

PREDICTION OF POST INTUBATION CARDIAC ARREST (PICA) IN NON TRAUMATIC PATIENTS ON THE BASIS OF REVERSE SHOCK INDEX (RSI) IN THE EMERGENCY MEDICINE DEPARTMENT

Emergency Medicine

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ABSTRACT

Background: Post-intubation cardiac arrest (PICA) is a serious and potentially fatal complication of emergency endotracheal intubation, particularly in non-traumatic critically ill patients. Early identification of patients at risk is essential to improve outcomes. The Reverse Shock Index (RSI), calculated as pulse rate divided by systolic blood pressure, may serve as a simple bedside predictor of hemodynamic instability and adverse events. **Objectives:** To evaluate the predictive value of the Reverse Shock Index (RSI) for post-intubation cardiac arrest in non-traumatic patients undergoing emergency endotracheal intubation and to compare its performance with the Shock Index (SI). **Methods:** This prospective observational study was conducted from August 2024 to April 2025 in the Emergency Medicine Department of a tertiary care medical college hospital. Adult non-traumatic patients requiring emergent endotracheal intubation were enrolled. Pre-intubation vital parameters were recorded and RSI and SI were calculated. Patients were followed for 24 hours post-intubation for occurrence of cardiac arrest. Data were analyzed using descriptive and inferential statistical methods including logistic regression and ROC curve analysis. **Results:** A total of 70 patients were included, with a mean age of 62.3 ± 15.7 years and male predominance (58.6%). Post-intubation cardiac arrest occurred in 36 patients (51.4%). RSI <1 was independently associated with increased risk of PICA (OR 5.6; 95% CI 1.35–22.34; $p=0.003$). Additional predictors included age, $SpO_2 < 90\%$, and elevated total bilirubin. RSI demonstrated superior predictive performance compared to SI (AUC 0.74 vs. 0.68). **Conclusion:** Reverse Shock Index is a useful bedside predictor of post-intubation cardiac arrest in non-traumatic emergency department patients and performs better than Shock Index. Incorporation of RSI into pre-intubation assessment may improve risk stratification and patient outcomes.

KEYWORDS

Reverse Shock Index, Shock Index, Post-intubation Cardiac Arrest, Emergency Department, Risk Prediction

INTRODUCTION

Endotracheal intubation is a life-saving intervention commonly performed in emergency departments for airway protection and ventilatory support. However, it carries a risk of serious complications, including post-intubation cardiac arrest (PICA), which is associated with high mortality. Non-traumatic critically ill patients are particularly vulnerable due to underlying comorbidities, sepsis, hypoxia, and hemodynamic instability.

The Shock Index (SI), defined as heart rate divided by systolic blood pressure, is widely used to assess circulatory compromise. The Reverse Shock Index (RSI), calculated as pulse rate divided by systolic blood pressure, has been proposed as a potential predictor of adverse outcomes in critically ill patients. RSI may better reflect the balance between cardiovascular demand and perfusion pressure.

Despite increasing interest in shock indices, limited prospective data exist from Indian emergency care settings evaluating RSI as a predictor of post-intubation cardiac arrest. This study was undertaken to assess the predictive value of RSI and compare it with SI in non-traumatic patients undergoing emergency intubation.

MATERIALS AND METHODOLOGY:

Design: Prospective Observational study approved by ethics committee and informed consent obtained.
Sample Size – 70 patients.

Inclusion Criteria

Patients aged ≥ 18 years
Non-traumatic patients requiring emergency endotracheal intubation
Willing to provide informed consent

Exclusion Criteria

Age < 18 years
Trauma patients
Cardiac arrest prior to intubation
Incomplete vital parameter data
Unwillingness to participate

AIMS:

Primary Objective:

To assess the predictive value of Reverse Shock Index for post-intubation cardiac arrest in non-traumatic patients undergoing emergency endotracheal intubation.

Secondary Objectives:

To compare the predictive performance of RSI and Shock Index (SI) and to identify additional predictors of post-intubation cardiac arrest.

DATA COLLECTION:

After Institutional Ethics Committee approval and informed consent, patients were evaluated using a structured proforma. Pre-intubation vital parameters including heart rate, systolic blood pressure, and oxygen saturation were recorded.

RSI was calculated as Pulse Rate / Systolic Blood Pressure. SI was calculated as Heart Rate / Systolic Blood Pressure. Baseline laboratory investigations including total bilirubin were performed. Patients were monitored for 24 hours post-intubation for development of cardiac arrest.

STATISTICAL METHODS: Data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Continuous variables were expressed as mean $\pm$ standard deviation. Categorical variables were expressed as frequencies and percentages. Univariate and multivariate logistic regression analysis were performed. Receiver Operating Characteristic (ROC) curve analysis was used to evaluate predictive performance. $p < 0.05$ was considered statistically significant.

RESULTS:

A total of 70 patients were enrolled, with a mean age of 62.3 ± 15.7 years; 58.6% were male.

The most common indications for intubation were respiratory failure (45.7%), altered mental status (30%), and septic shock (24.3%). Of these 36 (51.4%) developed PICA, while 34 (48.6%) did not.

Table 1: Baseline Characteristics (N = 70)

Variable	Frequency (%)
Male	41 (58.6%)

Female	29 (41.4%)
Mean Age	62.3 ± 15.7 years

Table 2: Occurrence of Post-Intubation Cardiac Arrest

Outcome	Number	Percentage
PICA	36	51.4%
No PICA	34	48.6%

Table 3: Independent Predictors of PICA

Variable	OR	95% CI	p-value
RSI <1	5.6	1.35–22.34	0.003
Age	1.04	1.01–1.08	0.018
SpO ₂ <90%	3.2	1.12–9.15	0.030
Total Bilirubin	1.7	1.09–2.65	0.019

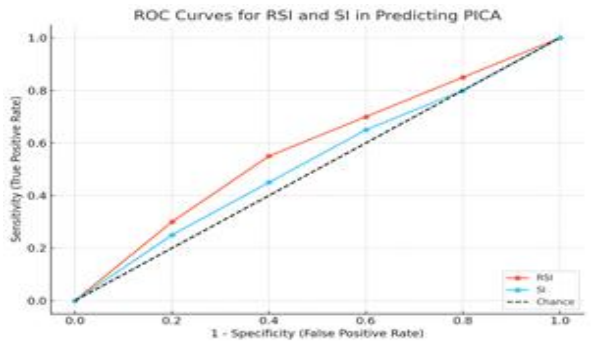


Table 4: ROC Curve Analysis

Parameter	AUC (95% CI)	Sensitivity	Specificity
RSI	0.74 (0.62–0.86)	61.1%	77.3%
SI	0.68 (0.55–0.81)	55.6%	70.6%

DISCUSSION:

This prospective observational study demonstrates that Reverse Shock Index is a significant predictor of post-intubation cardiac arrest in non-traumatic emergency department patients. An RSI value <1 was strongly associated with increased risk of cardiac arrest within 24 hours of intubation.

Advanced age, hypoxia, and elevated bilirubin levels were additional independent predictors. RSI showed better discriminatory ability than Shock Index, indicating potential superiority as a bedside screening tool. Early identification of high-risk patients using RSI may allow optimization of hemodynamic status prior to intubation and improve patient outcomes.

LIMITATIONS:

- Single-center study limits generalizability
- Small sample size
- Short follow-up period of 24 hours
- External validation required

CONCLUSION:

Reverse Shock Index is a valuable and easily calculable bedside predictor of post-intubation cardiac arrest in non-traumatic emergency department patients. It demonstrates superior predictive performance compared to Shock Index. Incorporation of RSI into routine pre-intubation assessment may enhance risk stratification and improve clinical outcomes.

ACKNOWLEDGEMENTS

Authors would like to thank study participants and hospital administration for the generous support.

DECLARATION:

- Funding: No funding sources
- Conflict of interest: None
- Ethical approval: The study was approved by Institutional Ethical Committee

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