

Comparing the Prognostic Values of Serum hs-CRP and IL-6 with SOFA in Patients with Sepsis and Septic Shock**Sansar Chandra Asiwali¹, Pinki Tak², Monika Kumawat³, Manoj Kumar Banyal⁴, Rajesh Jain⁵**¹Senior Resident, Department of General Medicine, JLN Medical College, Ajmer, Rajasthan, India²Associate Professor, Department of General Medicine, JLN Medical College, Ajmer, Rajasthan, India³Post MBBS Student, RUHS Medical College, Jaipur, Rajasthan, India⁴Senior Resident, Department of General Medicine, RNT Medical College, Udaipur, Rajasthan, India⁵Unit Head and Senior Professor, Department of General Medicine, JLN Medical College, Ajmer, Rajasthan, India

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Corresponding author: Dr. Pinki Tak

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Abstract**Background:** Sepsis and septic shock are life-threatening conditions with high mortality rates. Early identification and accurate prognostic markers are crucial for improving patient outcomes. This study aims to compare the prognostic values of serum high-sensitivity C-reactive protein (hs-CRP) and interleukin-6 (IL-6) with the Sequential Organ Failure Assessment (SOFA) score in patients with sepsis and septic shock.**Methods:** A cross-sectional observational study was conducted on 400 patients admitted to the medical ward and ICU of Jawahar Lal Nehru Hospital, Ajmer, Rajasthan, India, from October 2022 to September 2023. Patients were categorized into two groups based on outcome: mortality (death) and survival. Serum hs-CRP, IL-6, and SOFA scores were measured on days 0, 3, and 7. Statistical analysis was performed using SPSS 20 software.**Results:** The mortality rate in the sepsis cohort was 15%. The mean age of the patients was 52.13±13.82 years, with no significant difference between the mortality and survival groups. The prevalence of diabetes and hypertension was significantly higher in the mortality group. Mean hs-CRP and IL-6 levels were significantly higher in the mortality group compared to the survival group at all time points. The SOFA score was also significantly higher in the mortality group. ROC analysis showed that IL-6 had the highest sensitivity (98%) and specificity (99%) in predicting mortality, followed by hs-CRP (95% sensitivity, 95.6% specificity).**Conclusion:** Serum hs-CRP and IL-6 are valuable prognostic markers for sepsis and septic shock. IL-6, in particular, demonstrated superior sensitivity and specificity in predicting mortality. Combining these biomarkers with the SOFA score can enhance prognostic accuracy and guide early intervention strategies.**Keyword:** Serum hs-CRP, IL-6, SOFA, Sepsis, Septic Shock.**DOI:** 10.25258/ijcpr.18.1.112This 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 is a complex syndrome characterized by a dysregulated host response to infection, leading to life-threatening organ dysfunction. Despite advances in medical treatment, sepsis remains a leading cause of mortality worldwide, with rates ranging from 25% to 30% [1].

Septic shock, a subset of sepsis, is associated with even higher mortality due to persistent hypotension and multi-organ failure [2]. Early diagnosis and timely intervention are critical for improving patient outcomes, but the lack of specific and sensitive biomarkers complicates the process. Traditional biomarkers such as C-reactive protein

(CRP) and procalcitonin (PCT) have been widely used, but their diagnostic and prognostic values are limited [7,8,9]. Recent studies have highlighted the potential of interleukin-6 (IL-6) and high-sensitivity CRP (hs-CRP) as more reliable markers for sepsis prognosis [14,15,16].

The Sequential Organ Failure Assessment (SOFA) score is another tool used to assess the severity of organ dysfunction in sepsis patients [50].

This study aims to evaluate the prognostic values of serum hs-CRP and IL-6 in comparison with the SOFA score in patients with sepsis and septic shock.

Aims and Objectives

1. Estimation of serum IL-6 and hs-CRP in sepsis and septic shock patients on day 0,3,7.
2. To compare the prognostic values of hs-CRP and IL- 6 in sepsis and septic shock patients.

Methods

Study Design and Setting: This cross-sectional observational study was conducted in the Department of Medicine at Jawahar Lal Nehru Medical College and Hospital, Ajmer, Rajasthan, India. The study duration was from October 2022 to September 2023.

Study Population:

A total of 400 patients diagnosed with sepsis or septic shock were enrolled in the study. Inclusion criteria included patients aged 18 years or older with sepsis or septic shock, as defined by the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3.0). Exclusion criteria included patients with rheumatic heart disease, collagen vascular disease, malignancy, pregnancy, recent antibiotic use, or post-surgical status.

Sample Size: The sample size was estimated based on prevalence of disease and using the formula $n = z^2pq/d^2$

Where n = Sample Size

- z= Statistic for a level of confidence. (1.96 For 95%)

- p= Expected prevalence or Proportion (56%)
- d=Precision (5%)

Sample size = 400

Data Collection: Data were collected on demographic characteristics, comorbidities, and clinical parameters. Serum hs-CRP and IL-6 levels were measured on days 0, 3, and 7 using immunoturbidimetric assay and enzyme-linked immunosorbent assay (ELISA), respectively. SOFA scores were calculated at the same time points.

Statistical Analysis: Statistical analysis was performed using SPSS 20 software. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were expressed as percentages. Differences between groups were analyzed using unpaired t-tests and chi-square tests. Receiver operating characteristic (ROC) curve analysis was used to determine the sensitivity and specificity of hs-CRP and IL-6 in predicting mortality.

Results

Demographic and Clinical Characteristics: The mean age of the study population was 52.13±13.82 years, with no significant difference between the mortality and survival groups. The mortality rate was 15%, with 60 patients in the mortality group and 340 in the survival group. The prevalence of diabetes (21.5%) and hypertension (28%) was significantly higher in the mortality group.

Table 1: Outcome of Sepsis Patients

Death		Survival	
No.	%	No.	%
60	15%	340	85%

Table 2: Mean Age in Sepsis Patients

Parameter	Death	Survival	Total	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
Age	49.32±15.29	52.63±13.51	52.13±13.82	0.172

Table 3: Sex Distribution of Sepsis Patients

Parameter		Death		Survival		Total		P Value
		No.	%	No.	%	No.	%	
Gender	Female	20	16.1%	104	83.9%	124	31.0%	0.672
	Male	40	14.5%	236	85.5%	276	69.0%	
	Total	60	15.0%	340	85.0%	400	100.0%	

Biomarker Levels and SOFA Scores

Mean hs-CRP and IL-6 levels were significantly higher in the mortality group compared to the survival group at all time points (p < 0.001). The

SOFA score was also significantly higher in the mortality group (p < 0.001). ROC analysis revealed that IL-6 had the highest sensitivity (98%) and specificity (99%) in predicting mortality, followed by hs-CRP (95% sensitivity, 95.6% specificity).

Table 4: SOFA Score of Sepsis patients at day-0(admission), day-3 and day-7

Parameter	Death	Survival	Total	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
SOFA Score (Day-0)	13.62±2.19	5.51±0.86	6.73±3.12	<0.001
SOFA Score (Day-3)	17.78±1.24	3.00±0.70	5.22±5.35	<0.001
SOFA Score (Day-7)	21.22±1.54	0.50±0.50	3.61±7.44	<0.001

Comparison of TLC, hs-CRP, and IL-6: Total leukocyte count (TLC) at admission had a sensitivity of 60% and specificity of 60% in predicting mortality. In contrast, hs-CRP and IL-6 demonstrated higher sensitivity and specificity, with IL-6 being the most accurate predictor of mortality.

Table 5: hs CRP of Sepsis patients at day-0(admission), day-3 and day-7

Parameter	Death	Survival	Total	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
hs CRP (Day-0)	77.82±8.45	47.44±11.62	52.00±15.60	<0.001
hs CRP (Day-3)	117.10±21.17	46.56±12.63	56.23±28.07	<0.001
hs CRP (Day-7)	143.16±20.08	33.85±7.24	44.83±34.21	<0.001

Table 6: IL-6 of Sepsis patients at day-0(admission), day-3 and day-7

Parameter	Death	Survival	Total	P Value
	Mean (SD)	Mean (SD)	Mean (SD)	
IL-6 (Day-0)	42.08±4.40	20.44±2.10	23.69±8.15	<.001
IL-6 (Day-3)	59.65±8.00	18.74±1.70	24.35±14.48	<.001
IL-6 (Day-7)	72.82±6.50	14.66±2.97	20.51±17.85	<.001

Table 7: ROC Analysis of TLC, hs-CRP and IL-6 in predicting outcome of Sepsis

Parameter	AUC	P Value	CI	Cut-off Value	Sensitivity	Specificity
TLC (Day-0)	0.628	0.002	0.553-0.704	16750	60%	60%
hs CRP (Day-0)	0.997	0.000	0.995-1.000	65.05	95%	95.6%
IL-6 (Day-0)	0.998	0.000	0.998-1.000	29.4	98%	99%

Discussion

The findings of this study highlight the prognostic value of serum hs-CRP and IL-6 in sepsis and septic shock patients. IL-6, in particular, demonstrated superior sensitivity and specificity in predicting mortality compared to hs-CRP and TLC. These results are consistent with previous studies that have shown IL-6 to be a reliable marker for sepsis prognosis [93,105].

The SOFA score, a well-established tool for assessing organ dysfunction in sepsis, was also significantly higher in the mortality group.

This finding underscores the importance of early identification of organ dysfunction in sepsis management. Combining hs-CRP, IL-6, and SOFA scores may provide a more comprehensive prognostic model for sepsis patients.

Limitations

This study has several limitations. The sample size was limited, and the study was conducted at a single center, which may affect the generalizability of the results. Additionally, other biomarkers such as procalcitonin and lactate were not included in the analysis. Future studies should consider a larger, multicenter cohort and include additional biomarkers to further validate these findings.

Conclusion

Serum hs-CRP and IL-6 are valuable prognostic markers for sepsis and septic shock. IL-6, in particular, demonstrated superior sensitivity and specificity in predicting mortality. Combining these biomarkers with the SOFA score can enhance prognostic accuracy and guide early intervention strategies. Future research should focus on developing a comprehensive prognostic model that incorporates multiple biomarkers and clinical parameters to improve sepsis management and patient outcomes.

References

1. Singer M, Deutschman CS, Seymour CW, et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA*. 2016;315(8):801-810.
2. Levy MM, Fink MP, Marshall JC, et al. 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference. *Crit Care Med*. 2003;31(4):1250-1256.
3. Luzzani A, Polati E, Dorizzi R, et al. Comparison of procalcitonin and C-reactive protein as markers of sepsis. *Crit Care Med*. 2003;31(6):1737-1741.
4. Uzzan B, Cohen R, Nicolas P, et al. Procalcitonin as a diagnostic test for sepsis in

- critically ill adults and after surgery or trauma: a systematic review and meta-analysis. *Crit Care Med.* 2006;34(7):1996-2003.
5. Tang BM, Eslick GD, Craig JC, et al. Accuracy of procalcitonin for sepsis diagnosis in critically ill patients: systematic review and meta-analysis. *Lancet Infect Dis.* 2007; 7(3): 210-217.
 6. Reinhart K, Bauer M, Riedemann NC, et al. New approaches to sepsis: molecular diagnostics and biomarkers. *Clin Microbiol Rev.* 2012;25(4):609-634.
 7. Bozza FA, Salluh JJ, Japiassu AM, et al. Cytokine profiles as markers of disease severity in sepsis: a multiplex analysis. *Crit Care.* 2007;11(2):R49.
 8. Gogos CA, Drosou E, Bassaris HP, et al. Pro-versus anti-inflammatory cytokine profile in patients with severe sepsis: a marker for prognosis and future therapeutic options. *J Infect Dis.* 2000;181(1):176-180.
 9. Vincent JL, Moreno R, Takala J, et al. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. *Intensive Care Med.* 1996; 22(7): 707-710.
 10. Zou S, Zhang Z, Yu Y, et al. Prognostic value of serum procalcitonin, high-sensitivity C-reactive protein, and interleukin-6 in patients with sepsis. *J Crit Care.* 2017; 38:1-6.
 11. Li Z, Wang H, Liu J, et al. Serum interleukin-6 and C-reactive protein as early markers of sepsis in patients with severe burns. *Burns.* 2014;40(4):638-644.