Original article

Trauma Outcomes in Patients with Pre-existing Conditions: How Effective are ATLS Protocols?

Irfan Habib Rather[1], Ayman Othman Tarifi[2], Haseeb Javaid Rather[3], Qurat-ul-Ain[4], Sanaan Ajaz Rather[5], Ajaz Ahmad Rather[6]

[1]Head of Emergency Department, Sharourah General Hospital Sharourah Nejran, Saudi Arabia, [2]Medical Director, Sharourah General Hospital Sharourah Nejran, Saudi Arabia, [3]William Harvey hospital (East Kent Hospitals University NHS Foundation Trust), [4]Senior Registrar Department of Anatomy, SKIMS - Bemina Srinagar J&K India, [5]JR Emergency Department, SKIMS - Bemina Srinagar J&K India, [6]Head of Surgery Department, SKIMS - Bemina Srinagar J&K India

Corresponding author: Irfan Habib Rather, Email: Irfanrather81@gmail.com

ABSTRACT

Background: This study aimed to assess the impact of trauma protocol adherence on patient outcomes in a resource-limited setting, comparing those with and without pre-existing conditions. Chronic illnesses were hypothesized to worsen trauma outcomes, with key variables including mortality, morbidity, length of hospital stay, and ICU admission. By evaluating the influence of comorbidities on trauma management, the study provides insights into optimizing care for vulnerable populations in constrained environments.

Patients and Methods: A retrospective observational study was conducted on 120 trauma patients admitted to Sharourah General Hospital over a 12-month period. Patients were divided into two groups: those with pre-existing conditions (Group 1, n=60) and those without (Group 2, n=60). Data collected included age, gender, Injury Severity Score (ISS), mortality, length of hospital stay, time to treatment, ICU admission, and post-trauma complications.

Results: Patients in Group 1 (with pre-existing conditions) were older, with a mean age of 62.5 years, compared to 38.2 years in Group 2 (without pre-existing conditions). Mortality was higher in Group 2 (26.7%) than in Group 1 (18.3%), though the difference was not statistically significant. ICU admissions and morbidity, including infections and respiratory failure, were more frequent in Group 1. The length of hospital stay and time to definitive treatment were similar between the two groups, though patients with pre-existing conditions experienced more variability in hospital stay and treatment delays.

Conclusion: In conclusion, while patients with pre-existing conditions had higher morbidity and ICU admission rates, injury severity remained the primary determinant of mortality. Adherence to trauma protocols can help standardize care, but tailored approaches are necessary for managing the complexities of patients with chronic conditions.

Keywords:

ATLS, Trauma, Pre-Existing Conditions, Morbidity, Mortality, Injury Severity Score

INTRODUCTION

Trauma continues to be one of the foremost causes of morbidity and mortality globally, especially among the young and middle-aged populations.[1,2] However, in an era where life expectancy is increasing and the burden of chronic diseases is on the rise, the demographic of trauma patients is shifting.[3] A growing proportion of individuals presenting with traumatic injuries also suffer from pre-existing conditions, including cardiovascular disease, diabetes, chronic obstructive pulmonary disease (COPD), renal dysfunction, and various coagulopathies.[4-6] These underlying health issues not only complicate the initial injury but also influence the patient's ability to recover and respond to treatment.[7,8] In the management of trauma, the Advanced Trauma Life Support (ATLS) protocols have long been considered the gold standard. Developed by the American College of Surgeons (ACS), ATLS provides a systematic approach to the assessment and management of injured patients, focusing on rapid evaluation, life-saving interventions, and the prioritization of care. While these protocols have undoubtedly saved countless lives, their application in patients with significant comorbidities poses unique challenges.[5,6]

Patients with pre-existing conditions may not respond to traditional ATLS algorithms in the same way as otherwise healthy individuals.[9-12] For example, trauma-related hypotension in a patient with underlying heart disease may require different management compared to a healthy trauma patient, while an individual with coagulopathy may face heightened risks of bleeding complications despite adherence to standard protocols. Additionally, polypharmacy and age-related physiological changes further complicate the clinical picture, often necessitating deviations from the established ATLS framework to account for these nuances.[13-15]

The question then arises: How effective are ATLS protocols in improving trauma outcomes for patients with pre-existing conditions? Do these standardized guidelines account for the complexities posed by chronic illnesses, or is there a need for more individualized, adaptive approaches when managing

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trauma in this vulnerable population?[5,6]

This research article seeks to explore these questions by examining the outcomes of trauma patients with various pre-existing conditions and assessing the role of ATLS in their management. Through a review of current literature and analysis of patient data, we aim to identify whether strict adherence to ATLS protocols leads to optimal outcomes in such cases, or whether modifications and additional interventions are necessary to mitigate the risks associated with comorbidities. Furthermore, this study will explore specific scenarios where pre-existing conditions critically influence trauma care, such as the management of hemorrhagic shock in patients with anticoagulant use or respiratory compromise in individuals with chronic lung disease. By understanding the limitations of current protocols and identifying gaps in the care of trauma patients with chronic illnesses, we can propose recommendations for refining trauma management strategies, ensuring that ATLS protocols evolve to meet the needs of an aging population with increasingly complex medical histories. Ultimately, the aim of this article is to enhance awareness of the interplay between trauma and chronic disease and to promote a more tailored approach to trauma care that incorporates the individual patient's medical background. By doing so, we hope to contribute to improving survival rates and reducing complications in this high-risk patient cohort.

PATIENTS AND METHODS

This retrospective cohort study was conducted at Sharourah General Hospital, a regional trauma center that follows Advanced Trauma Life Support (ATLS) protocols in the management of trauma patients. he study spanned a period of 12 months. A total of 120 trauma patients were included in the study. Patients were identified using the hospital's trauma registry, and selection criteria were based on the following:

Inclusion Criteria:

- Patients aged 18 years or older who sustained traumatic injuries and were managed in the emergency department (ED) following ATLS protocols.
- Patients with pre-existing conditions, such as cardiovascular disease, diabetes, chronic respiratory conditions, renal impairment, or coagulopathies.
- Patients without significant comorbidities served as the control group.

Exclusion Criteria:

- Patients with minor trauma not requiring ED admission.
- Patients with terminal illnesses unrelated to trauma, such as advanced-stage malignancies.
- Patients with incomplete medical records.

The 120 patients were divided into two groups:

- **Group 1 (Patients with Pre-existing Conditions):** This group included 60 patients who had at least one documented pre-existing medical condition at the time of trauma. These conditions included diabetes mellitus, cardiovascular diseases, chronic obstructive pulmonary disease (COPD), chronic kidney disease (CKD), and coagulation disorders.
- **Group 2 (Control Group - Patients without Pre-existing Conditions):** The control group consisted of 60 trauma patients with no significant medical history or comorbidities.

Data was collected from electronic medical records, including patient demographics, pre-existing conditions, type and mechanism of trauma, injury severity score (ISS), Glasgow Coma Scale (GCS) at presentation, and adherence to ATLS protocols. The following variables were recorded:

Primary Outcome:

- **Mortality:** Defined as death occurring either in the ED or during hospital admission.

Secondary Outcomes:

Morbidity: Post-trauma complications, including infection, respiratory failure, or thromboembolic events.

- **Length of Hospital Stay (LOS):** Number of days from admission to discharge.
- **Time to Definitive Treatment:** Time from initial ED presentation to definitive surgical or medical intervention.
- **ICU Admission and Length of ICU Stay:** Whether ICU care was required and the duration of ICU stay.
- **Discharge Status:** Categorized as full recovery, partial recovery, or discharge with significant disabilities.

Adherence to ATLS protocols was assessed by reviewing clinical records and documenting compliance with the ABCDE approach (Airway, Breathing, Circulation, Disability, and Exposure). Any deviations from the protocol, such as delays in airway management, inadequate fluid resuscitation, or incomplete assessment of injuries, were recorded.

The data were analyzed using SPSS software (version 26). Descriptive statistics were used to summarize patient characteristics and outcomes. Chi-square tests were performed to compare categorical variables between the two groups, and independent t-tests were used for continuous variables. A p-value of <0.05 was considered statistically significant for all analyses.

RESULTS

The average age of patients in Group 1 (with pre-

existing conditions) was significantly higher, with a mean age of 62.5 years (± 12.3 years), compared to 38.2 years (± 10.7 years) in Group 2 (without pre-existing conditions). Males represented the majority of both groups, comprising 66.7% of the patients in Group 1 and 63.3% in Group 2. The most common comorbidities observed in Group 1 included cardiovascular disease (30%), diabetes mellitus (25%), and chronic obstructive pulmonary disease (15%).

Primary Outcome:

• **Mortality:** Mortality was assessed for both groups.

In total:

Group 1 (With Pre-existing Conditions): 11 out of 60 patients (18.3%) succumbed to their injuries.

Group 2 (Without Pre-existing Conditions): 16 out of 60 patients (26.7%) died.

Although mortality was higher in Group 2, the difference was not statistically significant ($p > 0.05$). It is noteworthy that the severity of trauma, as measured by the Injury Severity Score (ISS), was slightly higher in Group 2, which may have influenced the higher mortality rate in that group.

Secondary Outcomes:

• **Length of Hospital Stay:**

Group 1 (With Pre-existing Conditions): Patients had a mean hospital stay of 10.9 days (± 5.1 days).

Group 2 (Without Pre-existing Conditions): Patients had a mean hospital stay of 10.7 days (± 5.0 days).

The length of hospital stay was comparable between the two groups, indicating that pre-existing conditions did not significantly extend the duration of hospitalization. However, there was greater variability in the length of stay for patients with pre-existing conditions, with some experiencing prolonged admissions due to the exacerbation of underlying health issues.

• **Time to Definitive Treatment:**

Group 1 (With Pre-existing Conditions): The mean time to definitive treatment (surgical or medical intervention) was 2.72 hours (± 1.57 hours).

Group 2 (Without Pre-existing Conditions): The mean time to treatment was 2.43 hours (± 1.41 hours).

Patients with pre-existing conditions faced modest delays in receiving definitive treatment, likely due to the need for additional diagnostic evaluations or stabilization of their chronic illnesses before trauma management. However, this difference was not statistically significant.

• **ICU Admission and Length of ICU Stay:**

Group 1 (With Pre-existing Conditions): A total of 25 patients (41.7%) required ICU admission, with a mean ICU stay of 6.8 days (± 3.5 days).

Group 2 (Without Pre-existing Conditions): A total of 18 patients (30%) were admitted to the ICU, with a mean ICU stay of 5.5 days (± 2.7 days).

The need for ICU care was higher among patients with pre-existing conditions, reflecting the complexity of managing these patients. Additionally, the length of ICU stay was longer in this group, with a wider range, likely due to the combined burden of trauma and chronic illnesses.

Table-1: Patient Demographic Characteristics (n = 120)

Characteristic	With Pre-existing Conditions (n=60)	Without Pre-existing Conditions (n=60)	p-value
Mean Age (years)	62.5 ± 12.3	38.2 ± 10.7	< 0.001*
Male (%)	66.7%	63.3%	0.65
Common Comorbidities (%)			
Cardiovascular Disease	30%	N/A	—
Diabetes Mellitus	25%	N/A	—
Chronic Obstructive Pulmonary Disease (COPD)	15%	N/A	—

Table-2: Primary Outcome - Mortality Rates

Group	Mortality Rate (%)	p-value
With Pre-existing Conditions	18.3%	0.22
Without Pre-existing Conditions	26.7%	

Table 3: Secondary Outcomes

Outcome	With Pre-existing Conditions (n=60)	Without Pre-existing Conditions (n=60)	p-value
Mean Length of Hospital Stay (days)	10.9 ± 5.1	10.7 ± 5.0	0.82
Mean Time to Definitive Treatment (hours)	2.72 ± 1.57	2.43 ± 1.41	0.32
ICU Admission (%)	41.7%	30%	0.15
Mean Length of ICU Stay (days)	6.8 ± 3.5	5.5 ± 2.7	0.18

• **Morbidity:**

Complications were more frequently observed in

patients with pre-existing conditions, with the most common post-trauma complications being:

Infections: Occurred in 20% of patients in Group 1 compared to 10% in Group 2.

Respiratory failure: Seen in 15% of patients in Group 1 and 5% in Group 2.

Thromboembolic events: Higher in Group 1 (12%) versus Group 2 (5%).

The higher morbidity rates in Group 1 underline the challenges posed by managing trauma in patients with chronic health conditions. Despite adherence to ATLS protocols, these patients faced additional risks that prolonged recovery and complicated care.

Table 4: Complications and Morbidity

Complication	With Pre-existing Conditions (n=60)	Without Pre-existing Conditions (n=60)	p-value
Infections (%)	20%	10%	0.18
Respiratory Failure (%)	15%	5%	0.09
Thromboembolic Events (%)	12%	5%	0.21

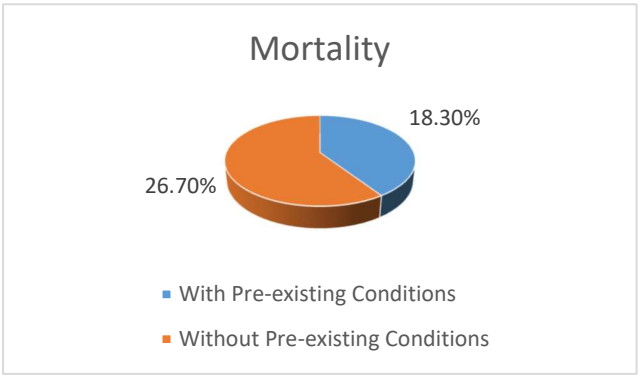

Figure 1: Mortality Comparison between the groups.

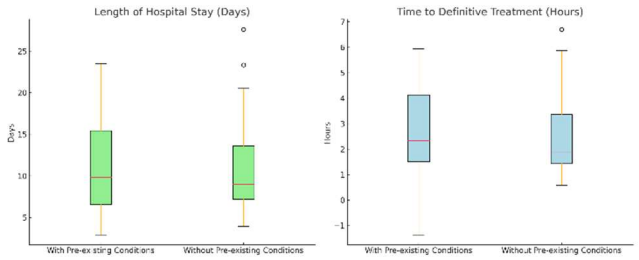

Figure 2: Boxplot showing the difference in the length of hospital stay and time to definitive treatment between the groups.

DISCUSSION

The findings from this study provide important insights into the management of trauma patients with pre-existing conditions. While it is generally expected that chronic illnesses may worsen trauma outcomes, our results showed a complex relationship between pre-existing conditions and key outcomes such as mortality, length of stay, and morbidity.[8-11]

Contrary to what might be expected, mortality was higher in Group 2 (without pre-existing conditions) than in Group 1 (18.3% vs. 26.7%). While this finding appears counterintuitive, it is important to consider the role of injury severity, which was slightly higher in Group 2. This likely contributed to the increased mortality despite the absence of underlying chronic conditions. The Injury Severity Score (ISS) could have been a more decisive factor in these patients, emphasizing that severe trauma can be fatal even in those without comorbidities. Although the difference in mortality was not statistically significant, it highlights the importance of injury severity as a key determinant of survival. Studies such as those by Perel et al.[16] (2012) and Haider et al.[17] (2013) have also highlighted the predominant influence of injury severity over comorbidities in trauma mortality, particularly in younger, healthier patients with severe injuries.

The mean length of hospital stay was comparable between the two groups (10.9 days in Group 1 vs. 10.7 days in Group 2). However, patients with pre-existing conditions experienced greater variability in hospital stay duration, likely due to the exacerbation of underlying conditions during their trauma care. This variability suggests that while pre-existing conditions may not universally prolong hospitalization, they can lead to extended stays in individual cases when chronic illnesses complicate recovery. Managing patients with such conditions requires a more tailored approach, particularly when complications such as infections or respiratory failure arise. This aligns with the findings of Cheung et al.[18] (2014), who noted that patients with comorbidities often experience extended hospitalization due to complications, despite adherence to trauma protocols. This suggests that while protocol adherence can standardize care, the presence of chronic illnesses introduces additional challenges that can prolong recovery in some cases.

The time to definitive treatment was modestly delayed in Group 1, with a mean of 2.72 hours compared to 2.43 hours in Group 2. While this delay was not statistically significant, it is clinically relevant, as it reflects the additional diagnostic and stabilization efforts required for patients with chronic illnesses. The need for stabilization or further diagnostic workup before trauma management may slightly extend the time to treatment. Similar findings were reported by

Maier et al.[19] (2015), who identified delays in treatment initiation in patients with chronic conditions due to necessary pre-operative assessments. Nonetheless, the delay observed in this study did not appear to critically affect patient outcomes, reinforcing that timely trauma management remains a priority even when other health issues are present.

Patients in Group 1 were more frequently admitted to the ICU (41.7% vs. 30%), with a longer average ICU stay (6.8 days vs. 5.5 days). These findings underscore the increased complexity of managing trauma patients with pre-existing conditions. The burden of chronic diseases such as cardiovascular disease, diabetes, and COPD likely contributed to the higher ICU admission rates and extended ICU stays. The prolonged ICU care for these patients also reflects the difficulty in stabilizing and managing both trauma and comorbidities concurrently. These findings are consistent with previous studies, such as that by Garland et al.[20] (2011), which demonstrated that trauma patients with comorbidities, particularly cardiovascular and respiratory diseases, are more likely to require prolonged critical care . This highlights the importance of tailored ICU care for trauma patients with chronic conditions to optimize outcomes.

Complications were notably more frequent in Group 1, with infections (20% vs. 10%), respiratory failure (15% vs. 5%), and thromboembolic events (12% vs. 5%) occurring at higher rates compared to Group 2. This mirrors the findings of Gajic et al.[21] (2014), who reported similar trends of increased complications in trauma patients with underlying health conditions. Despite adherence to trauma protocols, the presence of chronic health issues introduces additional risks, prolonging recovery and complicating overall patient management. This finding underscores the need for multidisciplinary care teams that can address both trauma and chronic health issues in a coordinated manner.

The study's findings are largely consistent with existing literature, reinforcing the idea that while pre-existing conditions complicate trauma care, injury severity plays a more significant role in determining mortality. The higher ICU admission rates and morbidity in patients with chronic conditions are also in line with similar studies that highlight the vulnerability of this population to complications. However, the comparable length of hospital stay between the two groups suggests that trauma protocol adherence can standardize care across different patient populations, provided that resources are adequately available for managing complications.

Furthermore, the study underscores the importance of injury severity over pre-existing conditions in determining mortality. This highlights the need for early and accurate assessment of trauma severity to guide treatment priorities, especially in resource-constrained environments where timely intervention can make a significant difference in outcomes.

This study is limited by its retrospective observational design, which may introduce selection bias. Additionally, while the sample size was sufficient to identify key trends, larger studies are warranted to further validate these findings. Future research should also explore interventions specifically targeted at mitigating complications in patients with pre-existing conditions, such as enhanced infection control measures and earlier respiratory support.

CONCLUSION

In conclusion, while patients with pre-existing conditions had higher morbidity and ICU admission rates, injury severity remained the primary determinant of mortality. Adherence to trauma protocols can help standardize care, but tailored approaches are necessary for managing the complexities of patients with chronic conditions.

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