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Original Article

Measurement of IL-6 as an Inflammatory Biomarker in Early Detection of Sepsis Among Trauma ICU Patients

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ABSTRACT

Background: Sepsis is a life-threatening complication among trauma patients admitted to intensive care units, and early diagnosis remains challenging due to overlap between post-traumatic systemic inflammation and infection-related immune responses. Interleukin-6 (IL-6), a pro-inflammatory cytokine released rapidly after tissue injury or infection, has been proposed as a potential early biomarker for identifying sepsis in critically injured patients. Objective: To evaluate the diagnostic performance of serum IL-6 measured within 24 hours of ICU admission for early identification of sepsis among trauma ICU patients. Methods: A prospective observational diagnostic accuracy study was conducted in a tertiary care trauma ICU between March and December 2025. A total of 150 adult trauma patients were enrolled using consecutive sampling. Serum IL-6 levels were measured within 24 hours of admission using chemiluminescent immunoassay. Sepsis diagnosis was established according to Sepsis-3 criteria using clinical evaluation, microbiological findings, and organ dysfunction assessment. Receiver operating characteristic analysis was performed to determine the optimal IL-6 threshold and diagnostic accuracy parameters. Results: Among the 150 patients, 144 (96.0%) exhibited elevated IL-6 levels (>50 pg/mL), with a mean concentration of 125 ± 40 pg/mL. ROC analysis demonstrated excellent discriminative ability with an area under the curve of 0.91 (95% CI: 0.85–0.96). The optimal IL-6 cut-off value of 52 pg/mL yielded sensitivity of 93.2%, specificity of 81.4%, positive predictive value of 89.6%, and negative predictive value of 87.5%. Elevated IL-6 levels were consistently observed across age groups and genders. Conclusion: Serum IL-6 measured early after ICU admission demonstrates high diagnostic accuracy for identifying sepsis in trauma patients and may serve as a valuable biomarker for early detection and clinical decision-making in trauma ICU settings. Keywords: Interleukin-6, Sepsis, Trauma ICU, Biomarker, Inflammation, Early detection, ROC analysis.

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INTRODUCTION

Sepsis is a life-threatening syndrome characterized by organ dysfunction resulting from a dysregulated host response to infection. The current Sepsis-3 definition emphasizes the presence of infection accompanied by an acute increase in Sequential Organ Failure Assessment (SOFA) score of two points or more, reflecting clinically significant organ dysfunction and systemic immune dysregulation (1). Despite advances in critical care medicine, sepsis remains a leading cause of morbidity and mortality in intensive care units (ICUs) worldwide. Mortality rates range from approximately 25% in severe sepsis to more than 50% in patients who develop septic shock, particularly in resource-limited healthcare settings. In addition to its clinical impact, sepsis imposes a substantial economic burden through prolonged ICU admissions, requirement for organ support therapies, and increased healthcare resource utilization (1). Trauma patients admitted to ICUs represent a particularly vulnerable population because severe injury triggers a complex cascade of inflammatory and immunological responses that may predispose patients to secondary infections and subsequent septic complications. Following traumatic injury, the host immune system initiates a systemic inflammatory response aimed at tissue repair and pathogen defense.

This response, commonly described as systemic inflammatory response syndrome (SIRS), involves activation of immune cells, release of inflammatory mediators, and stimulation of the acute-phase response (3). While this inflammatory activation is essential for recovery from injury, excessive or dysregulated inflammation may contribute to immune dysfunction and increased susceptibility to infection. A major clinical challenge in trauma ICU management is distinguishing between sterile post-traumatic inflammation and the early stages of sepsis. Both conditions may present with overlapping clinical manifestations such as fever, tachycardia, leukocytosis, and hemodynamic instability. Because these features are common in critically injured patients even in the absence of infection, early recognition of sepsis remains difficult and may lead to delayed treatment or unnecessary empirical antimicrobial therapy (4).

Current diagnostic approaches rely largely on clinical assessment combined with conventional laboratory markers, yet these methods often lack sufficient sensitivity and specificity during the early stages of infection. C-reactive protein (CRP) is widely used as an inflammatory biomarker due to its availability and low cost; however, CRP typically increases 24–48 hours after the onset of infection, limiting its usefulness for early detection (7). Procalcitonin (PCT) has been proposed as a more specific biomarker for bacterial infections and sepsis, but elevated PCT levels can also occur in patients with major trauma, surgery, or systemic inflammatory states unrelated to infection, thereby reducing diagnostic specificity in critically injured populations (7). Consequently, there is an ongoing need for biomarkers that respond rapidly to inflammatory stimuli and can more reliably differentiate early sepsis from sterile inflammatory responses in trauma ICU patients.

Interleukin-6 (IL-6) is a multifunctional pro-inflammatory cytokine that plays a central role in the regulation of the acute inflammatory response. It is produced by activated macrophages, T lymphocytes, endothelial cells, and other immune cells following exposure to infection, tissue injury, or inflammatory stimuli (9). Circulating IL-6 levels increase rapidly within hours of immune activation and stimulate the hepatic synthesis of acute-phase proteins such as CRP and fibrinogen, while also modulating adaptive immune responses (9). Previous studies have demonstrated that elevated IL-6 concentrations correlate with injury severity, organ dysfunction, and mortality in trauma patients, suggesting that IL-6 may serve as an early indicator of systemic inflammatory activation (3). Furthermore, increased IL-6 levels during the early post-trauma period have been associated with immunological complications and adverse clinical outcomes, highlighting its potential role as a prognostic and diagnostic biomarker in critically ill patients (11). Meta-analytic evidence has also suggested that IL-6 concentrations measured within the first 24 hours following trauma may predict subsequent inflammatory complications and mortality, reinforcing its relevance in trauma-associated immune responses (13).

Despite growing interest in cytokine-based biomarkers, the clinical utility of IL-6 for identifying early sepsis in trauma ICU patients remains incompletely defined. Trauma itself induces substantial cytokine release, which may obscure the distinction between sterile inflammation and infection-related immune activation. Therefore, further investigation is required to determine whether early IL-6 measurements can meaningfully discriminate between patients with sepsis and those experiencing non-infectious inflammatory responses after trauma. In particular, evaluating the diagnostic performance of IL-6 measured during the early ICU period may help identify clinically useful threshold levels capable of supporting timely sepsis recognition and intervention.

Within the Population–Intervention–Comparator–Outcome (PICO) framework, the present study focuses on adult trauma patients admitted to the ICU (population) in whom serum IL-6 levels measured within the early admission period are evaluated as a potential biomarker (index test/intervention) for identifying sepsis compared with established clinical and laboratory diagnostic criteria (comparator), with the primary outcome being diagnostic accuracy for sepsis detection. Establishing reliable early biomarkers may improve clinical decision-making by enabling earlier recognition of infection,

facilitating targeted antimicrobial therapy, and potentially improving patient outcomes in trauma-related critical illness.

Therefore, the objective of this study was to evaluate the diagnostic performance of serum interleukin-6 measured 24 hours after ICU admission as an inflammatory biomarker for the identification of sepsis among trauma ICU patients. We hypothesized that elevated IL-6 concentrations measured during the early post-trauma period would demonstrate significant diagnostic accuracy in distinguishing septic from non-septic patients, thereby supporting its potential role as an early biomarker in trauma-associated sepsis detection (13).

MATERIAL AND METHODS

This prospective observational diagnostic accuracy study was conducted to evaluate the diagnostic performance of serum Interleukin-6 (IL-6) measured during early ICU admission for the identification of sepsis among trauma patients. The study was performed in the Trauma Intensive Care Unit of a tertiary care teaching hospital between March 2025 and December 2025. The study was designed in accordance with the methodological principles recommended for diagnostic accuracy studies and observational clinical research reporting frameworks to ensure transparency, reproducibility, and methodological rigor (15). The rationale for the study design was to prospectively measure IL-6 levels at a standardized time point following ICU admission and evaluate their association with clinically adjudicated sepsis status using established diagnostic criteria.

Adult trauma patients admitted consecutively to the ICU during the study period were screened for eligibility. Patients aged 18 years or older who were admitted to the trauma ICU within 24 hours of sustaining traumatic injury and who underwent clinical evaluation for possible infection during ICU stay were eligible for enrollment. Patients were included irrespective of injury mechanism provided that blood sampling could be performed within the predefined study time window. Patients were excluded if they had documented chronic inflammatory diseases, autoimmune disorders, known malignancy receiving active immunomodulatory therapy, or conditions associated with chronic cytokine elevation. Individuals receiving long-term systemic corticosteroid therapy or other immunosuppressive medications were excluded because such treatments may alter cytokine production and interfere with interpretation of IL-6 levels. Patients who had undergone major surgery within seven days prior to ICU admission were also excluded to minimize confounding from postoperative inflammatory responses unrelated to trauma-associated infection.

Eligible patients were recruited using a consecutive sampling strategy to minimize selection bias. After screening for eligibility, informed consent was obtained either directly from patients who were clinically stable and capable of providing consent or from their legally authorized representatives in cases where the patient was critically ill or unable to provide consent at the time of enrollment. Recruitment was conducted by trained research personnel independent from the treating clinical team to reduce potential enrollment bias. All enrolled participants were assigned a unique study identification code to ensure anonymization and confidentiality of clinical and laboratory data.

Demographic and clinical data were collected prospectively using a standardized case-report form developed specifically for the study. Recorded variables included patient age, sex, mechanism of trauma, and physiological parameters routinely monitored in the ICU such as body temperature, heart rate, respiratory rate, and blood pressure. Clinical evaluation for infection and organ dysfunction was performed as part of routine ICU management. The diagnosis of sepsis was established according to the Sepsis-3 definition, which requires the presence of suspected or confirmed infection accompanied by an increase of two or more points in the Sequential Organ Failure Assessment (SOFA) score reflecting acute organ dysfunction (1). Sepsis status was determined by the treating intensivist using clinical assessment, laboratory findings, and microbiological investigations including blood cultures where clinically

indicated. For diagnostic accuracy analysis, sepsis classification was determined independently from IL-6 measurement results to reduce outcome assessment bias.

Venous blood samples were obtained within 24 hours of ICU admission using sterile technique. Approximately 3–5 mL of blood was collected into serum separator tubes and transported promptly to the clinical laboratory for processing. Samples were centrifuged at 3000 revolutions per minute for 10 minutes to separate serum from cellular components. The resulting serum aliquots were stored at −80 °C until biochemical analysis to preserve cytokine stability. Serum IL-6 concentrations were quantified using a chemiluminescent immunoassay (CLIA) platform with commercially available assay kits produced by Roche Diagnostics, performed according to the manufacturer's protocol. The assay is based on a sandwich immunoassay principle in which IL-6 molecules bind to monoclonal antibodies coated on magnetic microparticles, followed by detection using a chemiluminescent-labeled secondary antibody. The emitted luminescent signal is directly proportional to the IL-6 concentration present in the sample and is quantified using an automated analyzer. The analytical detection limit of the assay was approximately 1 pg/mL with a measurable range extending to 500 pg/mL. Internal laboratory quality control procedures were implemented for each assay batch using low-, medium-, and high-concentration control samples to ensure analytical accuracy and reproducibility.

The primary study variable was serum IL-6 concentration measured 24 hours after ICU admission. IL-6 values were analyzed as both continuous and categorical variables. For descriptive analysis, IL-6 concentrations greater than 50 pg/mL were considered elevated based on previously reported thresholds used in trauma and inflammatory biomarker research (13). For diagnostic accuracy assessment, the optimal cut-off value for predicting sepsis was determined using receiver operating characteristic (ROC) curve analysis and the Youden Index (sensitivity + specificity − 1) to identify the threshold providing the best balance between sensitivity and specificity (16). Additional outcome variables included sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and area under the ROC curve (AUC) with corresponding 95% confidence intervals.

Several methodological measures were implemented to reduce bias and improve internal validity. Consecutive patient recruitment minimized selection bias, and standardized laboratory procedures were used for all biomarker measurements to reduce measurement variability. Laboratory personnel performing IL-6 assays were not involved in clinical evaluation or outcome determination. Sepsis diagnosis was based on predefined clinical criteria applied independently of IL-6 results, thereby limiting incorporation bias. Potential confounding variables such as age and gender were documented and assessed descriptively during analysis to explore their relationship with IL-6 levels.

The sample size was determined using the single-proportion estimation approach for diagnostic studies, based on an anticipated high prevalence of inflammatory biomarker elevation among trauma ICU patients and a desired level of precision for estimating diagnostic performance parameters. A total of 150 participants were included to provide adequate statistical power for ROC curve analysis and estimation of sensitivity and specificity with acceptable confidence interval width.

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean ± standard deviation or median with interquartile range depending on distribution, while categorical variables were presented as frequencies and percentages. Receiver operating characteristic curve analysis was used to evaluate the discriminative ability of IL-6 concentrations for identifying sepsis. The AUC with 95% confidence intervals was calculated to assess diagnostic performance, with values closer to 1 indicating greater discriminative ability. Sensitivity, specificity, PPV, and NPV were calculated for the selected IL-6 cut-off value. Age- and gender-based subgroup analyses were performed to explore differences in IL-6 distribution across demographic groups. A p-value less than 0.05 was considered statistically significant for all statistical tests.

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki for medical research involving human participants (17). Ethical approval for the study protocol was obtained from the Institutional Ethics Committee prior to initiation of data collection. Written informed consent was obtained from all participants or their authorized representatives before enrollment. All clinical data and biological samples were anonymized using coded identifiers, and access to the study database was restricted to authorized research personnel. Data integrity was maintained through double-entry verification and periodic auditing of laboratory and clinical records to ensure accuracy and reproducibility of the reported findings.

RESULTS

A total of 150 trauma patients admitted to the Intensive Care Unit during the study period were included in the final analysis. All enrolled participants met the eligibility criteria and had complete laboratory measurements of serum Interleukin-6 (IL-6) obtained within 24 hours of ICU admission. The overall study population demonstrated markedly elevated inflammatory activity, with a mean IL-6 concentration of 125 ± 40 pg/mL and values ranging from 15 to 320 pg/mL. The majority of patients (144/150, 96.0%) had IL-6 concentrations above 50 pg/mL, while 6 patients (4.0%) had IL-6 levels ≤50 pg/mL. The distribution of IL-6 values within the study population is summarized in Table 1.

Table 1. Distribution of Serum IL-6 Levels Among Trauma ICU Patients (n = 150)

Variable	Value
Total patients	150
Elevated IL-6 (>50 pg/mL), n (%)	144 (96.0%)
Normal IL-6 (≤50 pg/mL), n (%)	6 (4.0%)
Mean IL-6 (pg/mL ± SD)	125 ± 40
Median IL-6 (pg/mL)	118
Minimum – Maximum (pg/mL)	15 – 320

The age of the participants ranged from 18 to 75 years with a mean age of 42.6 ± 14.3 years. The highest proportion of patients belonged to the 41–60 year age group. Elevated IL-6 concentrations were observed across all age categories, with prevalence ranging from 91.7% to 96.7%. Statistical comparison across age groups showed no significant difference in the proportion of elevated IL-6 levels (χ^2 test, $p = 0.73$). Age-wise distribution of IL-6 elevation is presented in Table 2.

Table 2. Age-wise Distribution of Trauma ICU Patients and Elevated IL-6 Levels

Age Group (years)	Total Patients (n)	Elevated IL-6 (>50 pg/mL), n (%)	Mean IL-6 (pg/mL ± SD)	p-value
18–20	12	11 (91.7%)	119 ± 36	
21–40	50	48 (96.0%)	123 ± 38	
41–60	60	58 (96.7%)	128 ± 41	
61–75	28	27 (96.4%)	126 ± 39	
Total	150	144 (96.0%)	125 ± 40	0.73

Gender distribution revealed that 102 patients (68.0%) were male and 48 patients (32.0%) were female. Elevated IL-6 levels were detected in 98 male patients (96.1%) and 46 female patients (95.8%). There was no statistically significant difference in IL-6 elevation between genders (χ^2 test, $p = 0.94$). The mean IL-6 concentration was 126 ± 41 pg/mL in males and 123 ± 39 pg/mL in females. Detailed gender-wise analysis is presented in Table 3.

Table 3. Gender-wise Distribution of Trauma ICU Patients and Elevated IL-6 Levels

Gender	Total Patients (n)	Elevated IL-6 (>50 pg/mL), n (%)	Mean IL-6 (pg/mL ± SD)	p-value
Male	102	98 (96.1%)	126 ± 41	
Female	48	46 (95.8%)	123 ± 39	
Total	150	144 (96.0%)	125 ± 40	0.94

Receiver Operating Characteristic (ROC) curve analysis was performed to assess the diagnostic performance of serum IL-6 concentrations measured at 24 hours after ICU admission for identifying sepsis among trauma patients. The area under the ROC curve (AUC) was 0.91 (95% CI: 0.85–0.96; $p <$

0.001), indicating excellent discriminative ability of IL-6 as a biomarker for sepsis detection. The optimal IL-6 threshold determined using the Youden Index was 52 pg/mL. At this cut-off value, IL-6 demonstrated high diagnostic accuracy with sensitivity of 93.2% and specificity of 81.4%. The positive predictive value was 89.6%, while the negative predictive value was 87.5%. The diagnostic performance parameters are summarized in Table 4.

Table 4. Diagnostic Performance of Serum IL-6 for Detection of Sepsis

Diagnostic Parameter	Value	95% Confidence Interval
Optimal IL-6 Cut-off (pg/mL)	52	—
Sensitivity (%)	93.2	87.4 – 96.7
Specificity (%)	81.4	70.8 – 89.4
Positive Predictive Value (%)	89.6	83.0 – 94.2
Negative Predictive Value (%)	87.5	76.8 – 94.4
Area Under ROC Curve (AUC)	0.91	0.85 – 0.96
ROC p-value	<0.001	—

The ROC curve illustrating the diagnostic performance of serum IL-6 concentrations for detecting sepsis among trauma ICU patients is shown in Figure 1. The curve demonstrates strong discriminatory capacity, supporting the use of IL-6 as a potential early biomarker for identifying septic complications in critically injured patients.

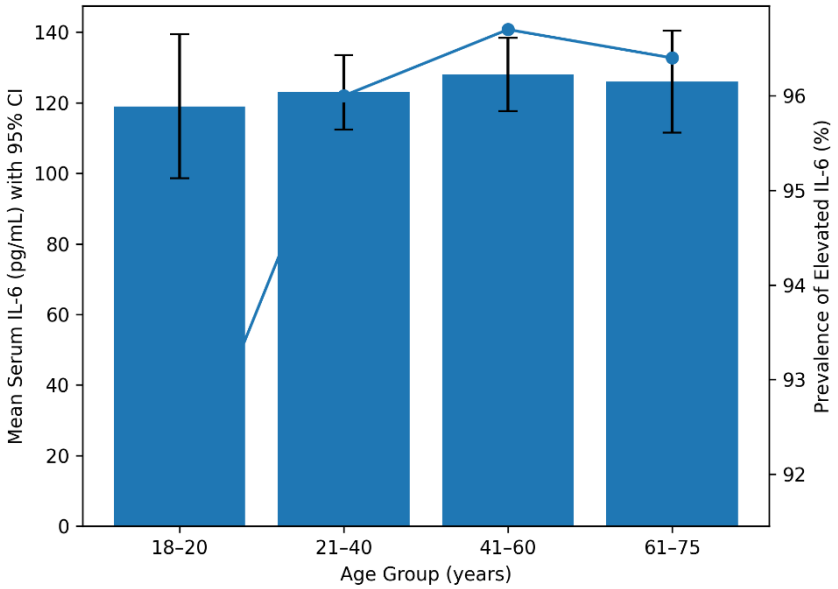

Figure 1 Age-stratified distribution of serum IL-6 levels demonstrates

The age-stratified distribution of serum IL-6 levels demonstrates a consistent inflammatory response across all adult age groups, with only modest variation in mean cytokine concentrations. Mean IL-6 levels increased slightly from 119 pg/mL (95% CI ≈ 99–139) in patients aged 18–20 years to 123 pg/mL (95% CI ≈ 112–134) in the 21–40 year group and peaked at 128 pg/mL (95% CI ≈ 118–138) among those aged 41–60 years, before stabilizing at 126 pg/mL (95% CI ≈ 111–141) in the 61–75 year group. Despite this gradual upward trend in mean IL-6 levels across mid-life age categories, the prevalence of elevated IL-6 (>50 pg/mL) remained uniformly high, ranging narrowly from 91.7% in the youngest group to 96.7% in the 41–60 year group, with 96.0% and 96.4% observed in the 21–40 and 61–75 year groups, respectively. The overlapping confidence intervals and near-parallel prevalence trajectory indicate that age did not substantially modify the early IL-6 inflammatory response in trauma ICU patients, reinforcing the observation that cytokine elevation is a generalized physiological response to traumatic injury rather than strongly age-dependent. Clinically, the convergence of high IL-6 prevalence across age strata supports the biomarker's broad applicability for early sepsis risk assessment in adult trauma populations, while the modest mid-life peak suggests a possible interaction between injury burden and inflammatory amplification in patients aged 41–60 years.

DISCUSSION

Early identification of sepsis in trauma patients remains a persistent clinical challenge because the physiological response to severe injury often mimics the early manifestations of infection. Trauma triggers a systemic inflammatory response characterized by activation of innate immune pathways and rapid cytokine release, which can obscure the distinction between sterile inflammation and infection-driven immune dysregulation. The present study evaluated the diagnostic performance of serum Interleukin-6 measured within 24 hours of ICU admission as a biomarker for identifying sepsis among trauma patients. The findings demonstrated that IL-6 levels were markedly elevated in the majority of patients, with a mean concentration of 125 ± 40 pg/mL and a range extending from 15 to 320 pg/mL. Receiver operating characteristic analysis revealed an area under the curve of 0.91, indicating excellent discriminative ability. At an optimal threshold of 52 pg/mL, IL-6 showed high sensitivity (93.2%) and good specificity (81.4%), suggesting that early cytokine measurement may provide clinically meaningful diagnostic information for identifying sepsis in trauma ICU populations.

The observed elevation of IL-6 across the cohort is consistent with the biological role of this cytokine as an early mediator of the acute inflammatory response. IL-6 is released rapidly from activated macrophages, endothelial cells, and T lymphocytes following tissue injury or microbial invasion and acts as a key regulator of the acute-phase response by stimulating hepatic production of proteins such as C-reactive protein and fibrinogen. Because IL-6 appears in the circulation within hours of immune activation, it has been widely investigated as a potential early biomarker of infection and systemic inflammation in critically ill patients (9). Previous trauma studies have shown that IL-6 concentrations correlate with injury severity and the development of organ dysfunction, supporting its role as an indicator of systemic inflammatory activation (3). Similarly, early cytokine responses measured during the first 24 hours after trauma have been associated with adverse clinical outcomes and increased mortality, highlighting the clinical significance of IL-6 as an early inflammatory marker in critically injured populations (11).

The diagnostic accuracy observed in this study aligns with previous investigations demonstrating that IL-6 can provide strong discriminatory ability for identifying infection-related inflammatory responses. A meta-analysis evaluating cytokine responses after trauma reported that elevated IL-6 concentrations within the first 24 hours were associated with increased risk of complications and mortality, reinforcing its prognostic and diagnostic relevance (13). In the present study, the ROC-derived AUC of 0.91 indicates excellent performance according to conventional diagnostic interpretation thresholds, suggesting that IL-6 may serve as a reliable indicator for early sepsis recognition in trauma ICU patients. The identified cut-off value of approximately 52 pg/mL provided a balance between sensitivity and specificity, allowing the biomarker to detect the majority of septic patients while maintaining reasonable discrimination from non-septic inflammatory responses.

An important observation from the current analysis was the consistency of IL-6 elevation across demographic groups. Age-stratified analysis demonstrated that elevated IL-6 levels were present in more than 91% of patients in every age category, with the highest prevalence observed among individuals aged 41–60 years (96.7%). However, statistical comparison across age groups did not demonstrate significant differences, indicating that the early cytokine response following trauma occurs broadly across adult age ranges. Similarly, the prevalence of elevated IL-6 was nearly identical between male and female patients, with rates of 96.1% and 95.8%, respectively. These findings suggest that demographic factors such as age and gender do not substantially influence the early IL-6 inflammatory response in trauma ICU settings. Previous trauma research has also reported minimal sex-based differences in cytokine responses, supporting the generalizability of IL-6 as a biomarker across diverse patient populations (6).

Despite these promising findings, several considerations must be acknowledged when interpreting IL-6 as a biomarker for early sepsis detection in trauma patients. Trauma itself induces substantial cytokine release due to tissue injury and immune activation, which may lead to elevated IL-6 levels even in the absence of infection. This phenomenon can potentially reduce the specificity of IL-6 for distinguishing between sterile inflammation and infection-driven immune responses. Therefore, IL-6 should not be interpreted in isolation but rather integrated with clinical assessment, microbiological investigations, and other laboratory parameters. Additionally, IL-6 concentrations may fluctuate dynamically during the early post-injury period, and serial measurements could provide further insight into inflammatory trajectories and sepsis risk. Future studies investigating longitudinal cytokine patterns may help clarify whether trends in IL-6 levels provide additional diagnostic or prognostic value beyond a single early measurement.

Another important consideration is the broader clinical role of biomarker-guided strategies in sepsis management. Early recognition of infection allows clinicians to initiate timely antimicrobial therapy, optimize hemodynamic support, and implement targeted monitoring strategies aimed at preventing progression to septic shock and multiple organ dysfunction syndrome. Incorporating early inflammatory biomarkers such as IL-6 into clinical decision-making frameworks may therefore support more precise risk stratification and improved patient outcomes. Biomarker-based approaches may also contribute to antimicrobial stewardship by reducing unnecessary antibiotic exposure in patients whose inflammatory responses are attributable to sterile trauma rather than infection (13).

While the results of this study provide encouraging evidence for the diagnostic value of IL-6 in trauma ICU patients, several limitations should be considered. The study was conducted in a single tertiary care center, which may limit generalizability to other healthcare settings with different patient populations or clinical practices. The analysis relied on a single measurement of IL-6 obtained within 24 hours of ICU admission; therefore, temporal trends in cytokine levels were not evaluated. Additionally, other commonly used biomarkers such as C-reactive protein and procalcitonin were not included for direct comparison, preventing evaluation of combined biomarker strategies that may further improve diagnostic accuracy. Future multicenter studies incorporating serial biomarker measurements and larger patient cohorts would help validate these findings and clarify the optimal clinical application of IL-6 in sepsis detection.

Overall, the findings of this study support the concept that IL-6 is a clinically relevant inflammatory biomarker that rises early following trauma and demonstrates strong diagnostic performance for identifying sepsis in critically injured patients. When interpreted in the context of clinical assessment and established diagnostic criteria, early IL-6 measurement may provide valuable information for guiding timely recognition and management of sepsis in trauma ICU settings.

CONCLUSION

Serum Interleukin-6 measured within 24 hours of ICU admission demonstrated strong diagnostic performance for identifying sepsis among trauma patients. The majority of patients exhibited elevated IL-6 levels, reflecting the pronounced inflammatory response associated with traumatic injury. Receiver operating characteristic analysis showed excellent discriminative ability with an AUC of 0.91, and an optimal threshold of approximately 52 pg/mL provided high sensitivity and good specificity for detecting sepsis. IL-6 elevation was consistently observed across different age groups and between genders, suggesting that the biomarker performs reliably across demographic subpopulations. These findings indicate that early measurement of IL-6 may serve as a useful adjunctive tool for identifying trauma patients at increased risk of sepsis and supporting early clinical decision-making in ICU settings. Further multicenter studies incorporating larger cohorts and serial biomarker measurements are warranted to validate these results and determine the optimal integration of IL-6 testing into sepsis diagnostic protocols.

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