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Original Research Article

Frequency of Factors Leading to Thrombocytopenia Presenting to a Tertiary Care Hospital

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Abstract: *Thrombocytopenia is a common haematological abnormality encountered in hospitalised patients and is associated with increased morbidity and mortality. Identifying the underlying factors contributing to thrombocytopenia is essential for timely intervention and prevention of complications.* ***Objective:*** *To determine the frequency of factors leading to thrombocytopenia in patients presenting to a tertiary care hospital.* ***Methods:*** *This cross-sectional study included 127 patients aged 18–80 years presenting with thrombocytopenia (platelet count <150,000/µL) from 12-02-2025 to 12-05-2025. Patients with autoimmune disorders, pregnancy, and known platelet disorders were excluded. All participants were evaluated for potential etiological factors, including sepsis, invasive catheter use, antibiotic exposure, and heparin-induced thrombocytopenia. Data were analysed using SPSS version 21, and results were expressed as frequencies and percentages.* ***Results:*** *The mean age of the patients was 51.9 ± 18.4 years, with 65 (51.2%) males and 62 (48.8%) females. Diabetes mellitus was present in 35 (27.6%) patients, while 46 (36.2%) had hypertension. Antibiotic exposure was the most frequent factor associated with thrombocytopenia, identified in 70 cases (55.1%), followed by sepsis in 54 cases (42.5%), invasive catheter use in 29 cases (22.8%), and heparin-induced thrombocytopenia in 21 cases (16.5%).* ***Conclusion:*** *Antibiotic exposure and sepsis were the most common factors associated with thrombocytopenia in patients presenting to a tertiary care hospital. Awareness and early identification of these factors may help reduce complications and improve patient outcomes.*

Keywords: Thrombocytopenia; Sepsis, Drug-Induced Thrombocytopenia, Heparin-Induced Thrombocytopenia, Central Venous Catheters

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Introduction

Thrombocytopenia is a hematological condition characterized by a low platelet count (less than 150,000/µL) and is a common clinical finding. This condition leads to the risk of serious morbidity and mortality due to bleeding complications and systemic ailments (1-3). A fundamental mechanism contributing to thrombocytopenia is a low level of platelet production within the bone marrow due to the disorders that damage megakaryocyte function. Immune-mediated processes, including primary immune thrombocytopenia, activate autoantibody-mediated platelet clearance by the spleen. Drug-induced immune thrombocytopenia may occur when medications create neoantigens that aggravate immune recognition and platelet destruction (4-6).

Viral infections directly influence platelet production, leading to a decline in circulating platelet numbers via bone marrow suppression. A study highlighted the multifaceted interactions between viral agents and thrombocytopenia, observing that viruses can disrupt megakaryopoiesis and accelerate platelet destruction through direct immunological responses and cytopathic effects (7). A study in Pakistan reported that dengue infection frequently causes a substantial reduction in platelet counts, and concurrent vitamin B12 deficiency worsens thrombocytopenia severity (8,9).

Gestational thrombocytopenia occurs in pregnancies due to hemodilution and raised platelet turnover. More severe forms of pregnancy-related thrombocytopenia occur in the context of preeclampsia and immune thrombocytopenic purpura. A study in Pakistan showed the numerous complications associated with pregnancies in women with thrombocytopenia, highlighting its significance within the obstetrical practice and the need for vigilant supervision during antenatal care (10). Discerning the underlying factors of thrombocytopenia through careful clinical assessment is vital for effective management and better patient prognoses in regions with extraordinary burdens of infectious diseases (10, 11).

In many healthcare settings, patients often present with thrombocytopenia without an immediately recognizable cause, which leads to delays in diagnosis and unsuitable management. Factors contributing variably to platelet reduction frequently overlap in patients. Understanding these contributory factors is essential for timely intervention and the prevention of complications. A dedicated evaluation of the determinants of thrombocytopenia enhances patient outcomes by guiding targeted management strategies rather than empirical platelet transfusions. This study aims to determine the frequency of factors leading to thrombocytopenia in our health setting.

Methodology

This cross-sectional study was conducted at the Department of Medicine, Hayat Abad Medical Complex, Peshawar. Ethical approval was obtained before conducting the study from 12-02-2025 to 12-05-2025. The study sample size was 127, calculated using the WHO calculator, based on a previous frequency of invasive catheters leading to thrombocytopenia of 53.1% (12), a 95% confidence interval, and a margin of error of 8.7%. Non-probability Consecutive Sampling was used.

Eligible patients were of either gender, aged 18 to 80 years, presenting with thrombocytopenia (platelet count <150,000/µL on laboratory assessment) and all of the following symptoms: excessive bleeding (nosebleeds, gum bleeds), fatigue, and easy bruising. Patients with autoimmune disorders, pregnancy, and platelet disorders were not included in the study.

After obtaining informed written consent, demographic data were collected, including age, gender, occupation status, residence, socioeconomic status, and BMI, as well as comorbidities such as diabetes and hypertension. Patients with thrombocytopenia were assessed for factors that lead to thrombocytopenia; these factors included sepsis, defined by Systemic Inflammatory Response Syndrome criteria, with any 2 of the following: fever (or hypothermia), Body Temperature >38°C, or body temperature <36°C. Leukocytosis or Leukopenia, White blood cell

count >12,000/µL, or >10% band forms, tachypnea, respiratory rate >20 bpm AND/OR $PaCO_2$ <32 mm Hg. Invasive catheters are defined as positive catheter-related bloodstream infections using blood cultures OR differential growth of organisms in cultures from the catheter and peripheral blood. Usage of an antibiotic was defined as an antibiotic-induced thrombocytopenia on history taking of antibiotic usage, resulting from immune-mediated reactions, direct toxicity to bone marrow, or disruption of platelet function, and heparin was defined as heparin-induced thrombocytopenia on recent heparin exposure (within the past 2 months)/ 5-10 days following initiation of heparin therapy. All assessments were performed under the supervision of a consultant with at least 5 years of post-fellowship experience.

The data were entered and analyzed using SPSS version 21. Gender, factors, occupation status, residence, socioeconomic status, diabetes, and hypertension were presented as frequencies and percentages. Age and BMI were reported as mean ± standard deviation. Thrombocytopenia was stratified by age, gender, BMI, occupation status, residence, socioeconomic status, diabetes, and hypertension. A post-stratification chi-square test was applied. A p-value of ≤ 0.05 was considered significant.

Results

The present study had 127 patients with thrombocytopenia. Their mean age was 51.88 ± 18.440 years. Their mean body mass index (BMI) was 24.44 ± 2.859 kg/m².

Demographically, there were 65 (51.2%) males and 62 (48.8%) females. 68 (53.5%) patients resided in rural areas, while 59 (46.5%) resided in urban areas. Socioeconomic status showed that 63 (49.6%) were from lower socioeconomic backgrounds, while 49 (38.6%) were from middle-income strata. Regarding employment, 69 (54.3%) were unemployed (Table 1). Comorbid conditions were diabetes, observed in 35 (27.6%) patients, and 46 (36.2%) had hypertension (Figure 1).

Regarding the factors associated with thrombocytopenia, Sepsis was present in 54 (42.5%) cases. The use of invasive catheters was a factor in 29 (22.8%) cases. Antibiotic-induced thrombocytopenia occurred in 70 (55.1%) patients, and Heparin-induced thrombocytopenia was observed in 21 (16.5%) cases (Table 2). The association between demographics, comorbidities, and factors leading to thrombocytopenia is presented in Table 3.

Table 1: Demographics

Demographics		n	%
Gender	Male	65	51.2%
	Female	62	48.8%
Residence	Rural	68	53.5%
	Urban	59	46.5%
Socioeconomic status	Low	63	49.6%
	Middle	49	38.6%
	High	15	11.8%
Occupation status	Employed	58	45.7%
	Unemployed	69	54.3%
Diabetes	Yes	35	27.6%
	No	92	72.4%
Hypertension	Yes	46	36.2%
	No	81	63.8%

Figure 1: Comorbidities

Table 2: Factors leading to thrombocytopenia

Factors leading to thrombocytopenia		n	%	95% CI	
				Lower	Upper
Sepsis	Yes	54	42.5%	0.33	0.51
	No	73	57.5%		
Invasive catheters	Yes	29	22.8%	0.15	0.31
	No	98	77.2%		
Antibiotic-induced thrombocytopenia	Yes	70	55.1%	0.46	0.63
	No	57	44.9%		
Heparin-induced thrombocytopenia	Yes	21	16.5%	0.10	0.24
	No	106	83.5%		

Table 3: Association of demographics and comorbidities with factors leading to thrombocytopenia

Demographics & comorbidities		Sepsis		Invasive catheters		Antibiotic-induced thrombocytopenia		Heparin-induced thrombocytopenia	
		Yes	No	Yes	No	Yes	No	Yes	No
Age groups (Years)	18 to 40	18.5%	41.1%	20.7%	34.7%	28.6%	35.1%	42.9%	29.2%
	41 to 60	25.9%	30.1%	20.7%	30.6%	31.4%	24.6%	14.3%	31.1%
	> 60	55.6%	28.8%	58.6%	34.7%	40.0%	40.4%	42.9%	39.6%
P value		.005		.069		.623		.243	
BMI kg/m2)	18 to 25	38.9%	65.8%	65.5%	51.0%	48.6%	61.4%	42.9%	56.6%
	> 25	61.1%	34.2%	34.5%	49.0%	51.4%	38.6%	57.1%	43.4%
P value		.003		.169		.149		.248	
Gender	Male	50.0%	52.1%	48.3%	52.0%	45.7%	57.9%	52.4%	50.9%
	Female	50.0%	47.9%	51.7%	48.0%	54.3%	42.1%	47.6%	49.1%
P value		.819		.722		.172		.904	
Residence	Rural	57.4%	50.7%	58.6%	52.0%	57.1%	49.1%	61.9%	51.9%
	Urban	42.6%	49.3%	41.4%	48.0%	42.9%	50.9%	38.1%	48.1%
P value		.453		.533		.367		.400	
Socioeconomic status	Low	50.0%	49.3%	51.7%	49.0%	52.9%	45.6%	57.1%	48.1%
	Middle	38.9%	38.4%	31.0%	40.8%	35.7%	42.1%	33.3%	39.6%
	High	11.1%	12.3%	17.2%	10.2%	11.4%	12.3%	9.5%	12.3%
P value		.978		.466		.710		.749	
Occupation status	Employed	57.4%	37.0%	51.7%	43.9%	45.7%	45.6%	47.6%	45.3%
	Unemployed	42.6%	63.0%	48.3%	56.1%	54.3%	54.4%	52.4%	54.7%
P value		.022*		.456		.991		.844	
Diabetes	Yes	25.9%	28.8%	34.5%	25.5%	25.7%	29.8%	19.0%	29.2%
	No	74.1%	71.2%	65.5%	74.5%	74.3%	70.2%	81.0%	70.8%

P value		.723		.342		.606		.339	
Hypertension	Yes	38.9%	34.2%	41.4%	34.7%	41.4%	29.8%	23.8%	38.7%
	No	61.1%	65.8%	58.6%	65.3%	58.6%	70.2%	76.2%	61.3%
P value		.590		.511		.176		.195	

Discussion

Thrombocytopenia is a clinically significant condition in hospitalised patients, with a multifactorial aetiology that poses diagnostic challenges. Studies have consistently identified sepsis, drug exposures, and invasive catheters as predominant contributors. A study conducted on ICU patients demonstrated that thrombocytopenia was present in 42% of patients at admission, with its prevalence peaking at 56% by the fifth day and showing a significant association with increased short-term mortality (13). This chronological relationship suggests thrombocytopenia often reflects evolving critical illness rather than a static admission diagnosis. Another study conducted in patients with thrombocytopenia of all ages found primary immune thrombocytopenia and acute infection to be the most frequent causes (14). This emphasizes the need for a thorough diagnostic evaluation to distinguish between benign, self-limiting causes and those that lead to life-threatening conditions.

Certain antibiotics also pose a risk for thrombocytopenia. A study of meropenem found that 59.5% of treated patients developed thrombocytopenia, resulting in reduced platelet counts. This finding is very significant due to the fact that meropenem is used as a last-line agent for severe infections, often in critically ill populations who are already at high risk for haematological complications. The study further identified a significant association between the dose and duration of meropenem therapy and the Development of thrombocytopenia (15). Beyond antibiotics, heparin also remains a critical anticoagulant drug with an adverse effect profile. Heparin-induced thrombocytopenia is an immune-mediated prothrombotic disorder characterised by antibody formation against platelet factor 4-heparin complexes. Its clinical significance is important as it unexpectedly elevates the risk of thrombosis despite a low platelet count with untreated mortality (16). The diagnostic challenge lies in its variable presentation, which requires structured assessment tools such as the 4Ts score to estimate pre-test probability and guide confirmatory laboratory testing.

The relationship between thrombocytopenia, invasive devices, and infection risk represents another critical dimension of patient management. The placement of central venous catheters is common in tertiary care, yet it introduces risks of both mechanical complications and infection. A retrospective study on tunneled and non-tunneled catheters found that pre-procedure leukopenia and thrombocytopenia were significant risk factors for catheter-related bloodstream infections (17).

In the present study, 127 patients presenting with thrombocytopenia were studied; the demographic profile showed a middle-aged cohort with almost equal gender distribution and a slight predominance of rural residents. Comorbidities such as diabetes and hypertension were present in 27.65 and 36.2% patients, respectively. The analysis of factors leading to thrombocytopenia showed noticeable findings. Sepsis occurred in 42.5% of cases, aligning with studies that identify infection as a primary factor of thrombocytopenia in hospital settings (13). Invasive catheters were a contributing factor in 22.8% patients. Antibiotic exposure emerged as the most frequent associated factor, occurring in 55.1% of cases. Heparin-induced thrombocytopenia was confirmed in 16.5% patients.

The novelty of these findings in the current study lies in the quantification and ranking of these modifiable risk factors within a single cohort; it provides a picture of the current aetiological landscape. The study emphasizes the critical importance of using structured diagnostic algorithms, such as the 4Ts score, to navigate the overlapping presentations of sepsis, drug reactions, and device-related complications.

Conclusion

Based on the present study, the most frequent risk factors for thrombocytopenia are antibiotic use and sepsis. At the same time, invasive catheters and heparin use are also notable contributing factors.

Declarations

Data Availability statement

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

Ethics approval and consent to participate (Ref # 1814)

Approved by the department concerned.

Consent for publication

Approved

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Conflict of interest

The authors declared no conflicts of interest.

Author Contribution

NUW, MU

Contributed to study design, data collection, and initial manuscript drafting

Assisted in data acquisition, literature review, and manuscript editing

Performed statistical analysis and contributed to the interpretation of results

Helped in methodology Development, data organization, and manuscript formatting

Contributed to patient recruitment, data entry, and results compilation

AK, MB

Assisted in referencing, proofreading, and final revisions of the manuscript

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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