

Original Research Article

Trends and outcomes of new-onset thrombocytopenia in hospitalized patients: a secondary care center experience

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ABSTRACT

Background: Thrombocytopenia is common among hospitalized patients and is associated with increased morbidity, prolonged hospitalization, and mortality. It may result from infection, sepsis, medications, disseminated intravascular coagulation (DIC), or other acute conditions. However, data on new-onset thrombocytopenia in secondary care hospitals in Saudi Arabia are limited. This study assessed its incidence, severity, etiology, and clinical outcomes in hospitalized adults.

Methods: This retrospective study was conducted at Security Forces Hospital, Makkah, Saudi Arabia, from January 2020 to December 2024. A total of 392 adult inpatients who developed new-onset thrombocytopenia (platelet count $<150 \times 10^9/l$) after admission were included using consecutive sampling. Patients with pre-existing thrombocytopenia, hematological malignancies, or recent chemotherapy were excluded. Demographic, clinical, laboratory, and outcome data were extracted from medical records. Thrombocytopenia severity and underlying etiologies were classified according to clinical and laboratory findings.

Results: Sepsis was the leading cause of new-onset thrombocytopenia (34.7%), followed by viral infections (19.6%), drug-induced thrombocytopenia (12.5%), and DIC (11.2%). Severe thrombocytopenia occurred in 26.5% of patients. ICU admission was required in 38.8%, while in-hospital mortality was 21.4%. Mortality was particularly higher among patients with sepsis-related and severe thrombocytopenia, highlighting the prognostic significance of both the underlying cause and degree of platelet reduction.

Conclusions: New-onset thrombocytopenia during hospitalization is associated with substantial morbidity and mortality. Early recognition, close monitoring, and prompt identification of underlying causes may improve outcomes, particularly in resource-limited secondary care settings.

Keywords: Thrombocytopenia, Sepsis, Platelets, In-hospital mortality

INTRODUCTION

Thrombocytopenia, characterized by a platelet count below $150 \times 10^9/L$, is among the most frequently observed hematological abnormalities in hospitalized patients. Thrombocytopenia is often an early indicator of underlying systemic illness or clinical deterioration.¹⁻³ The emergence of new-onset thrombocytopenia during hospitalization is clinically significant because of its association with increased mortality, extended hospital stays, bleeding complications, and elevated rates of intensive care unit (ICU) admission.²⁻⁵ As a result, thrombocytopenia is increasingly recognized not only as a laboratory abnormality but also as a significant marker of disease severity and adverse clinical outcomes.

Thrombocytopenia in hospitalized patients arises from multiple factors, including reduced platelet production, enhanced peripheral destruction, splenic sequestration, immune-mediated processes, or consumptive coagulopathies, such as disseminated intravascular coagulation (DIC).⁶ Infections, notably bacterial sepsis and viral illnesses, are prevalent causes of thrombocytopenia. These conditions contribute to the disorder through mechanisms such as bone marrow suppression, immune-mediated platelet destruction, endothelial injury, and increased platelet consumption.^{4,7,8,9} Thrombocytopenia associated with sepsis has been demonstrated to correlate with both the severity of the disease and mortality rates, thereby establishing platelet count as a significant prognostic marker in critically ill patients.^{4,9}

Drug-induced thrombocytopenia is a notable and potentially reversible cause of thrombocytopenia in hospitalized patients. Various medications, such as antibiotics, anticoagulants, and antiepileptic drugs, can lead to immune-mediated platelet destruction or hinder platelet production.^{6,10} Timely identification of medication-induced thrombocytopenia is crucial, as immediate cessation of the causative agent can lead to rapid platelet recovery and avert severe complications, including hemorrhage.

Recent advancements have broadened our understanding of platelet biology beyond their role in hemostasis. Platelets are now acknowledged as active contributors to both innate and adaptive immune responses, especially during viral infections, where they exhibit pro-inflammatory and immunomodulatory effects.^{8,11} This evolving understanding underscores thrombocytopenia as a dynamic indicator of host-pathogen interactions and systemic inflammatory responses. Numerous studies have investigated the epidemiology and clinical implications of thrombocytopenia in hospitalized patients.

However, the majority of existing data are derived from tertiary care hospitals and intensive care units.^{2,3,5} Studies conducted in Saudi Arabia have revealed variability in the etiology of thrombocytopenia and hematological

characteristics among different patient populations.^{1,12-14} Although observations have been made, data from secondary care hospitals are scarce. Comprehending the etiological spectrum and clinical outcomes of thrombocytopenia in these settings is crucial for enhancing early recognition, risk stratification, and management of thrombocytopenia. Consequently, this study aimed to assess the trends, etiologies, and clinical outcomes of new-onset thrombocytopenia among hospitalized patients at a secondary care hospital in Saudi Arabia.

METHODS

This retrospective study was conducted at the Security Forces Hospital, a secondary care hospital in Makkah, Saudi Arabia, between January 1, 2020, and December 31, 2024. The study included 392 adult inpatients (≥ 18 years) who developed new-onset thrombocytopenia during hospitalization, defined as a platelet count of $<150 \times 10^9/L$ after admission. Patients with thrombocytopenia at admission, known hematological disorders, recent chemotherapy exposure, or malignancy-related bone marrow suppression were excluded from the study.

Data were obtained from the hospital's electronic health records and included demographic characteristics (age, sex, and nationality), comorbidities (diabetes mellitus, hypertension, chronic kidney disease, and liver disease), and clinical variables, such as the timing and etiology of thrombocytopenia, platelet nadir, severity, bleeding manifestations, and transfusion requirements. The clinical outcomes assessed included intensive care unit (ICU) admission, length of hospital stay, and in-hospital mortality. Thrombocytopenia severity was categorized as mild ($100\text{--}149 \times 10^9/L$), moderate ($50\text{--}99 \times 10^9/L$), and severe ($<50 \times 10^9/L$).

Statistical analyses were performed using SPSS version 26.0. Continuous variables are summarized as means $\pm$ standard deviations or medians with interquartile ranges, as appropriate. Categorical variables are presented as frequencies and percentages. Comparisons between groups were conducted using the chi-square test for categorical variables and analysis of variance (ANOVA) for continuous variables. Statistical significance was set at $p < 0.05$.

RESULTS

Throughout the duration of the study, 392 individuals were diagnosed with new-onset thrombocytopenia. The average age among these patients was 52.1 years, with a standard deviation of 15.8 years, and 59.0% of them were male. Table 1 illustrates that diabetes mellitus and hypertension were the most frequently observed comorbidities.

Etiology and severity of thrombocytopenia

Sepsis emerged as the leading cause, responsible for 34.7% of the cases, with viral infections and drug-induced

thrombocytopenia following. Thrombocytopenia severity ranged from mild to severe, with severe cases,

characterized by a platelet count below $50 \times 10^9/l$, observed in 26.3% of patients, as detailed in Tables 2 and 3.

Table 1: Baseline demographic and clinical characteristics (n=392).

Variables	Value
Mean age (years)	52.1±15.8
Gender	Male: 231 (59.0%)
	Female: 161 (41.0%)
Nationality	Saudi: 380 (96.9%)
	Non-Saudi: 12 (3.1%)
Diabetes mellitus	162 (41.3%)
Hypertension	156 (39.7%)
Chronic kidney disease	67 (17.1%)
Chronic liver disease	48 (12.2%)
ICU transfer	152 (38.8%)
Mean hospital stays (days)	11.3±4.8

Table 2: Etiology of thrombocytopenia.

Etiology	N (%)
Sepsis	136 (34.7)
Viral infections (e.g., Dengue, COVID-19)	77 (19.6)
Drug-induced	49 (12.5)
Disseminated intravascular coagulation	44 (11.2)
Liver cirrhosis	36 (9.2)
Malaria	21 (5.4)
Other (e.g., autoimmune, idiopathic)	29 (7.4)

Table 3: Severity of thrombocytopenia.

Severity category	Platelet count ($\times 10^9/l$)	N (%)
Mild	100–149	146 (37.2)
Moderate	50–99	143 (36.5)
Severe	<50	103 (26.3)

Table 4: Outcome measures according to severity of thrombocytopenia.

Outcome measure	Mild (n=146)	Moderate (n=143)	Severe (n=103)	P value
ICU admission	34 (23.3%)	56 (39.2%)	62 (60.2%)	<0.001
Major bleeding events	6 (4.1%)	24 (16.8%)	36 (35.0%)	<0.001
Platelet transfusion	8 (5.5%)	29 (20.3%)	50 (48.5%)	<0.001
In-hospital mortality	13 (8.9%)	20 (14.0%)	43 (41.7%)	<0.001
Mean hospital stays (days)	8.2±3.1	10.5±4.4	14.6±5.2	<0.001

Clinical outcomes according to the severity of thrombocytopenia

There was a significant association between severe thrombocytopenia and ICU transfer, bleeding, as well as higher mortality rates. Within the cohort, the overall mortality rate stood at 21.4%, with sepsis and DIC posing the greatest risks (Table 4).

DISCUSSION

This retrospective analysis investigated the causes and clinical outcomes of newly developed thrombocytopenia in adults admitted to a secondary care hospital. The results indicate that thrombocytopenia continues to be a significant clinical issue during hospitalization, linked to high morbidity and mortality rates. Sepsis emerged as the primary cause of thrombocytopenia, with viral infections and drug-induced cases following. Additionally, severe

thrombocytopenia was linked to higher rates of ICU admissions, bleeding complications, the need for platelet transfusions, and in-hospital mortality.

In our group, sepsis emerged as the leading cause. This observation aligns with global research indicating that thrombocytopenia linked to infections is the primary reason for thrombocytopenia in hospitalized individuals.^{3,4,15} According to Papakitsou et al infections ranked as one of the leading causes of thrombocytopenia in elderly medical inpatients and were linked to poorer clinical outcomes.³ In a recent systematic review and meta-analysis, Alqeeq et al found that patients with sepsis and septic shock who experience thrombocytopenia face notably higher mortality rates, extended hospital stays, and more severe organ dysfunction.⁴ Previous research conducted by Venkata et al demonstrated that thrombocytopenia frequently occurs in sepsis patients and acts as an independent indicator of negative outcomes.¹⁶ In our study, the high occurrence of thrombocytopenia associated with sepsis probably results from a combination of factors, including systemic inflammation, damage to the endothelium, activation of platelets, heightened consumption, and disruption of the coagulation pathways.

Recent evidence from Saudi Arabia also backs our findings. According to Farooq et al infectious diseases significantly contribute to thrombocytopenia in patients admitted to a tertiary care facility in Saudi Arabia.¹ The resemblance between their results and ours indicates that infectious causes continue to be the primary factors leading to thrombocytopenia in various healthcare environments within the Kingdom. These findings may be partially attributed to regional epidemiological elements, such as the prevalence of infectious diseases and hematological traits specific to the population.¹²⁻¹⁴

In our cohort, viral infections ranked as the second leading cause of thrombocytopenia. Earlier research has demonstrated that viral pathogens trigger thrombocytopenia via multiple mechanisms, such as direct suppression of bone marrow, immune-mediated destruction of platelets, sequestration in the spleen, and increased peripheral consumption.⁷ Raadsen et al underscored the various mechanisms responsible for virus-related thrombocytopenia and stressed its clinical importance in a wide range of viral infections.⁷ El Filaly et al also showed that platelets are essential in antiviral immune responses, reinforcing the idea that thrombocytopenia indicates intricate host-pathogen interactions instead of just a hematological issue.⁸ In areas where viral infections play a significant role in increasing hospital admissions, these findings hold particular importance.

In this study, drug-induced thrombocytopenia emerged as a significant cause. Present guidelines for diagnosis and management highlight the necessity of identifying drug-induced thrombocytopenia, since stopping the responsible medication frequently results in the restoration of platelet

levels and prevents potentially fatal complications.^{6,10} The probability of developing this condition rises with greater exposure to various medications while hospitalized.

A key discovery of this study was the significant link between the severity of thrombocytopenia and negative outcomes. Patients suffering from severe thrombocytopenia showed notably increased rates of ICU transfers, bleeding events, and death. These results align with those of Pène et al who showed that severe thrombocytopenia correlates with poor outcomes in critically ill patients and continues to be a crucial prognostic indicator in ICU environments.² In a similar way, Cheng et al found that in critically ill elderly patients, thrombocytopenia was an independent factor linked to higher mortality rates and extended stays in the ICU.⁵ The link between reduced platelet levels and adverse outcomes probably indicates both the seriousness of the underlying condition and the direct effects of disrupted hemostasis and widespread inflammation.

The findings of this study reinforce the prognostic importance of thrombocytopenia in relation to overall mortality. Earlier research has repeatedly demonstrated that ongoing thrombocytopenia and the inability of platelet counts to recover are linked to higher mortality rates, especially in patients suffering from sepsis and multiorgan failure.^{4,9,16} According to Mangalesh et al analyzing platelet kinetics and trends offers significant prognostic insights for sepsis patients, and these analyses are more precise in predicting mortality than single platelet measurements.⁹ As a result, regularly tracking platelet levels could be crucial for assessing risk and guiding clinical decisions.

Our study observation of a heightened demand for platelet transfusions in patients with severe thrombocytopenia aligns with current global practices. The Nine-I International Platelet Transfusion Survey underscored the extensive use of platelet transfusions in critically ill patients with thrombocytopenia and stressed the importance of developing evidence-based transfusion strategies to enhance patient outcomes and reduce unnecessary transfusion exposure.¹⁵

In the context of thrombocytopenia research, this study provides important data from a secondary care environment, an area that is often overlooked. The majority of existing research has concentrated on tertiary referral hospitals and intensive care facilities.^{2,3,5,17} Conversely, our group represents a more extensive hospitalized demographic typically seen in everyday clinical settings. This data is especially pertinent in Saudi Arabia, where secondary care hospitals handle a significant share of yearly inpatient admissions.

This research faces several constraints. Firstly, its retrospective, single-center nature might limit its applicability to broader contexts and could introduce information bias. Secondly, it was not possible to

definitively confirm a causal link between thrombocytopenia and negative outcomes. Thirdly, the lack of uniform availability of detailed investigations for all causes might have led to some misclassification. Despite these issues, the study's relatively large sample size and the inclusion of consecutively hospitalized patients offer valuable insights into the epidemiology and clinical effects of new-onset thrombocytopenia in a real-world secondary care setting.

In summary, our results support the growing evidence that new-onset thrombocytopenia serves as a significant indicator of disease severity and negative outcomes. Identifying underlying causes early, especially sepsis and viral infections, along with closely monitoring platelet trends, could enhance risk assessment and improve clinical outcomes for hospitalized patients.

CONCLUSION

The occurrence of thrombocytopenia in hospitalized patients represents a clinically significant event with considerable prognostic implications, especially when associated with sepsis and severe platelet depletion. It is imperative for secondary care hospitals to prioritize early detection and management strategies to prevent potential complications. The establishment of protocols for etiological classification and treatment is crucial, particularly during periods of elevated infection rates or high-risk seasons.

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