

Evaluation of Neutrophil Lymphocyte Ratio and Shock Index as Prognostic Predictors in SepsisPeruri Bhavya¹, Sitaramachandra Gupta N², Ch V Ravi Kiran³, S. Sreenivas⁴, M Sriharibabu⁵, T Jaya Chandra⁶¹Consultant, Department of General Medicine, GSL Medical College, Rajahmundry.²Associate Professor, Department of General Medicine, GSL Medical College, Rajahmundry.³Associate Professor, Department of General Medicine, GSL Medical College, Rajahmundry.⁴Professor, Department of General Medicine, GSL Medical College, Rajahmundry.⁵Prof & Head, Department of General Medicine, GSL Medical College, Rajahmundry.⁶Central Research Laboratory, GSL Medical College, Rajahmundry.

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Abstract**Introduction:** Sepsis, a dysregulated host response to infection, carries a mortality rate of 20%. Prognostic markers like neutrophil lymphocyte ratio (NLR) and shock index (SI) offer insights into inflammation and cardiovascular status, aiding in risk assessment. This study aims to evaluate NLR and SI as predictors of clinical outcomes in sepsis and septic shock.**Methods:** A hospital-based cross-sectional study conducted at GSL Medical College, Rajahmundry, between January 2021 to June 2022, assessed NLR and SI as prognostic indicators in sepsis. Inclusion criteria involved hospitalized adults meeting sepsis criteria, with exclusion of pregnant patients. Comprehensive evaluations and statistical analyses were conducted using SPSS and Excel.**Results:** Out of 79 patients, mean age was 54.82 ± 13.42 years, with 55 survivors (mean age 55.42 ± 13.12) and 24 non-survivors (mean age 53.46 ± 14.28). Diabetes (60.8%) and hypertension (44.3%) were prevalent. No significant gender difference (63.3% male). Significant differences were observed in SOFA scores, NLR, and SI between survivor and non-survivor groups.**Conclusion:** Sepsis and septic shock present critical challenges in patient management. Despite no significant gender disparity, females tend to have a lower likelihood of sepsis. Comorbidities like diabetes and hypertension did not significantly affect disease severity or mortality. NLR and SI emerged as valuable prognostic markers, reflecting disease severity and aiding in risk stratification.**Keywords:** Sepsis, Septic Shock, Gender Differences, Comorbidities, Prognostic Markers.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Sepsis, characterized by a dysregulated host response to infection, leads to organ dysfunction even in the absence of direct infection. With around 6% of hospitalized patients affected, sepsis carries a mortality rate of approximately 20%. [1] Early identification of patients at high risk of mortality is crucial for initiating timely interventions. Prognostic markers like the neutrophil-lymphocyte ratio (NLR) and shock index (SI) play a vital role in this process, offering insights into the severity of inflammation and cardiovascular status. [2] Utilizing these markers alongside clinical and laboratory parameters enables clinicians to anticipate outcomes and tailor interventions effectively. By identifying high-risk patients early, healthcare providers can optimize care delivery,

potentially reducing mortality rates and improving overall patient outcomes in sepsis management.

The evaluation of NLR and SI as prognostic predictors in sepsis has garnered significant interest in medical research. NLR, derived from dividing neutrophil count by lymphocyte count, signifies systemic inflammation and immune dysregulation. Elevated NLR correlates with poor outcomes in sepsis, including higher mortality, prolonged hospitalization, and increased organ dysfunction. [3] As a cost-effective marker, NLR assists in risk assessment and clinical decision-making, aiding in sepsis management. SI, calculated from heart rate divided by systolic blood pressure, indicates cardiovascular status and tissue perfusion. Elevated SI suggests hemodynamic instability and heightened mortality risk in sepsis. [4] While its

predictive value varies, SI aids early identification of deteriorating patients, complementing other prognostic markers in sepsis management. The study aimed to evaluate whether NLR and SI could be used to predict clinical outcomes in patients with sepsis and septic shock.

Methods

It was a hospital based cross sectional study, conducted in the department of General Medicine, GSL Medical College, Rajahmundry. Study was conducted between January 2021 to June 2022. Study protocol was approved by the Institutional Ethics Committee. Informed written consent was taken from the study members.

Inclusion criteria involved hospitalized adults aged 18 years and older meeting sepsis criteria based on the Sequential Organ Failure Assessment (SOFA) score. This facilitated the enrollment of adult inpatients with confirmed sepsis, enabling a targeted assessment of neutrophil lymphocyte ratio and shock index as prognostic indicators in sepsis and septic shock. Exclusion criteria included pregnant patients and those receiving specific medications or having certain medical conditions, ensuring a homogeneous study population for accurate evaluation.

The study encompassed all ICU and Emergency ward patients diagnosed with sepsis during the designated period. Patients meeting inclusion criteria underwent comprehensive evaluation, including history-taking via a pre-structured validated questionnaire, clinical examination, and pertinent laboratory investigations. These investigations comprised complete blood picture (CBP), C-reactive protein (CRP), liver function tests (LFT), renal functional tests (RFT), cultures from various sites, complete urine examination (CUE), fasting and postprandial blood sugar, serum electrolytes, chest X-ray, ECG, and USG abdomen.

Study variables included age, gender, comorbidities, focus of infection, presence of bacteremia, baseline SOFA score, use of vasopressors, mechanical ventilation, and various laboratory investigations. Endpoints for prognostic evaluation were discharge, length of ICU stay, and in-hospital mortality. These parameters allowed for a comprehensive assessment of the predictive capability of neutrophil lymphocyte ratio and shock index in predicting clinical outcomes in patients with sepsis and septic shock.

Statistical Analysis: All statistical analyses were conducted using SPSS software trial version 20.0 and MS Excel-2010. The Chi-square test was employed to evaluate associations among categorical variables. A p-value of <0.05 was deemed statistically significant, indicating meaningful associations between variables.

Results

Total 79 (100%) patients were included, the mean age was 54.82 ± 13.42 years. In this 55 were survived with mean age 55.42 ± 13.12 years and 53.46 ± 14.28 was the mean age for non survivors and statistically there was no significant difference. Total 50 (63.3%) were male and group wise, 32 in and 18, respectively; statistically there was no significant difference. Diabetes was the leading (60.8%) followed by hypertension (44.3%). Smoking was the leading addiction followed by alcohol consumption. Statistically there was no significant difference in mean arterial pressure (MAP), pulse rate (PR) and systolic BP (SBP) but there was significant difference in the SOFA scores, NLR and SI between the groups.

Discussion

Sepsis represents a critical condition characterized by systemic organ dysfunction stemming from the body's dysregulated response to infection. [5] Septic shock, a severe manifestation of sepsis, entails profound circulatory, cellular, and metabolic dysfunctions, leading to an elevated risk of mortality compared to sepsis alone. In septic shock, the body's response to infection triggers a cascade of inflammatory mediators, culminating in widespread vascular dilation, compromised tissue perfusion, and cellular dysfunction. [6] This results in hypotension, impaired oxygen delivery, and multi-organ failure. Timely recognition and aggressive management of septic shock are paramount, as prompt intervention can significantly impact patient outcomes and survival.

In this study the mean age was 54.82 ± 13.42 years. The Australian and New Zealand Intensive Care Society (ANZICS) study population had a relatively higher mean age upon admission at 60.7 years, contrasting with a comparatively younger patient cohort in INDICAPS (mean age 53.8) and our study (mean age 59.7). [7] In another Indian report, the mean age was reported to be 56.3 ± 11.6 years. [8]

While gender and sex are often used interchangeably, they hold distinct meanings in medical contexts. Sex refers to biological characteristics, such as reproductive anatomy and genetic makeup, while gender encompasses social and cultural roles, behaviors, and identities. [9] Despite this distinction, sex-based differences in disease prevalence, presentation, and outcomes are well-documented. For instance, females exhibit a higher prevalence of autoimmune diseases, including rheumatoid arthritis, lupus, and multiple sclerosis, compared to males. [10] The underlying mechanisms behind these sex disparities involve complex interactions between genetic, hormonal, immunological, and environmental factors. Recognizing and understanding these differences are crucial for tailoring personalized healthcare interventions and improv-

ing outcomes for all individuals, regardless of gender identity or expression.

Total 50 (63.3%) were male and group wise, 32 in and 18, respectively; statistically there was no significant difference. In general, being female appears to confer protection against the likelihood of developing sepsis. Following an infectious challenge, females tend to clear bacteria more rapidly than males. [11] Diabetes was the leading (60.8%) followed by hypertension (44.3%). Smoking was the leading addiction followed by alcohol consumption. Statistically there was no significant difference in mean arterial pressure (MAP), pulse rate (PR) and systolic BP (SBP). In the present study, it was observed that patients who had comorbid conditions had no higher chance of developing severe disease and more risk of death than those who did not have the predisposing conditions. The comorbid conditions studied were diabetes mellitus and hypertension. In a study it was reported that there was no significant association between outcome and comorbidities. [12]

NLR value on day 5 was statistically significant with median value being 4.90 ± 6.38 among survivors and 8.60 ± 5.70 among non-survivors. Kaushik R et al. [13] reported that NLR can be a useful diagnostic and prognostic marker in sepsis. Similar to this study findings, Prasad KJD et al. [14] also reported significant difference between SI and septic shock. In this research, there was significant difference in the SOFA scores between the groups. Whereas there was significant raise SOFA score as reported by Shinde VV et al. [15]

In conclusion, sepsis and septic shock present critical challenges in patient management. Despite no significant gender disparity, females tend to have a lower likelihood of sepsis. Comorbidities like diabetes and hypertension did not significantly affect disease severity or mortality. NLR and SI emerged as valuable prognostic markers, reflecting disease severity and aiding in risk stratification.

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