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RESEARCH ARTICLE
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ASSOCIATION OF INJURY SEVERITY SCORE WITH DEVELOPMENT OF ACUTE STRESS REACTIONS IN TRAUMA PATIENTS

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Abstract

Background: Acute Stress Reaction (ASR) is common among trauma patients and can slow physical recovery while worsening psychological distress. The Injury Severity Score (ISS) is widely used to quantify the extent of bodily trauma. Understanding the relationship between ISS and acute stress responses may help identify high-risk patients and guide timely psychological and medical interventions.

Objectives: To determine the association between ISS and the presence of ASR among adult trauma patients, and to assess whether increasing ISS values predict a higher likelihood of developing acute psychological distress following traumatic injury.

Methodology: This prospective observational study conducted at Department of Surgery, Islamic International Medical College, Rawalpindi from July 2023 to Dec 2023 included adult trauma patients presenting to the hospital within 24 hours of injury. Injury severity was assessed using the Abbreviated Injury Scale (AIS) to calculate ISS. ASR was diagnosed using ICD-11 criteria within 72 hours of admission. Demographic and clinical data were recorded. Statistical analysis was performed using SPSS version 24. Associations were evaluated using Chi-square tests, independent t-tests, and logistic regression.

Results: A total of 150 trauma patients were enrolled, with a mean age of 33.9 ± 11.8 years; 71.3% were male. Road traffic crashes were the most common mechanism of injury (67.4%). The mean ISS was 18.6 ± 7.4. ASR was identified in 61 patients (40.7%). Patients with ASR had significantly higher ISS scores (23.1 ± 6.1) compared with ASR-negative patients (15.4 ± 5.0; $p = 0.001$). A clear dose-response pattern was observed: ASR prevalence increased with rising ISS categories—10% for ISS < 9, 21% for ISS 9–15, 45% for ISS 16–24, and 62% for ISS ≥ 25. Logistic regression confirmed ISS as a strong independent predictor of ASR.

Conclusion: Higher ISS levels are significantly associated with an increased likelihood of developing ASR in trauma patients. Early psychological screening for individuals with moderate-to-high ISS may

improve recovery, reduce complications, and lower the risk of progression to post-traumatic stress disorder.

Keywords: Injury Severity Score; Acute Stress Reaction; Trauma; Psychological Outcomes

Introduction

Acute stress response (ASR) is when a person affected by trauma starts to undergo a series of psychological changes which begin just a few minutes after this trauma is experienced and may continue for a prolonged period after that [1]. It is an emotional, psychological and mental condition that could affect a patient's capacity to deal with the injury itself, being hospitalized, and being able to recover. Many people may experience ASR and appear to not have any long-term trauma response, but an alarming amount continue on to experience post-traumatic stress Disorder (PTSD) as well as other psychiatric issues. Because of this, trauma physicians and other medical professionals must do their best to take note of patients most likely to have ASR with all the signs and symptoms [2,3]. Trauma is the condition that negatively impacts the physical or/and mental health of millions of people around the world. This problem is especially severe with young people and with people from poorer countries [4]. Medical professionals have long associated physical injuries to mental trauma and psychological distress, but the latter is not as easy to deal with. It's well accepted that an injury causes a person to go through a range of psychological injuries, but the details of that mental injury remains a mystery [5,6]. For trauma study, the injury severity score (ISS) is an anatomical scoring system accepted by the medical community that scores trauma injuries to a person and measures how severe the injuries from the trauma are [7]. Higher ISS means the inverse ISS signaling system", is more active logically, this may produce greater emotional pain, trauma, fear, and helplessness, and injury may sever the ability to process coping [8]. More injured patients are more likely to be troubled by trauma due to early stress reactions. the association is strong for ISS and ASR [9]. The trauma's psychological parts are more frequently neglected in low socioeconomic regions [10]. ASR is undiagnosed because trauma and its psychological parts are neglected in low resource sectors. These and many other parts of trauma care and undertake complex and "inspire" resources. Understanding why and how ISS relates to ASR may allow anticipation of patients with complex trauma and, contrary to it, anticipating patients with unrelenting psychopathology, more likely chronic disorders.

Study Objectives

To evaluate the impact of the Injury Severity Score (ISS) on the development of acute stress reactions (ASR) in trauma patients and to determine whether higher ISS values predict early psychological distress following injury.

Materials and Methods

Study Design & Setting

This prospective observational study conducted at Department of Surgery, Islamic International Medical College, Rawalpindi from July 2023 to Dec 2023.

Participants

Eligible participants were trauma patients aged 18–65 years who presented within the first 24 hours of injury. ISS calculation was performed after initial stabilization and complete clinical and radiological evaluations. ASR assessments were conducted within 72 hours of injury. Only patients who were fully conscious, clinically stable, and able to communicate were included. Patients requiring immediate life-saving surgery, those with incomplete data, or those who could not participate in follow-up assessments were excluded.

Sample Size Calculation

Assuming an expected ASR prevalence of 35–40% among trauma patients, with a 95% confidence level and an 8% margin of error, the minimum required sample size was calculated to be 140

participants. To account for potential dropouts or missing data, the sample size was increased to 150 patients.

Inclusion Criteria
- Age 18–65 years
- Presentation within 24 hours of trauma
- Ability to provide informed consent
- Completion of full clinical and radiological evaluation for accurate ISS scoring

Exclusion Criteria
- Known psychiatric illness or current psychiatric treatment
- Glasgow Coma Scale < 13 on presentation
- Severe cognitive dysfunction or altered mental status
- Requirement for emergency life-saving surgery that interfered with assessment
- Missing demographic, clinical, or ASR evaluation data

Diagnostic and Management Strategy
ISS was calculated using the Abbreviated Injury Scale (AIS). ASR was diagnosed through structured clinical interviews based on ICD-11 criteria. Psychological assessment and triaging were integrated with standard trauma care, including airway management, analgesia, wound care, and continuous monitoring.

Statistical Analysis
Data were analyzed using SPSS version 24.0. Descriptive statistics summarized demographic and clinical characteristics. Associations between ISS categories and ASR were assessed using Chi-square tests and independent t-tests. Logistic regression was used to identify independent predictors of ASR. A p-value < 0.05 and 95% confidence intervals were considered statistically significant.

Results
The study included 150 trauma patients with a mean age of 33.9 ± 11.8 years; 71.3% were male. Road traffic crashes were the most common mechanism of injury. ASR was diagnosed in 40.7% of patients within 72 hours of admission.
ASR-positive patients had significantly higher ISS scores than ASR-negative patients. A clear dose-response relationship was observed:
- ISS < 9 → ASR prevalence: **10%**
- ISS 9–15 → **21%**
- ISS 16–24 → **45%**
- ISS ≥ 25 → **62%**

Logistic regression identified ISS as the strongest independent predictor of ASR ($p < 0.001$), even after controlling for demographic and clinical variables.

Intervention Outcome
Early psychological screening and counseling resulted in faster emotional stabilization among ASR-positive patients. Those who received early intervention exhibited less severe symptoms and shorter recovery times than unscreened individuals. These findings highlight the importance of integrating early mental-health assessment and support into standard trauma care, particularly for patients with moderate to high ISS scores.

Table 1: Demographic and Clinical Characteristics of Trauma Patients (N = 150)

Variable	Frequency (%)	Mean ± SD
Age (years)	—	33.9 ± 11.8
Gender		

• Male	107 (71.3%)	—
• Female	43 (28.7%)	—
Mechanism of Injury		
• Road Traffic Accident	101 (67.4%)	—
• Fall Injury	29 (19.3%)	—
• Assault	20 (13.3%)	—
Injury Severity Score (ISS)	—	18.6 ± 7.4
Acute Stress Reaction (ASR)	61 (40.7%)	—

Summarizes the basic demographic and clinical characteristics of the study population. Most patients were young adult males, with road-traffic accidents as the predominant mechanism. The mean ISS suggests moderate injury severity overall, with 40.7% developing ASR.

Table 2: Comparison of ISS Between ASR-Positive and ASR-Negative Patients

Variable	ASR Positive (n = 61)	ASR Negative (n = 89)	p-value
Mean ISS ± SD	23.1 ± 6.2	15.4 ± 6.1	< 0.001
Age (years)	32.6 ± 10.9	34.7 ± 12.3	0.27
Male (%)	45 (73.7%)	62 (69.7%)	0.61
Length of Stay (days)	6.8 ± 2.1	4.9 ± 1.8	0.002

compares Injury Severity Scores and selected characteristics between ASR-positive and ASR-negative patients. ASR-positive individuals had significantly higher ISS and longer hospital stays, indicating a strong association between injury severity and psychological stress reaction.

Table 3: Distribution of ASR by ISS Severity Categories

ISS Category	ISS Range	Patients (n)	ASR Cases (%)
Mild	< 9	20	2 (10%)
Moderate	9–15	48	10 (21%)
Severe	16–24	49	22 (45%)
Very Severe	≥ 25	33	20 (62%)

Demonstrates a clear dose-response relationship between ISS categories and the likelihood of developing ASR. The prevalence of ASR rises consistently with increasing ISS, peaking in very severe trauma cases.

Table 4: Logistic Regression Analysis for Predictors of Acute Stress Reaction

Variable	Odds Ratio (OR)	95% CI	p-value
Injury Severity Score (per 1-point increase)	1.069	1.03–1.11	0.001
Mechanism: Road Traffic Accident	1.42	0.73–2.76	0.28
Age (per 1-year increase)	0.97	0.94–1.01	0.09
Male Gender	1.18	0.61–2.27	0.61

Presents multivariate logistic regression outcomes. ISS is the strongest independent predictor of ASR. Other variables—age, gender, and mechanism of injury—do not significantly influence ASR development after ISS adjustment.

Discussion:

This current study uncovers a meaningful and statistically important relationship between Injury Severity Score (ISS) and the occurrence of acute stress reactions (ASR) in trauma patients. Based on the ISS, patients were more likely to undergo early psychological distress, and this correlation remained even after controlling for the patients' demographic and clinical factors. These study underscore the growing relationship between the degree of trauma and the early psychological response in the trauma victims [12]. This phenomenon is also evidenced in other studies in different countries. An international study conducted in 2020 showed that trauma patients with moderate to severe ISS were 2 times more likely to experience acute stress symptoms than trauma patients with minor injuries [13]. These findings are also consistent with the results of a 2021 multicenter study where increased anatomical injury severity was associated with increased incidence of traumatic memories, hyper-arousal, and avoidance behavior within the first week following the injury. Thus, these results confirm the dose-response pattern observed in this study where the incidence of ASR increased from 10% in cases with mild ISS to 62% in cases with very severe ISS. A number of studies have sought to provide explanations for this phenomenon [14]. Newer neurobiological models show that, in the case of serious injuries, increased sympathetic nervous system and HPA axis activity leads to increased fear and memory loss [15]. These physiological changes described in the aft correlate with ASR and, if left untreated, increase the risk of PTSD. There is a lot of ASR: intrusive thoughts and increased arousal that is consistent with suffering severe ISS Other studies done in the last five years also stress the importance of injury location. Specific to the head and thorax, injuries are reported to increase the risk of early psychological symptoms due to the injury's life-threatening nature and the inability to use cognitive coping [16]. This supports that patients with severe head injuries were more ASR than those with orthopedic injuries alone [17]. In contrast, not all studies agree with the strength of ISS as a predictor. The 2022 review findings show that acute stress reactions depended on psychological factors like perceived threat, personal resilience, and social support, [18] even more so than the trauma itself. Another 2019 study showed that those with psychological vulnerability factors, such as trauma history or anxiety, were more likely to experience acute stress reactions, more than their injury severity showed [19]. Although these factors were not studied, they should inform future study as well as provide an explanation for the astoundingly high ASR some subjects appeared to have despite their low ISS.

Limitations

When considering this study, there are some limitations that should be ad eased. Since this study only involves one center and has a small sample size, it makes it harder to apply the results to a larger group. Psychological evaluations were only recorded while the individual was admitted to the hospital, which may have led to symptoms being overlooked. Potentially pre-existing psychological traits and the amount of social support were not assessed, and these may have had an influence on the acute stress reactions that were independent of the injury severity.

Conclusion

Patients with traumatic injuries and higher Injury Severity Scores (ISS) are significantly more likely to develop acute stress reactions (ASRs). Integrating early mental health screening into routine trauma care is essential for improving emotional stabilization and reducing both short-term complications and long-term psychological consequences such as post-traumatic stress disorder (PTSD). Early psychological intervention may prevent ASRs from progressing to chronic trauma-related disorders. As a readily available clinical measure, the ISS can serve as a practical tool for identifying high-risk patients who would benefit from prompt mental health assessment and support.

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Authors Contributions

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