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Frequency of Thrombocytopenia and Its Etiologies in the Last Trimester of Pregnancy

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ABSTRACT

Thrombocytopenia is a frequent hematological abnormality in late pregnancy with diverse etiologies and potential maternal-fetal implications. **Objective:** To determine the frequency of thrombocytopenia and its etiologies in pregnant women in the last trimester. **Methods:** A descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Sheikh Zayed Hospital, Rahim Yar Khan, from June to December 2025. A total of 210 pregnant women in the third trimester were enrolled through non-probability consecutive sampling. Demographic and obstetric data were recorded, and platelet counts were assessed using a complete blood count. Thrombocytopenia severity and etiologies were determined using standardized clinical and laboratory criteria. **Results:** Among 210 women evaluated in the last trimester, the mean maternal age was 29.63 ± 5.03 years, and the mean gestational age was 36.46 ± 3.21 weeks. Mean gravidity and parity were 2.79 ± 1.26 and 1.90 ± 1.26, respectively, with overall platelet count 210.26 ± 57.04 $\times 10^3$/µL. Thrombocytopenia was detected in 26 (12.4%). Platelet counts differed significantly between thrombocytopenia and non-thrombocytopenia groups (115.73 ± 32.45 vs 223.61 ± 46.08 $\times 10^3$/µL; $p<0.001$). Severity was mild in 18 (69.2%), moderate in 6 (23.1%), and severe in 2 (7.7%). Gestational thrombocytopenia predominated (57.7%), followed by pre-eclampsia (11.5%), eclampsia (7.7%), disseminated intravascular coagulation (7.7%), infection-related causes (7.7%), HELLP syndrome (3.8%), and immune thrombocytopenic purpura (3.8%) overall. **Conclusions:** Thrombocytopenia affected 12.4% of late-pregnancy women, mostly mild. Gestational thrombocytopenia predominated, with smaller contributions from hypertensive disorders, disseminated intravascular coagulation, and infections.

INTRODUCTION

Pregnancy is a physiological phenomenon of human reproduction, which brings about various changes in the normal physiological functions of the body [1]. Amongst hematological changes, thrombocytopenia or reduced platelet count is one of the most commonly encountered changes in pregnant women [2]. It has been reported in a bulletin of the "American College of Obstetrics and Gynecology" that 12% pregnant women develop thrombocytopenia of some severity, which can either be due to a physiologic process or can indicate a serious underlying pathology that can pose a serious risk to mother and fetus [3]. In Pakistan, hospital-based data show wide variation in late-pregnancy thrombocytopenia prevalence (2–40%), depending on case mix and inclusion criteria, with most cases occurring in the third trimester and gestational thrombocytopenia being the leading cause [4, 5]. Thrombocytopenia, defined as a platelet count below 150,000/µL, is a frequent hematological abnormality in pregnancy and is often detected during late gestation when physiological haemodilution and increased platelet consumption contribute to a decline in circulating platelets [6, 7]. In clinical obstetrics, severity is commonly stratified as mild (100,000 to 149,000/µL), moderate (50,000 to 99,000/µL), and severe (<50,000/µL) because of an

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underlying pathological process, and the anticipated bleeding risk rises as platelet levels fall [8]. Gestational thrombocytopenia causes about 40%–75% of pregnancy thrombocytopenia, is usually mild, presents in the late second or third trimester, and resolves postpartum [9]. Hypertensive disorders, particularly preeclampsia and HELLP syndrome (Hemolysis, Elevated Liver enzymes, Low Platelet syndrome), account for roughly 10%–30%, are often moderate to severe, and are linked with preterm birth, placental abruption, and stillbirth [10]. Immune thrombocytopenia, including immune thrombocytopenic purpura, contributes about 3%–17% overall and is a major cause of platelets <50 $\times 10^9$/L, often presenting earlier [11]. A study conducted in Pakistan reported that the frequency of thrombocytopenia in pregnant women was 10.5% [12]. Another study, in addition to these, reported a frequency of etiological factors of thrombocytopenia in pregnant women, including gestational thrombocytopenia (57.50%), pre-eclampsia (16.10%), eclampsia (16.10%), HELLP syndrome (12%), disseminated intravascular coagulation (3.40%), and immune thrombocytopenic purpura (3.30%) [13].

A gap persists in locally generalizable evidence, quantifying the frequency and severity of thrombocytopenia specifically in the last trimester and simultaneously characterizing its major etiologies using uniform, predefined clinical and laboratory criteria, as existing reports show wide variability by setting and diagnostic workup. This limits risk stratification and timely etiological evaluation during the last trimester, when thrombocytopenia may reflect benign gestational change or serious hypertensive, consumptive, immune, or infection-related pathology with maternal-fetal implications. Therefore, the present study aimed to determine the frequency and severity of thrombocytopenia among last trimester of pregnant women and to find the major etiologies of thrombocytopenia.

METHODS

A descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Sheikh Zayed Hospital, Rahim Yar Khan, over six months from June to December 2025. Ethical approval was obtained from the institutional review committee (779/IRB/SZMC/SZH; dated 21st September 2023). Non-probability consecutive sampling was used to recruit eligible pregnant women presenting for routine antenatal care, scheduled delivery, or general obstetric evaluation in the third trimester. The sample size of 210 was calculated using the World Health Organization sample size calculator by assuming a 95% confidence level, 3.5% margin of error, and an anticipated frequency of thrombocytopenia in term pregnant women of 7.20% [14]. Pregnant women aged 16 to 45 years with singleton pregnancy confirmed on obstetric ultrasound and gestational age at or above 26 weeks based on last menstrual period or dating scan were included, irrespective of blood pressure status. Women with multiple pregnancy on obstetric ultrasound, documented medical comorbidities including smoking, diabetes mellitus, chronic liver disease, or chronic renal failure, pre-existing thrombocytopenia such as idiopathic thrombocytopenic purpura, and known hematological disorders associated with thrombocytopenia, including aplastic anemia or leukemia, were excluded. At enrolment, after taking written informed consent, demographic and obstetric variables, including maternal age, gestational age, gravidity, and parity, were recorded on the study proforma. A 3 mL venous blood sample was collected under aseptic precautions and transferred to a complete blood count vial for platelet count assessment in the hospital laboratory, which served as the primary assessing tool. Thrombocytopenia was defined as a platelet count below 150,000/mm^3 measured on a complete blood count, and severity was categorized as mild (100,000 to 149,000/mm^3), moderate (50,000 to 99,000/mm^3), and severe (<50,000/mm^3). Samples with thrombocytopenia on complete blood count were rechecked by repeat platelet estimation to exclude pseudothrombocytopenia. In women identified with thrombocytopenia, etiological assessment was performed. Gestational thrombocytopenia was characterized by mild to moderate thrombocytopenia, clinical stability, absence of hypertension and proteinuria, normal liver function tests, and no features suggestive of immune-mediated or consumptive coagulopathy. Pre-eclampsia was defined as systolic blood pressure at or above 140 mmHg or diastolic blood pressure at or above 90 mmHg on two readings at least four hours apart after 20 weeks' gestation with proteinuria of at least 300 mg/24-hour urine collection. Eclampsia was defined as pre-eclampsia with seizures. HELLP syndrome was defined by schistocytes on peripheral smear with elevated hepatic enzymes (aspartate aminotransferase or alanine aminotransferase >70 U/L or lactate dehydrogenase >600 U/L) and platelet count below 150,000/mm^3. Immune thrombocytopenic purpura was defined as an isolated thrombocytopenia below 100,000/mm^3 without systemic illness or secondary causes, supported by a peripheral smear showing small-sized platelets without hemolysis or schistocytes. Disseminated intravascular coagulation was diagnosed in clinically suspected bleeding diathesis when at least three criteria were present, including platelet count below 100,000/mm^3, prolonged prothrombin time >3 seconds above control, and/or activated partial thromboplastin time >5 seconds above control, elevated fibrin degradation

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products or D-dimer >0.5 µg/mL, and fibrinogen below 150 mg/dL. Malaria was diagnosed clinically with parasitological confirmation on peripheral smear or malarial antigen testing, while dengue fever was diagnosed on a compatible febrile illness with laboratory confirmation by NS1 antigen or immunoglobulin M testing as per illness day. Etiologies were classified as mutually exclusive. If more than one diagnostic category was fulfilled, the primary etiology was assigned using a prespecified hierarchy to minimize misclassification

Data were entered and analyzed using Statistical Package for the Social Sciences version 22.0. Normality of quantitative variables was assessed by using the Shapiro–Wilk test. Continuous variables were summarized as mean and standard deviation, while categorical variables were presented as frequencies and percentages. To address potential confounding, stratification was performed for maternal age, gestational age, gravidity, and parity, followed by post-stratification comparisons using the Chi-square test for associations between categorical variables. Comparison for continuous data was made using the Independent Samples t-test. A p-value of 0.05 or less was considered statistically significant.

RESULTS

The mean maternal age of the participants was 29.63 ± 5.03 years, with 128 (61.0%) women aged 16–30 years and 82 (39.0%) aged 31–45 years. The mean gestational age at assessment was 36.46 ± 3.21 weeks. The mean gravidity was 2.79 ± 1.26, and the mean parity was 1.90 ± 1.26. The overall mean platelet count was 210.26 ± 57.04 ×10^3/µL (Table 1).

Table 1: Baseline Demographic and Obstetric Characteristics of the Study Population (n=210)

Variables	Categories	n (%) / Mean ± SD
Maternal Age (Years)	Mean ± SD	29.63 ± 5.03
	16–30 Years	128 (61.0%)
	31–45 Years	82 (39.0%)
Gestational Age at Assessment (Weeks)	Mean ± SD	36.46 ± 3.21
	≤ 30 Weeks	20 (9.5%)
	31–36 Weeks	54 (25.7%)
	> 36 Weeks	136 (64.8%)
Gravidity	Mean ± SD	2.79 ± 1.26
	1–2	95 (45.2%)
	≥ 3	115 (54.8%)
Parity	Mean ± SD	1.90 ± 1.26
	0–2	139 (66.2%)
	≥ 3	71 (33.8%)
Platelet count (10^3/µL)	Mean ± SD	210.26 ± 57.04

Values are presented as mean ± standard deviation for continuous variables and number (percentage) for categorical variables. SD = standard deviation; n = number of participants

The frequency of thrombocytopenia among the participants was 26 (12.4%), while 184 (87.6%) women had normal platelet counts (Figure 1).

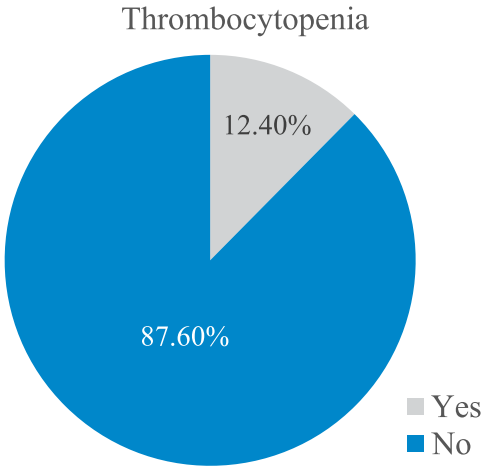

Figure 1: The Frequency of Thrombocytopenia Among Study Participants

Among the 210 pregnant women evaluated in the last trimester, the mean platelet count was significantly lower in the thrombocytopenia group (115.73 ± 32.45 ×10^3/µL) compared with the non-thrombocytopenia group (223.61 ± 46.08 ×10^3/µL) ($p<0.001$) (Table 2).

Table 2: Comparison of Baseline Characteristics by Thrombocytopenia Status (n=210)

Variables	Categories	Thrombocytopenia		Statistical Test Value	p-value
		Present, (n=26)	Absent, (n=184)		
Maternal Age (Years)	Mean ± SD	28.42 ± 5.04	29.80 ± 5.01	t = -1.309	0.192
Gestational Age (Weeks)	Mean ± SD	36.54 ± 2.96	36.45 ± 3.25	t = 0.138	0.891
Gravidity	Mean ± SD	2.58 ± 1.17	2.82 ± 1.28	t = -0.900	0.369
Parity	Mean ± SD	1.77 ± 1.37	1.91 ± 1.25	t = -0.544	0.587
Platelet (10^3/µL)	Mean ± SD	115.73 ± 32.45	223.61 ± 46.08	t = -14.954	<0.001
Maternal Age	16–30 years	19 (73.1%)	109 (59.2%)	χ^2 = 1.833	0.176
	31–45 years	7 (26.9%)	75 (40.8%)		
Gestational Age	≤30 weeks	2 (7.7%)	18 (9.8%)	χ^2 = 1.248	0.536
	31–36 weeks	9 (34.6%)	45 (24.5%)		
	>36 weeks	15 (57.7%)	121 (65.8%)		

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Gravidity	1–2	16 (61.5%)	79 (42.9%)	$\chi^2 = 3.183$	0.074
	≥3	10 (38.5%)	105 (57.1%)		
Parity	0–2	21 (80.8%)	118 (64.1%)	$\chi^2 = 2.818$	0.093
	≥3	5 (19.2%)	66 (35.9%)		

Values are presented as mean ± SD for continuous variables and n (%) for categorical variables. SD = standard deviation; t = independent samples t-test; χ^2 = Pearson Chi-square test statistic, and p<0.001 indicates statistical significance

Among the 26 women diagnosed with thrombocytopenia, 18 (69.2%) had mild thrombocytopenia, 6 (23.1%) exhibited moderate thrombocytopenia, and 2 (7.7%) had severe thrombocytopenia (Figure 2).

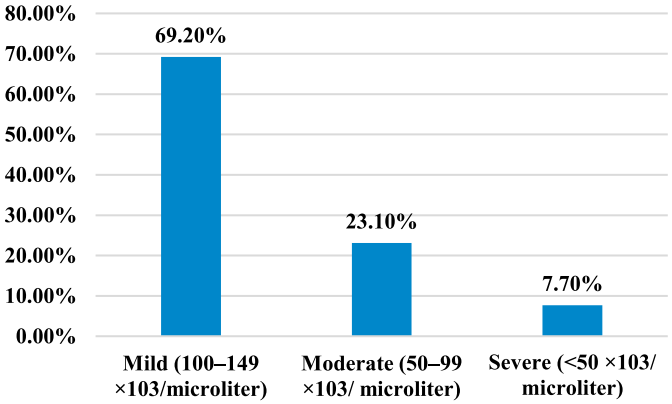

Figure 2: Severity of Thrombocytopenia

Gestational thrombocytopenia was identified in 15 (57.7%) patients, pre-eclampsia in 3 (11.5%), eclampsia in 2 (7.7%), HELLP syndrome in 1 (3.8%), immune thrombocytopenic purpura in 1 (3.8%), disseminated intravascular coagulation in 2 (7.7%), and infection-related thrombocytopenia in 2 (7.7%) (Table 3).

Table 3: Etiological Distribution of Thrombocytopenia Among Affected Pregnant Women (n=26)

Etiology	Count (%)
Gestational Thrombocytopenia	15 (57.7%)
Pre-Eclampsia	3 (11.5%)
Eclampsia	2 (7.7%)
HELLP Syndrome	1 (3.8%)
Immune Thrombocytopenic Purpura (ITP)	1 (3.8%)
Disseminated Intravascular Coagulation (DIC)	2 (7.7%)
Infection-Related Thrombocytopenia	2 (7.7%)

DISCUSSION

In the present cross-sectional study of 210 women assessed in the last trimester, thrombocytopenia was identified in 12.4%, with a mean maternal age of 29.63 ± 5.03 years and a mean gestational age of 36.46 ± 3.21 weeks. Mild thrombocytopenia predominated (69.2%), while moderate and severe disease accounted for 23.1% and 7.7%, respectively. Gestational thrombocytopenia was the leading etiological category (57.7%), followed by hypertensive disorders of pregnancy and smaller contributions from consumptive, immune, and infection-related causes. The observed frequency of 12.4% lies within the range reported by several studies using the same diagnostic threshold of platelet count <150 ×10^9/L. Similar prevalence was reported by Begam *et al.* as 13.4% and by Tirago *et al.* as 14.8%, while Hanif *et al.* reported 10.0%, and Mumtaz *et al.* reported 12.1% [15-18]. The pooled prevalence from Ethiopian studies was 10.7% (95% confidence interval 8.6% to 13.0%), providing a benchmark that closely approximates the present estimate [19]. Lower frequencies were reported in larger screening datasets, including 5.6% among women beyond 28 weeks and 7.20% across deliveries from a large retrospective series [14, 20]. In contrast, a markedly higher frequency of 24.8% was documented in a Pakistani study [21]. Differences across studies are plausibly attributable to recruitment windows, referral patterns, exclusion criteria, distribution of hypertensive disease, and infection-related exposures, as several studies implemented expanded diagnostic workups, including dengue and malaria testing in febrile women and coagulation testing when disseminated intravascular coagulation was suspected. Maternal age was not significantly associated with thrombocytopenia in the present study, with comparable mean ages in the thrombocytopenia versus non-thrombocytopenia groups (p=0.192) and no difference across age categories (p=0.176). Similar null associations have been reported previously, including Athira *et al.* (p=0.481), Hanif *et al.* (p=0.601), and Mumtaz *et al.* (p=0.637), indicating minimal age-related confounding in series dominated by gestational thrombocytopenia, although age may become more influential in severity-enriched samples [17, 18, 22]. Gestational age also showed no association with thrombocytopenia in the present dataset (p=0.891), consistent with Sridhar *et al.* (p=0.12). However, some reports suggest gestational timing affects detection, with higher frequency at >34 weeks in Hanif *et al.* (p=0.030) and an enrolment gestational age association in Athira *et al.* (p=0.002), As 64.8% of participants were assessed beyond 36 weeks, late gestation sampling may have preferentially captured physiological gestational thrombocytopenia and underrepresented earlier, more severe systemic etiologies [17, 22]. Non-significant associations with maternal age, gestational age, gravidity, and parity suggest no clear clustering of thrombocytopenia within these baseline strata in this sample. Nonetheless, smaller effects cannot be excluded due to the limited numbers in the

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thrombocytopenia group. Platelet count metrics were consistent with comparative literature. The overall mean platelet count was 210.26 ± 57.04 $\times10^3$/µL, which closely aligns with the mean platelet count reported by Hanif *et al.* at 213 ± 78.33 [17]. As expected, the thrombocytopenia group in the present study had substantially lower platelet counts than the non-thrombocytopenia group (115.73 ± 32.45 $\times10^3$/µL vs 223.61 ± 46.08 $\times10^3$/µL, $p<0.001$). Comparable values were reported by Bai *et al.* where thrombocytopenic women had a mean platelet count of 117 $\times10^9$/L, supporting similarity in the phenotype of thrombocytopenia detected in late pregnancy [13]. The present severity pattern, with mild predominance (69.2%), is consistent with previous literature. Athira C *et al.* reported mild 76.2%, moderate 19.0%, severe 4.8%, and Saba *et al.* reported mild 64.5%, moderate 29.0%, severe 6.5% [22]. Al Husban *et al.* reported mild disease in 78.53% and moderate to severe disease in 21.47% [14]. In contrast, Begam *et al.* documented a higher proportion of moderate thrombocytopenia (53.7%) relative to mild (35.8%) [15]. Etiological distribution in the present study is consistent with the literature, showing gestational thrombocytopenia as the most frequent cause. Gestational thrombocytopenia accounted for 57.7% in the present analysis, similar to Bai *et al.* (57.5%) and Chandil *et al.* (61.53%) [13, 23]. The contribution of hypertensive disorders was also comparable across studies. In the present study, pre-eclampsia, eclampsia, and HELLP syndrome together accounted for 23.0%, approximating Athira *et al.* where gestational hypertension or preeclampsia accounted for 11.9% and HELLP for 4.8%, and aligning with Chandil *et al.* where hypertensive disorders accounted for 32.69%, including preeclampsia 23.07% and eclampsia 7.69% [22, 23]. Infection and consumptive states were also consistently represented across series, including dengue 7.9% in Sridhar *et al.* viral fever 4.8% in Athira *et al.* The present identification of disseminated intravascular coagulation in 7.7% and infection-related thrombocytopenia in 7.7% is directionally concordant with reports where disseminated intravascular coagulation contributed 3.4% in Bai *et al.* and constituted a notable fraction in more severe restricted samples [13]. In a study limited to platelet counts below 100 $\times10^9$/L, thrombocytopenia incidence was 3.0%, with obstetric causes comprising 80% and including gestational thrombocytopenia 38%, preeclampsia 20%, and disseminated intravascular coagulation 12%, while immune thrombocytopenia and dengue each contributed 8%, illustrating how etiologic distributions shift when only moderate to severe thrombocytopenia is captured [24]. Although near-term platelet surveillance is useful for late-pregnancy detection, earlier risk-based screening may improve identification of clinically significant non-gestational thrombocytopenia.

This study quantified the prevalence, severity, and etiological profile of thrombocytopenia in late pregnancy using a standardized diagnostic method with structured clinical and laboratory assessment. Stratified analyses across maternal age, gestational age, gravidity, and parity strengthened interpretability. Limitations included the cross-sectional design, which precluded causal inference and outcome tracking; most participants were assessed beyond 36 weeks of gestation, and the single-center setting, which may limit external validity. Exclusion of major comorbidities may have reduced generalizability to higher-risk pregnancies. Future work should include multi-center prospective designs with serial platelet measurements and linked maternal and neonatal outcomes to refine risk stratification and management pathways.

CONCLUSIONS

Thrombocytopenia was observed in 12.4% of women evaluated during late pregnancy and was predominantly of mild severity. Gestational thrombocytopenia emerged as the most frequent etiology, while hypertensive disorders of pregnancy, disseminated intravascular coagulation, immune thrombocytopenic purpura, and infection-related causes accounted for smaller but clinically relevant subsets. These findings support routine platelet surveillance near term and prompt etiological assessment to guide safe obstetric management.

Authors' Contribution

Conceptualization: SZ
Methodology: TF, SZ, SY
Formal analysis: FA, SS
Writing and Drafting: TF, SZ, SY,
Review and Editing: TF, SZ, SY, FA, SS

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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