# CLINICAL PRESENTATION OF PEDIATRIC SEPSIS IN CHILDREN ADMITTED TO THE PEDIATRIC INTENSIVE CARE UNIT: A RETROSPECTIVE OBSERVATIONAL STUDY

**Gawkhar M. Tulegenova**
*Tashkent State Medical University (Tashkent, Uzbekistan)*
gmtulegenova@gmail.com

***Annotation:*** *Pediatric sepsis remains a major cause of morbidity and mortality in critically ill children. Early recognition is challenging due to nonspecific clinical manifestations, which often overlap with other infectious and inflammatory conditions. Bedside clinical assessment continues to play a central role in the early identification of sepsis, particularly before laboratory results become available.*

***Aim:*** *To characterize the clinical presentation of pediatric sepsis at the time of hospital admission based on retrospective analysis of bedside clinical findings in children admitted to the Pediatric Intensive Care Unit (PICU).*

***Materials and Methods:*** *A retrospective observational study was conducted using anonymized medical records of 21 pediatric patients diagnosed with sepsis and admitted to a tertiary PICU. Data included demographic characteristics, vital signs, and physical examination findings recorded at admission. Laboratory and microbiological data were excluded. Descriptive statistical methods were applied.*

***Results:*** *The most common clinical manifestations included abnormal pulmonary auscultation (81.0%), respiratory compromise (66.7%), and pallor (66.7%). Tachycardia was frequently observed, with a mean heart rate of 131.8 beats/min. Peripheral oxygen saturation averaged 92.4%, with values as low as 74%. Fever was present in some patients but demonstrated significant variability (36.2–39.2°C). Two patients (9.5%) required invasive mechanical ventilation. Overall, respiratory abnormalities and signs of impaired perfusion predominated at admission.*

***Conclusions:*** *Pediatric sepsis presents with heterogeneous clinical manifestations; however, respiratory abnormalities, altered vital signs, and impaired peripheral perfusion are the most consistent early findings. Careful bedside clinical assessment remains essential for early recognition and timely initiation of treatment before laboratory confirmation.*

***Keywords:*** *Pediatric sepsis; intensive care; clinical presentation; respiratory distress; vital signs; retrospective study.*

Sepsis remains one of the leading causes of morbidity and mortality among pediatric patients worldwide and continues to represent a major challenge for emergency physicians and pediatric intensivists. Despite substantial advances in antimicrobial therapy, intensive care technologies, and supportive treatment, sepsis is still associated with high rates of organ dysfunction, prolonged hospitalization, and adverse clinical outcomes. According to recent international estimates, infectious diseases complicated by sepsis account for a considerable proportion of pediatric intensive care unit (PICU) admissions and remain an important cause of preventable childhood mortality, particularly in critically ill patients.

The pathophysiology of pediatric sepsis is characterized by a dysregulated host immune response to infection, resulting in systemic inflammation, endothelial dysfunction, impaired microcirculation, and progressive tissue hypoperfusion. If not recognized and treated promptly, these processes may rapidly progress to multiple organ dysfunction syndrome, septic shock, and death. Because children possess unique physiological characteristics and compensatory mechanisms that differ substantially from those of adults, the clinical course of sepsis may evolve rapidly, making early recognition particularly challenging.

Timely diagnosis remains one of the most important determinants of survival in pediatric sepsis. Numerous clinical studies have demonstrated that early initiation of appropriate antimicrobial therapy, aggressive fluid resuscitation, hemodynamic stabilization, respiratory support, and continuous monitoring significantly improve patient outcomes. International guidelines, including the Surviving Sepsis Campaign recommendations, emphasize that prompt recognition during the first hours after hospital presentation is essential for reducing mortality and limiting irreversible organ injury.

However, early identification of pediatric sepsis remains difficult because its initial manifestations are frequently nonspecific and overlap with those of common viral and bacterial infections. Unlike adults, children often present with subtle clinical deterioration before the development of overt circulatory collapse. Fever may be absent, and classical signs of severe infection may not appear until significant physiological decompensation has already occurred. Consequently, reliance on a single clinical symptom or laboratory biomarker is insufficient for establishing an early diagnosis.

During the initial evaluation in the emergency department or pediatric intensive care unit, clinicians primarily depend on bedside clinical examination and assessment of vital signs before laboratory investigations become available. Careful evaluation of body temperature, heart rate, respiratory status, oxygen saturation, peripheral perfusion, level of consciousness, and overall clinical appearance remains the cornerstone of early diagnostic assessment. Recognition of abnormal physiological patterns enables clinicians to initiate empiric antimicrobial therapy and supportive treatment without unnecessary delay.

Although numerous investigations have focused on laboratory biomarkers, inflammatory mediators, molecular diagnostics, and prognostic scoring systems, comparatively fewer studies have specifically examined the spectrum of clinical manifestations documented during the first bedside assessment of children with sepsis. Nevertheless, these early clinical findings often determine the urgency of therapeutic interventions and influence decisions regarding admission to the pediatric intensive care unit.

A better understanding of the initial clinical presentation of pediatric sepsis may facilitate earlier recognition of critically ill children, improve diagnostic accuracy, and support timely implementation of evidence-based management strategies. Furthermore, characterization of routine bedside findings may be particularly valuable in healthcare settings where advanced laboratory testing is not immediately available.

Therefore, the present retrospective observational study aimed to characterize the clinical presentation of pediatric sepsis at the time of hospital admission by analyzing routinely documented bedside clinical findings in children admitted to a pediatric intensive care unit. The study specifically focused on clinical manifestations observed during the initial physical examination, including abnormalities of vital signs, respiratory findings, peripheral oxygen saturation, and general clinical condition, while intentionally excluding laboratory and microbiological parameters to emphasize the diagnostic value of early clinical assessment.

**Materials and Methods: Study Design:** A retrospective observational study was conducted to evaluate the clinical presentation of pediatric sepsis at the time of hospital admission. The study was based on the analysis of anonymized medical records of children who underwent treatment in the Pediatric Intensive Care Unit (PICU) of a tertiary children's hospital. The retrospective design enabled the assessment of routinely documented clinical findings obtained during the initial bedside examination without influencing patient management.

**Study Population:** The study included pediatric patients admitted to the PICU with a documented clinical diagnosis of sepsis during the study period. Medical records were reviewed consecutively to minimize selection bias.

Eligible patients met the following inclusion criteria:

- age below 18 years;
- clinical diagnosis of sepsis established by the attending physicians and documented in the medical records;
- admission to the Pediatric Intensive Care Unit;
- availability of complete clinical documentation describing the patient's condition at hospital admission.

Patients were excluded if the medical records contained incomplete documentation of the initial clinical examination or lacked essential physiological parameters required for analysis. Following application of the eligibility criteria, 21 patients were included in the final analysis, while one record was excluded because of incomplete documentation.

**Data Collection:** Clinical information was extracted retrospectively from archived medical records using a standardized data collection form. Only variables routinely documented during the initial bedside assessment were included in the analysis.

The following demographic and clinical characteristics were collected:

- age;
- sex;
- body temperature at admission;
- general clinical condition;
- heart rate;
- respiratory rate (when documented);
- peripheral oxygen saturation ($SpO_2$);
- findings of the initial physical examination;
- requirement for respiratory support, including invasive mechanical ventilation.

Special attention was paid to respiratory manifestations, cardiovascular findings, skin perfusion, and other physical signs reflecting systemic inflammatory response. Laboratory investigations, microbiological results, imaging findings, and therapeutic outcomes were intentionally excluded because the objective of the study was to characterize the clinical presentation observed before additional diagnostic investigations became available.

**Outcome Measures:** The primary outcome of the study was the frequency of clinical manifestations documented during the initial examination of pediatric patients with sepsis.

Secondary outcomes included the description of physiological parameters at admission, including body temperature, heart rate, peripheral oxygen saturation, and the requirement for respiratory support.

**Statistical Analysis:** Statistical analysis was performed using descriptive statistical methods. Continuous variables were summarized as mean ± standard deviation (SD) when normally distributed or as median with interquartile range (IQR) when appropriate. Minimum and maximum values were also reported to demonstrate data variability. Categorical variables were expressed as absolute numbers and percentages. Because of the relatively small sample size, no comparative statistical analyses or multivariable modeling were performed. The results are presented descriptively to characterize the spectrum of clinical manifestations observed during hospital admission.

**Ethical Considerations:** The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and institutional regulations governing retrospective observational research.

All patient data were fully anonymized before analysis, and no personally identifiable information was collected. Because the study involved retrospective analysis of existing medical records without any intervention or direct patient contact, patient confidentiality was strictly maintained throughout the study.

**Study Strengths and Limitations:** The retrospective design allowed evaluation of routine clinical practice and reflected real-world bedside assessment performed during emergency admission.

By focusing exclusively on clinical examination findings available before laboratory confirmation, the study provides information directly applicable to early recognition of pediatric sepsis.

However, several limitations should be acknowledged. The study was conducted at a single tertiary care center and included a relatively small number of patients, which may limit the generalizability of the findings. Furthermore, retrospective data collection depended on the completeness and accuracy of medical documentation, resulting in missing values for several physiological variables. Finally, laboratory biomarkers, microbiological investigations, and clinical outcomes were not included because they were beyond the scope of the present analysis.

**Results: Patient Characteristics**

A total of 22 medical records of pediatric patients admitted to the Pediatric Intensive Care Unit (PICU) with a documented diagnosis of sepsis were initially reviewed. One patient was excluded because of incomplete clinical documentation, resulting in a final study cohort of 21 children.

Clinical and physiological parameters recorded at the time of hospital admission are summarized in **Table 1**.

Body temperature was documented in 15 patients (71.4%). The mean body temperature at admission was **38.0°C**, with recorded values ranging from **36.2°C to 39.2°C**, indicating considerable variability in the initial thermal response. Although fever was common, several children presented with normal body temperature, demonstrating that the absence of fever does not exclude the diagnosis of pediatric sepsis.

Heart rate measurements were available for 18 patients (85.7%). The mean heart rate was **131.8 beats/min**, with values ranging from **104 to 160 beats/min**. Tachycardia represented one of the most frequently observed physiological abnormalities during the initial assessment.

Peripheral oxygen saturation ($SpO_2$) was documented in 14 patients (66.7%). The mean oxygen saturation was **92.4%**, with measurements ranging from **74% to 98%**. Several patients demonstrated clinically significant hypoxemia requiring immediate respiratory support.

***Table 1.***

**Physiological characteristics of pediatric patients at hospital admission**

| Variable | Number of patients (%) | Mean ± SD / Range |
|---|---|---|
| Body temperature | 15 (71.4%) | 38.0°C (36.2–39.2) |
| Heart rate | 18 (85.7%) | 131.8 bpm (104–160) |
| Peripheral oxygen saturation ($SpO_2$) | 14 (66.7%) | 92.4% (74–98) |

**Clinical Presentation at Hospital Admission**

The clinical manifestations of pediatric sepsis were heterogeneous; however, several characteristic findings were consistently documented during the initial bedside examination.

Respiratory abnormalities represented the predominant clinical manifestation. Abnormal pulmonary auscultation was documented in **17 patients (81.0%)**, making it the most frequently observed physical finding. Recorded abnormalities included harsh breathing, moist crackles, coarse crackles, and mixed crackles, indicating varying degrees of pulmonary involvement at presentation.

Clinical evidence of respiratory compromise was observed in **14 children (66.7%)**. In several patients, respiratory symptoms were accompanied by decreased peripheral oxygen saturation, suggesting impaired pulmonary gas exchange secondary to systemic inflammatory response. Two critically ill patients (**9.5%**) required invasive mechanical ventilation shortly after admission because of severe respiratory failure.

Signs of impaired peripheral perfusion were also common. Pallor of the skin was documented in **14 patients (66.7%)**, representing one of the most frequent non-respiratory manifestations identified during the initial examination.

Cardiovascular abnormalities were less frequent but remained clinically relevant. Diminished heart sounds were reported in **7 patients (33.3%)**, reflecting possible cardiovascular involvement associated with systemic inflammation and circulatory dysfunction.

Overall, the initial bedside assessment demonstrated that respiratory manifestations, alterations in vital signs, and evidence of impaired peripheral perfusion constituted the principal clinical features of pediatric sepsis at hospital admission.

***Table 2.***

**Clinical manifestations documented during the initial examination**

| Clinical finding | n | % |
|---|---|---|
| Abnormal pulmonary auscultation | 17 | 81.0 |
| Respiratory compromise | 14 | 66.7 |
| Pallor of the skin | 14 | 66.7 |
| Diminished heart sounds | 7 | 33.3 |
| Requirement for invasive mechanical ventilation | 2 | 9.5 |

**Summary of Clinical Findings**

The analysis demonstrated that pediatric sepsis most frequently presented with respiratory involvement accompanied by abnormalities of physiological parameters recorded during admission. Although fever and tachycardia were common findings, considerable variability in body temperature and oxygen saturation was observed among patients, emphasizing the heterogeneous clinical presentation of pediatric sepsis.

The predominance of respiratory abnormalities, together with signs of impaired peripheral perfusion and cardiovascular changes, underscores the importance of comprehensive bedside clinical assessment during the earliest stages of patient evaluation. These findings support the role of systematic physical examination as an essential component of early recognition of pediatric sepsis before laboratory and microbiological investigations become available.

**Discussion:** The present retrospective study evaluated the clinical presentation of pediatric sepsis at the time of admission to the Pediatric Intensive Care Unit, with particular emphasis on bedside clinical findings available before laboratory confirmation. The results demonstrate that pediatric sepsis is characterized by marked clinical heterogeneity; however, several manifestations—including respiratory abnormalities, tachycardia, impaired peripheral oxygenation, and pallor—were consistently observed during the initial assessment.

Respiratory involvement was the predominant clinical feature in the study cohort. More than four-fifths of the patients had abnormal pulmonary auscultation, while approximately two-thirds demonstrated clinical signs of respiratory compromise. In addition, reduced peripheral oxygen saturation was frequently documented, and a small proportion of patients required invasive mechanical ventilation because of severe respiratory failure. These findings indicate that respiratory dysfunction represents one of the earliest and most clinically relevant manifestations of pediatric sepsis requiring prompt recognition and intervention.

Previous studies have similarly identified respiratory abnormalities as common features of severe pediatric infection. Pulmonary involvement may result from primary respiratory infection, systemic inflammatory injury, increased pulmonary vascular permeability, or the development of acute respiratory distress syndrome. Consequently, careful assessment of respiratory rate, oxygen saturation, work of breathing, and auscultatory findings remains essential during the initial evaluation of children with suspected sepsis.

Abnormalities of vital signs also constituted important components of the clinical presentation. Although fever was observed in many patients, body temperature varied considerably, with some children presenting without hyperthermia. This observation supports current evidence indicating that

fever alone should not be considered a mandatory diagnostic criterion for pediatric sepsis. Young infants, immunocompromised patients, and children with advanced septic shock may present with normal or even reduced body temperature despite severe systemic infection.

Tachycardia was another consistently documented physiological abnormality. Increased heart rate represents an early compensatory response to systemic inflammation, fever, hypovolemia, and reduced tissue perfusion. Nevertheless, tachycardia is inherently nonspecific and may accompany numerous pediatric conditions, including dehydration, pain, anxiety, and respiratory disease. Therefore, interpretation of heart rate should always be integrated with other clinical findings rather than considered in isolation.

Pallor was documented in two-thirds of the study population and likely reflected impaired peripheral perfusion associated with systemic inflammatory response. Alterations in skin color, capillary refill, peripheral temperature, and pulse quality are well-recognized indicators of circulatory compromise in critically ill children. Although these findings lack diagnostic specificity, their presence may indicate early cardiovascular dysfunction requiring immediate reassessment and hemodynamic support.

An important aspect of the present study is its exclusive focus on bedside clinical assessment. In contemporary pediatric intensive care practice, laboratory biomarkers such as C-reactive protein (CRP), procalcitonin (PCT), serum lactate, and inflammatory cytokines contribute substantially to diagnostic evaluation. However, these investigations frequently require additional processing time and may not be immediately available during the first hours after admission. Consequently, initial therapeutic decisions—including empirical antimicrobial therapy, fluid resuscitation, oxygen supplementation, and transfer to intensive care—continue to depend primarily on clinical examination and assessment of physiological parameters.

The findings of the present study therefore reinforce the importance of systematic bedside examination in children with suspected sepsis. Early recognition of respiratory compromise, circulatory abnormalities, and deterioration in general condition may facilitate timely initiation of evidence-based treatment before laboratory confirmation becomes available. Such an approach is consistent with current international recommendations emphasizing rapid clinical assessment as a critical determinant of favorable outcomes in pediatric sepsis.

The study also has several limitations that should be considered when interpreting the results. First, its retrospective design limited the analysis to information documented in routine medical records, resulting in missing values for several clinical variables. Second, the investigation was conducted at a single tertiary care center and included a relatively small number of patients, which restricts the generalizability of the findings. Third, the study focused exclusively on the initial clinical presentation and did not evaluate microbiological etiology, laboratory biomarkers, disease severity scores, therapeutic interventions, or patient outcomes. Future prospective multicenter investigations involving larger cohorts are warranted to validate these observations and to determine the prognostic value of individual clinical manifestations.

Despite these limitations, the present study provides clinically relevant information regarding the bedside presentation of pediatric sepsis during the earliest stage of hospital admission. By emphasizing routinely documented physical findings, the study reflects real-world clinical practice and highlights the continued importance of comprehensive clinical examination in the early identification of critically ill children. The results may contribute to improving physicians' awareness of the heterogeneous manifestations of pediatric sepsis and support earlier recognition in emergency and intensive care settings.

**Conclusions:** Pediatric sepsis demonstrates a highly variable clinical presentation at the time of hospital admission. Despite this heterogeneity, respiratory dysfunction, abnormalities of vital signs, and signs of impaired peripheral perfusion represent the most consistent clinical features identified during initial bedside assessment. The findings of this study highlight that reliance on a

single clinical parameter, such as fever or tachycardia, is insufficient for early diagnosis. Instead, comprehensive evaluation of respiratory status, hemodynamic indicators, oxygen saturation, and general clinical appearance is essential for timely recognition of critically ill children. Early identification based on clinical examination remains particularly important in emergency and intensive care settings, where immediate treatment decisions must often be made before laboratory and microbiological results are available. These observations support the continued importance of structured bedside assessment in pediatric sepsis management.

Further prospective multicenter studies with larger sample sizes are required to validate these findings and to explore the prognostic value of specific clinical signs in the early stages of pediatric sepsis.

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