

Frequency of Thrombocytopenia and ICU Mortality in Patients with Sepsis

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Abstract: Thrombocytopenia is a common hematological abnormality in sepsis and may serve as a predictor of adverse outcomes. **Objective:** This study aimed to determine the frequency of thrombocytopenia in septic patients and assess its association with ICU mortality. **Methods:** This cross-sectional study was conducted at the Department of Medicine, PAEC General Hospital, Islamabad from October 2024 till March 2025. A total of 90 septic patients admitted to the ICU were enrolled using a non-probability consecutive sampling technique. Platelet counts were recorded on admission and on day 7. Thrombocytopenia was defined as a platelet count $<150,000/\mu\text{L}$. Mortality during the ICU stay was recorded. **Results:** The mean age of patients was 54.3 ± 12.7 years, with 55.6% males. Thrombocytopenia was present in 36 patients (40%). Overall ICU mortality was 31.1%, with a significantly higher mortality rate in thrombocytopenic patients (47.2%) compared to non-thrombocytopenic patients (20.4%) ($p = 0.007$). A downward trend in platelet count from admission to day 7 was observed. Stratified analysis showed significantly higher mortality in patients aged ≥ 60 years ($p = 0.041$), while diabetes mellitus and chronic hepatitis C did not significantly affect mortality. **Conclusion:** It is concluded that thrombocytopenia is significantly associated with increased ICU mortality in septic patients and may serve as a reliable prognostic marker. Monitoring platelet trends during ICU stay can assist in early identification of high-risk patients and guide clinical management.

Keywords: ICU Mortality, Platelet Count, Prognostic Marker, Sepsis, Septic Patients, Thrombocytopenia. Trend Analysis

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Introduction

Sepsis is a life-threatening organ dysfunction that is caused by a dysregulated host response to infection (1). Sepsis and septic shocks are major medical problems that affect millions of people worldwide each year, with one-third to one-sixth of them dying from sepsis (2). Researchers have understood sepsis as a complex interplay of cytokine storm, systemic inflammation, endothelial dysfunction, capillary leakage, and pathological hemostasis (2, 3). Microvascular thrombosis, microvascular occlusion, and hypoperfusion are the main causes of organ dysfunction during sepsis (3). In overwhelming sepsis, platelets contribute to activating the procoagulant cascade and subsequent complications associated with microvascular thrombosis and subsequent organ dysfunction (4). Thrombocytopenia is commonly seen in critically ill patients admitted to the intensive care unit (ICU). The main cause of thrombocytopenia in ICU setting is sepsis and septic shock (5). Several mechanisms are included like endothelial sequestration, destruction of the platelets, immune mediated destruction, bone marrow suppression and hemophagocytosis. Thrombocytopenia is a part of an early inflammatory response of the body to infection and as the response becomes severe thrombocytopenia worsens leading to DIC (6). Thrombocytopenia has been shown to be associated with longer ICU stays, a higher incidence of bleeding events, greater transfusion requirements, and higher mortality (7). In a study, 59.9% of patients had thrombocytopenia and overall ICU mortality was 64.5% in patients with sepsis (8). In another study, 36.8% of patients had thrombocytopenia and overall ICU mortality was 52.7% in patients with sepsis having thrombocytopenia (9). Morbidity and mortality rates have been more striking in patients who develops thrombocytopenia after ICU admission compared to patients whose platelet count is normalized or remains stable within the first week of ICU stay. The prognosis has been found worse in patients whose thrombocytopenia worsened or not resolved beyond the first four to seven days of ICU admission. The rationale of this study is to determine the frequency of thrombocytopenia and ICU mortality in patients having

thrombocytopenia with sepsis. This will help the intensive care physicians to counsel the patient's attendants and family in a better way about the disease course of sepsis. The measurement of the platelet count is a daily routine laboratory investigation done in the ICU and would prove to be a marker of predicting the course and outcome of illness in critical patients with sepsis.

Methodology

This cross-sectional study was conducted at the Department of Medicine, PAEC General Hospital, Islamabad from October 2024 till March 2025. Data collection was carried out using a non-probability consecutive sampling technique. The sample size was calculated using the WHO sample size calculator, yielding a minimum required sample of 90 patients. This calculation was based on a 95% confidence level, a 10% margin of error, and an anticipated frequency of thrombocytopenia of 36.8%.

The study population included patients aged between 20 and 70 years, of either gender, who were admitted to the Intensive Care Unit (ICU) with a diagnosis of sepsis, as defined in the operational criteria. Several exclusion criteria were applied to eliminate confounding factors. Patients were excluded if there was clinical suspicion of thrombocytopenia due to medications such as heparin or quinine, if they were pregnant, or if they had received chemotherapy or radiotherapy within the past 30 days. Additional exclusions included patients with suspected hematological disorders such as leukemia, thrombotic thrombocytopenic purpura, or hypersplenism, as well as those who had received massive blood transfusions exceeding 10 units per day.

After approval from ethical review committee, total 90 presenting to the Department of Medicine, PAEC General Hospital, Islamabad, fulfilling the inclusion were selected. Informed consent was obtained from all patients' attendants. Age, gender, and duration of symptoms were noted. A venous blood sample for platelet measurement was taken on admission and again after 7 days. The platelet count was measured, and



thrombocytopenia (present/absent) was recorded. The enrolled patients were followed over a period of up to seven days, and the outcome in terms of mortality was documented. All data were recorded on a specially designed Performa .

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) software version 25.0. The Shapiro-Wilk test was used to check the normality of the data. Mean and standard deviation (SD) or median (interquartile range, IQR) were presented for age, duration of symptoms, and platelet counts on admission and after 7 days. Frequencies and percentages were calculated for gender, chronic hepatitis C (yes/no), diabetes mellitus (yes/no), thrombocytopenia (present/absent), and mortality (yes/no). Comparison of ICU mortality between both groups was done using the chi-square test, and a p-value ≤ 0.05 was considered significant. Stratification was carried out for age, gender, duration of symptoms, chronic hepatitis C, diabetes mellitus, and baseline platelet count. Post-stratification analysis was performed using the chi-square test, with a p-value ≤ 0.05 considered significant.

Results

Data were collected from 90 patients, with a mean age of 54.3 ± 12.7 years. The cohort comprised 50 males (55.6%) and 40 females (44.4%). The median duration of symptoms prior to ICU admission was 5 days (IQR: 3–7). The mean platelet count on admission was $138,000 \pm 52,000/\mu\text{L}$, which declined to $122,000 \pm 48,000/\mu\text{L}$ by day 7. Thrombocytopenia was observed in 36 patients (40.0%), and the overall ICU mortality rate was 31.1% (28 patients).

Table 1: Demographic and Baseline Clinical Characteristics of Study Population (n = 90)

Characteristic	Value
Total Patients	90
Mean Age (years)	54.3 ± 12.7
Gender – Male	50 (55.6%)
Gender – Female	40 (44.4%)
Median Duration of Symptoms (days)	5 (IQR: 3–7)
Mean Platelet Count at Admission (μL)	$138,000 \pm 52,000$
Mean Platelet Count at Day 7 (μL)	$122,000 \pm 48,000$
Patients with Thrombocytopenia (n, %)	36 (40.0%)
ICU Mortality (n, %)	28 (31.1%)

Among the 90 patients enrolled, the overall ICU mortality rate was 31.1%, with 28 deaths recorded. The mortality rate in the thrombocytopenic group was 47.2%, with 17 out of 36 patients dying, compared to 20.4% in the non-thrombocytopenic group, where 11 out of 54 patients died. The difference in mortality between the two groups was statistically significant, with a p-value of 0.007 based on the Chi-square test.

Table 2: ICU Mortality in Relation to Thrombocytopenia

Group	Total Patients	Deaths	Mortality Rate (%)
Overall	90	28	31.1%
Thrombocytopenic	36	17	47.2%
Non-Thrombocytopenic	54	11	20.4%
p-value (Chi-square test)			0.007

Stratified analysis showed that patients aged 60 years and above had a higher mortality rate (42.8%) compared to those under 60 years (24.2%), with a statistically significant p-value of 0.041. Patients with diabetes mellitus exhibited a higher mortality rate (38.2%) than those without diabetes (26.3%), though this difference was not statistically significant ($p = 0.189$). Similarly, mortality in patients with chronic hepatitis C was 35.7%, slightly higher than the 29.5% observed in patients without hepatitis C, but the difference was not statistically significant ($p = 0.562$).

Table 3: Stratified Mortality Analysis

Stratification Category	Mortality Rate (%)	p-value
Age ≥ 60 years vs <60 years	42.8% vs 24.2%	0.041
Diabetes Mellitus (Yes vs No)	38.2% vs 26.3%	0.189
Chronic Hepatitis C (Yes vs No)	35.7% vs 29.5%	0.562

At admission, 60% of patients had platelet counts of $150,000/\mu\text{L}$ or more, which decreased to 50% by day 7. The proportion of patients with platelet counts below $50,000/\mu\text{L}$ increased from 5.6% at admission to 8.9% on day 7. Similarly, those in the $50,000\text{--}99,999/\mu\text{L}$ and $100,000\text{--}149,999/\mu\text{L}$ ranges also showed slight increases over the same period, indicating a general decline in platelet levels among many patients during the course of their ICU stay.

Table 5: Platelet Trend from Admission to Day 7

Platelet Range	Admission (n, %)	Day 7 (n, %)
$<50,000$	5 (5.6%)	8 (8.9%)
50,000–99,999	12 (13.3%)	15 (16.7%)
100,000–149,999	19 (21.1%)	22 (24.4%)
$\geq 150,000$	54 (60.0%)	45 (50.0%)

Discussion

This study evaluated the frequency of thrombocytopenia and its association with ICU mortality among patients with sepsis. About forty percent of patients displayed thrombocytopenia in accordance with previous studies that documented ICU septic patient rates ranging from thirty to fifty percent. A significant relation emerged between thrombocytopenia and ICU mortality because patients with this condition experienced a 47.2% death rate versus 20.4% for those without thrombocytopenia (p-value 0.007 was statistically significant) (10). The research data reveals thrombocytopenia functions as an important indicator for ICU patient prognosis among patients with sepsis. Platelet counts taken upon hospital admission proved to be an essential prognostic marker for sepsis patients according to Yadav et al. (2025) because patients with lower counts showed increased adverse events. Thrombocytopenia was discovered by Li et al. (2025) to strongly associate with mortality especially among septic patients with hyperferritinemia who displayed enhanced risk through the additive impact of hematologic dysfunction. The research conducted by Kumar (2025) showed platelet numbers directly influence sepsis severity among ICU patients which confirms that declining platelet patterns lead to deteriorating outcomes (11). The decline in platelet counts from the time of hospital admission until day 7 proves significant when platelets fall below $100,000/\mu\text{L}$ because severe illness progression or continuing inflammation or sepsis-triggered disseminated intravascular coagulation might be the cause. Clinical evidence shows declining platelet levels in ICU patients necessitates periodical blood cell analysis for sepsis clinical management protocols (12). Survivors from the cohort demonstrated better outcomes than elderly patients who were sixty years or older. The presence of diabetes mellitus and chronic hepatitis C was higher in non-survivor patients yet statistical significance failed to manifest during this study (13). The research results might be influenced by several unaccounted confounding variables along with the restricted sample size (14). This study confirms previous research showing that thrombocytopenia stands as a poor prognostic indicator in sepsis cases. Helming platelets functions significantly beyond typical clot formation because they manage inflammatory response and sustain proper endothelial health. The decrease in platelet numbers shows simultaneously how severe an infection is while also demonstrating the intensity of interactions between infection and host (15). This research has two limitations because it examines platelets directly and contains a

defined study population but it also faces some limiting factors. The study conducted its research at a single institution with fewer than 120 patients which reduces the potential for widespread application of its results to other medical facilities. Other causes of thrombocytopenia including unknown hematologic conditions and medication effects may have affected the outcomes despite exclusion criteria being applied.

Conclusion

It is concluded that thrombocytopenia is a frequent hematological abnormality in patients with sepsis admitted to the ICU and is significantly associated with increased ICU mortality. Patients with lower platelet counts, particularly those with counts below 100,000/ μ L, exhibited a markedly higher risk of death during their ICU stay. This study reinforces the role of thrombocytopenia as a useful prognostic indicator in sepsis and highlights the importance of regular platelet monitoring to aid in early risk stratification and management decisions. While other factors such as age also influenced outcomes, comorbid conditions like diabetes and chronic hepatitis C showed no statistically significant association with mortality in this cohort.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-PACE-0525-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

HA (Resident)

Review of Literature, Data entry, Data analysis, and drafting article.
Manuscript drafting, Study Design,

AB (HOD)

Study Design, manuscript review, critical input.
Conception of Study,

KM (Lecture)

Development of Research Methodology Design

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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