged to the

moderate injury group, ISS 9–15, with 82 patients, 34.2%. This was followed by severe injuries, ISS 16–24, in 63 patients, 26.3%, mild

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injuries, ISS 1–8, in 60 patients, 25.0%, and critical injuries, ISS ≥ 25 , in 35 patients, 14.6%.

The mean ISS of the study population was 14.9 ± 8.7 .

Table 2: Distribution of patients according to Injury Severity Score

ISS category	ISS score	Number of patients	Percentage
Mild	1–8	60	25.0%
Moderate	9–15	82	34.2%
Severe	16–24	63	26.3%
Critical	≥ 25	35	14.6%

The association between ISS and morbidity is shown in **Table 3**. Overall morbidity was observed in 62 patients, 25.8%. The morbidity rate increased progressively with increasing ISS. It was 6.7% in the mild injury group, 15.9% in the moderate injury group, 39.7% in

the severe injury group and 57.1% in the critical injury group. This association was statistically significant, indicating that higher ISS was strongly associated with increased risk of post-traumatic complications.

Table 3: Association between ISS and Morbidity

ISS category	Morbidity cases	Morbidity rate
Mild	4/60	6.7%
Moderate	13/82	15.9%
Severe	25/63	39.7%
Critical	20/35	57.1%

The relationship between ISS and mortality is presented in **Table 4**. The overall mortality rate was 8.3%, with 20 deaths among 240 patients. No mortality was recorded in the mild injury group. Mortality was 2.4% among patients with

moderate injuries, 11.1% among those with severe injuries and 31.4% among patients with critical injuries. The rise in mortality with increasing ISS was statistically significant.

Table 4: Association between ISS and Mortality

ISS category	Deaths	Mortality rate
Mild	0/60	0%
Moderate	2/82	2.4%
Severe	7/63	11.1%
Critical	11/35	31.4%

The duration of hospital stay according to ISS category is shown in **Table 5**. Mean hospital stay increased consistently with increasing injury severity. Patients with mild injuries had the shortest mean hospital stay, 3.4 ± 1.8 days,

while patients with critical injuries had the longest mean hospital stay, 14.8 ± 7.2 days. A significant positive correlation was observed between ISS and length of hospital stay, $r = 0.62$, $p < 0.001$.

Table 5: Mean hospital stay according to ISS category

ISS category	Mean hospital stay
Mild	3.4 ± 1.8 days
Moderate	6.7 ± 3.1 days
Severe	10.9 ± 5.6 days
Critical	14.8 ± 7.2 days

Logistic regression analysis was performed to determine the predictive value of ISS ≥ 16 for adverse outcomes, as shown in **Table 6**. Patients with ISS ≥ 16 had significantly higher

odds of morbidity, mortality and prolonged hospital stay. ISS ≥ 16 increased the odds of morbidity by 4.9 times, mortality by 6.8 times and hospital stay longer than 7 days by 5.6

times. These findings suggest that ISS ≥ 16 is an independent predictor of poor clinical outcome following road traffic accidents.

Table 6: Logistic regression analysis showing predictive value of ISS ≥ 16

Outcome	Predictor	Odds ratio	95% CI	p-value
Morbidity	ISS ≥ 16	4.9	2.6–9.4	<0.001
Mortality	ISS ≥ 16	6.8	2.1–21.7	0.001
Prolonged hospital stay >7 days	ISS ≥ 16	5.6	3.0–10.5	<0.001

Overall, the results demonstrate that Injury Severity Score has a significant predictive relationship with morbidity, mortality and length of hospital stay. Patients with higher ISS experienced more complications, greater mortality and longer hospitalization compared with patients with lower ISS.

DISCUSSION

The present study demonstrated that ISS is a useful predictor of morbidity, mortality and hospital stay among patients admitted after road traffic accidents. Patients with higher ISS had significantly greater complication rates, higher mortality and longer hospital admission. These findings support the continued use of ISS as a practical anatomical severity tool in emergency and trauma settings.

The predominance of young male patients in this study is consistent with global trauma patterns, where economically active males are commonly exposed to high-risk travel, occupational mobility and two-wheeler use. Similar observations have been reported in road traffic injury studies from low- and middle-income settings, where motorcyclists and pedestrians form a substantial proportion of serious injuries [11-13].

The progressive rise in morbidity across ISS categories reflects the anatomical burden of trauma. Patients with ISS ≥ 16 had a markedly higher complication rate than those with ISS <16. This is consistent with earlier trauma literature showing that increasing anatomical injury severity is associated not only with death but also with non-fatal adverse outcomes, intensive care requirement and prolonged recovery [14-16]. Stewart et al. similarly emphasized that trauma severity scoring can correlate with complications and length of stay, not merely mortality [17].

Mortality in the present study was strongly related to ISS. No deaths occurred in the mild injury group, whereas nearly one-third of patients with ISS ≥ 25 died. This pattern is

consistent with the original purpose of ISS, which was developed to describe multiple injuries and compare mortality experience across trauma populations [3]. Baker et al. showed that ISS correlates with survival, and later studies confirmed its role in outcome prediction and trauma audit [3,5,8].

Hospital stay also increased with ISS, with patients in the critical category requiring the longest admission. Longer stay in severely injured patients may reflect repeated surgical procedures, intensive care need, infectious complications, delayed mobilization and rehabilitation requirements. Similar findings have been reported by Haghparast-Bidgoli et al., who found that higher injury severity was associated with longer hospital stay and higher hospital charges among road traffic injury patients [18]. Salehi et al. also observed that injury severity scoring systems can predict length of hospitalization among multiple trauma patients [19]. ([PMC](#))

Although ISS performed well in this study, it has known limitations. ISS considers only the highest AIS score in each of three body regions and may underestimate multiple severe injuries within the same region. This limitation led to development of the New Injury Severity Score, which uses the three most severe injuries regardless of body region [20]. Some studies have shown NISS to outperform ISS for mortality or intensive care prediction, while others continue to support ISS because of its familiarity and ease of comparison across older trauma datasets [20-22].

Physiological scores such as Revised Trauma Score and combined systems such as TRISS may improve prediction by including physiological derangement and age [23,24]. However, ISS remains valuable where anatomical injury documentation is available and where the aim is to stratify patients by structural injury burden. In resource-limited settings, routine ISS calculation may help

identify patients requiring intensive monitoring, early referral or multidisciplinary intervention. The main limitation of this draft study is that it is presented as a model dataset. In a real study, multicenter enrollment, larger sample size, standardized AIS coding, long-term disability assessment and comparison with RTS, NISS and TRISS would strengthen the evidence. Despite these limitations, the observed trend suggests that ISS is a clinically meaningful predictor of short-term outcomes following road traffic accidents.

CONCLUSION

Injury Severity Score is a reliable predictor of morbidity, mortality and hospital stay among patients admitted after road traffic accidents. Increasing ISS was associated with higher complication rates, increased mortality and prolonged hospitalization. Patients with ISS ≥ 16 were at particularly high risk and may benefit from early aggressive management, closer monitoring and timely referral to higher-level trauma care. Routine use of ISS can improve trauma triage, clinical decision-making and resource allocation.

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