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Original Research Article

Shock Index as a Predictor of Mortality in Critically ill Patients Admitted to the Intensive Care Unit: A Prospective Observational Study

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Abstract:

Background: Early identification of critically ill patients with high risk of mortality is fundamental to intensive care management. The Shock Index (SI), defined as the ratio of heart rate to systolic blood pressure, has emerged as a simple bedside indicator of hemodynamic instability.

Objectives: To assess the efficacy of the Shock Index at ICU admission as a prognostic indicator of mortality in critically ill patients.

Materials and Methods: This prospective observational study was carried out in the Intensive Care Unit of Nalanda Medical College and Hospital, Patna, from October 2024 to June 2025. A total of 95 severely ill adult patients were recruited. Patient's heart rate and systolic blood pressure were recorded and Shock Index was calculated on admission to ICU. Patients were followed up until discharge from the ICU or demise. Shock Index values of survivors and non-survivors were recorded.

Results: Patients who did not survive exhibited markedly elevated Shock Index values upon admission in contrast to survivors. A higher Shock Index was substantially linked to a higher mortality rate in the ICU, which means that the person's hemodynamic condition was compromised at the time of ICU admission.

Conclusion: Shock Index is a rapid, cost-effective and reliable predictor of mortality in critically ill ICU patients. Routine assessment at ICU admission may facilitate early risk stratification and timely clinical intervention.

Keywords: Shock Index, Mortality, Critically Ill Patients, Intensive Care Unit, Hemodynamic Assessment.

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Introduction

Critically ill patients admitted to the intensive care unit (ICU) frequently exhibit complex physiological derangements associated with a high risk of morbidity and mortality. Early recognition of circulatory compromise is essential; as delayed intervention may result in irreversible organ dysfunction and death. [1]

Hemodynamic instability is a hallmark of critical illness and is commonly assessed using parameters such as heart rate and blood pressure. However, isolated vital signs may fail to reflect the severity of circulatory failure. [2] Composite indices derived from basic physiological variables may provide superior prognostic information while remaining simple and cost-effective. [3]

Shock Index (SI), calculated as heart rate divided by systolic blood pressure, was initially described as a marker of hypovolemia and shock. [4] Normal SI ranges between 0.5 and 0.7, with higher values indicating impaired cardiovascular compensation and reduced tissue perfusion. [5]

The role of shock index has been well known as a measure to predict outcomes in trauma, sepsis, myocardial infarction and emergency care. [6-8]

In severely ill patients, early circulatory failure may occur before hypotension manifests. [9] So, a high Shock Index might predict shock early even when vital signs seem normal. This makes SI especially useful in resource limited settings. [10]

Although several studies have demonstrated an association between elevated Shock Index and increased mortality, data from heterogeneous ICU populations in Indian tertiary care centres remain limited. [11-13] Differences in patient demographics, illness burden and healthcare resources make it necessary to test these kinds of predictive algorithms in different settings. [14]

Because Shock Index is easy to use, can be repeated and can be used at the bedside, it is very important to find out if it can predict mortality in critically ill patients. This study was conducted to evaluate the significance of Shock Index upon ICU admission in predicting death among critically ill patients admitted to a tertiary care hospital ICU.

Materials and Methods

Study Design: A Prospective Observational study.

Place of Study: Intensive Care Unit of Nalanda Medical College and Hospital, Patna.

Study duration: From October 2024 to June 2025.

Study Population: Adult patients in critical condition who were admitted to the ICU during the study period.

Sample Size: Ninety-five (95) patients.

Inclusion Criteria

- Age - 18 years or more
- Critically ill patients requiring ICU admission
- Written informed consent from the patient or a legally authorised representative.

Exclusion Criteria

- Incomplete clinical or hemodynamic data
- Pregnancy
- ICU length of stay less than one hour

Data Collection: Standard monitoring equipment was used to record heart rate and systolic blood pressure at the time of ICU admission. The formula used to figure the Shock Index was:

Heart Rate / Systolic Blood Pressure = Shock Index

Patients were monitored during their ICU stay, with outcomes documented as either survival or mortality.

Outcome Measure: Death rate in the ICU.

Analysis of Statistics: Data were incorporated into Microsoft Excel and analysed with the SPSS-27 statistical software. Continuous variables were represented as mean ± standard deviation. The comparison between survivors and non-survivors was conducted using appropriate statistical techniques. A p-value of less than 0.05 was deemed statistically significant.

Results

The study comprised 95 patients who were critically ill. The initial demographic traits were similar between survivors and non-survivors.

Shock Index levels at ICU admission were markedly elevated in non-survivors relative to survivors. Patients with an elevated Shock Index on ICU admission exhibited a significantly increased mortality rate.

The results indicate that Shock Index is a sensitive marker of early hemodynamic instability and has a strong correlation with mortality risk in critically ill patients.

Discussion

The current study shows that the Shock Index evaluated at ICU admission is a strong predictor of death in critically ill patients. Higher Shock Index values were consistently linked to worse outcomes, which supports its use as an early sign of circulatory collapse. [15]

Physiologically, the Shock Index indicates the relationship between the amount of blood the heart pumps and the amount of resistance the blood vessels exert. An elevated heart rate coupled with a decrease in systolic blood pressure signifies insufficient cardiovascular compensation, potentially preceding the onset of overt hypotension. [16] This elucidates why shock index may identify hemodynamic instability earlier than traditional vital indicators. [17]

Prior research in emergency and trauma settings has indicated analogous correlations between high Shock Index and elevated fatality rates. [18-20] The results of this study broaden the evidence to a diverse ICU population, underscoring the wider relevance of Shock Index in critical care settings.

In sepsis and shock conditions, microcirculatory dysfunction and diminished preload lead to compromised tissue perfusion. Shock Index captures these changes in the body in a simple way, which makes it valuable for quick bedside evaluations. [22]

The Shock Index is especially useful in healthcare settings when resources are limited and advanced hemodynamic monitoring technologies may not be available. [23] Regular use of Shock Index may help to find out high-risk patients early and manage aggressively.

Shock Index should not be utilised alone, even though it has some advantages. Using it in combination with clinical judgement and other severity scoring methods may make predictions more accurate. [24]

The limitations of this study are being a single-centre study and relatively small sample size. Additionally, Shock Index was measured at admission only, and serial measurements over time may give more accurate information about the prognosis. Future multicenter trials with larger cohorts and dynamic Shock Index assessment are necessary. [25]

Conclusion

Shock Index is a simple, inexpensive, and reliable predictor of mortality in critically ill patients admitted to the ICU. Routine assessment at ICU admission may facilitate early risk stratification and support timely clinical decision-making.

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