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Effect of Thrombocytopenia in Pregnancy and Their Maternal Outcome

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ABSTRACT

Gestational thrombocytopenia is a common hematological disorder during pregnancy that can significantly impact maternal health, depending on its severity. **Objective:** To assess the effects of thrombocytopenia severity on key maternal outcomes, including antepartum and postpartum hemorrhage, and placental abruption. **Methods:** In this prospective study, 192 pregnant women diagnosed with thrombocytopenia were analyzed at the Department of Obstetrics and Gynecology, Tertiary Care Hospital, Bahawalpur, from March 07, 2023, to September 06, 2023. We evaluated the severity of thrombocytopenia, maternal age, platelet count, and gestational age, examining their associations with maternal health outcomes using chi-square and correlation analysis. **Results:** No significant correlation was found between thrombocytopenia severity and maternal age ($p=0.467$). Severe thrombocytopenia was strongly associated with increased risks of antepartum hemorrhage (100% of cases), postpartum hemorrhage, and placental abruption ($p<0.001$ for both). Additionally, a moderate positive correlation was observed between platelet count and gestational age ($r=0.478$, $p<0.001$), indicating a potential link between the progression of pregnancy and changes in thrombocytopenia severity. **Conclusions:** It was concluded that severe gestational thrombocytopenia markedly increases maternal risks, underscoring the importance of diligent monitoring and management. The findings advocate for early detection and proactive interventions to enhance maternal outcomes in thrombocytopenic pregnancies.

INTRODUCTION

Thrombocytopenia, defined as a platelet count below 150,000/μL, is the second most common hematological abnormality in pregnancy after anemia. It affects approximately 7% to 12% of pregnant women, with gestational thrombocytopenia accounting for the majority of cases. While gestational thrombocytopenia is generally mild and resolves spontaneously after delivery, it is crucial to differentiate it from more serious causes such as preeclampsia, HELLP syndrome, immune thrombocytopenic purpura (ITP), and thrombotic micro-angiopathies, which can lead to significant maternal and fetal morbidity and mortality [1, 2]. In clinical practice, distinguishing benign gestational thrombocytopenia from more serious etiologies is based on the timing of onset, degree of thrombocytopenia, and absence of systemic symptoms. Gestational thrombocytopenia typically presents in the late second or third trimester with mild reductions in platelet count (usually >70,000/μL), lacks associated hypertension, liver dysfunction, or hemolysis, and resolves spontaneously postpartum without requiring specific therapy [2, 3]. In contrast, serious causes such as preeclampsia, HELLP syndrome, and ITP are often associated with more profound thrombocytopenia, systemic signs (e.g., elevated liver enzymes, hypertension, hemolysis), and may require active medical intervention or early delivery. Patients in this study were carefully evaluated through clinical history, laboratory assessments, and exclusion of systemic disease to ensure appropriate classification of thrombocytopenia severity and etiology. The severity of thrombocytopenia plays a pivotal role in determining maternal outcomes. Mild thrombocytopenia is often asymptomatic; however,

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moderate to severe thrombocytopenia significantly increases the risk of adverse outcomes such as antepartum hemorrhage (APH), postpartum hemorrhage (PPH), and placental abruption [3]. A study conducted in Ethiopia reported that pregnant women with moderate to severe thrombocytopenia had higher incidences of cesarean sections, APH, PPH, wound hematoma, intrauterine fetal death, preterm delivery, and intrauterine growth restriction compared to those with mild thrombocytopenia [4]. Placental abruption, a severe obstetric complication, has also been linked to low platelet counts. In a prospective study involving 96 thrombocytopenic pregnant women, 21.8% developed placental abruption, 14.6% suffered from PPH, and 7.3% required intensive care unit admission, while the maternal mortality rate was noted at 2.1% [5]. Another recent study emphasized that severe thrombocytopenia was more prevalent among primigravidae and associated with increased adverse outcomes, highlighting the importance of severity grading in clinical practice [6]. Immune thrombocytopenic purpura (ITP), an autoimmune disorder causing accelerated platelet destruction, presents additional challenges in pregnancy. Women with ITP are at an elevated risk of significant bleeding during delivery, and their neonates are susceptible to thrombocytopenia due to the trans-placental transfer of antiplatelet antibodies [7]. This condition necessitates careful monitoring and multidisciplinary management to prevent severe bleeding complications. Even mild thrombocytopenia before cesarean delivery has been identified as a risk factor for PPH. A retrospective cohort study reported that women with mild thrombocytopenia had a threefold increase in PPH risk compared to those with normal platelet counts [8]. This finding underscores the importance of monitoring platelet levels, even when thrombocytopenia appears clinically insignificant. Preventive strategies to reduce postpartum hemorrhage risk in thrombocytopenic pregnant women include routine monitoring of platelet counts throughout pregnancy and optimizing delivery planning. For women with moderate to severe thrombocytopenia, multidisciplinary management involving obstetricians, anesthesiologists, and hematologists is recommended. Prophylactic platelet transfusions are considered when counts fall below critical thresholds, especially before cesarean delivery or anticipated bleeding events [9]. Additionally, active management of the third stage of labor, including uterotonic administration and readiness with blood products, further mitigates PPH risk. The study adhered to these standard preventive protocols to ensure safe delivery outcomes. The correlation between thrombocytopenia severity and poor maternal outcomes such as APH, PPH, and placental abruption emphasizes the need for timely diagnosis and appropriate management. Early identification of at-risk women and proactive obstetric care can substantially improve maternal and neonatal outcomes. Comprehensive assessment strategies, including routine platelet count monitoring and individualized care plans based on thrombocytopenia severity, are essential components of obstetric care [9, 10]. Although various studies have examined gestational thrombocytopenia, most are limited either by sample size or lack of stratification by severity. Furthermore, there is little consensus on the threshold for intervention and limited local data regarding how varying degrees of thrombocytopenia affect maternal outcomes in our population. Additionally, few studies comprehensively explore antepartum hemorrhage and placental abruption about thrombocytopenia severity.

This study aims to fill this gap by evaluating the association between thrombocytopenia severity and key maternal outcomes, including antepartum hemorrhage, postpartum hemorrhage, and placental abruption in a well-characterized cohort of pregnant women. By identifying risk patterns across severity levels, this research aims to improve early diagnosis, risk stratification, and intervention planning.

METHODS

This prospective cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Tertiary Care Hospital, Bahawalpur, from March 07, 2023, to September 06, 2023. Ethical approval (Letter No: EC-2-2023) was obtained from the Institutional Review Board of CMH Bahawalpur, and informed consent was taken from all participants before data collection. The sample size was calculated using Open Epi version 3.01, a free and open-source epidemiological statistics tool. The calculation was based on a prior study by Qureshi et al., which reported a 14.6% incidence of postpartum hemorrhage (PPH) among pregnant women with thrombocytopenia [11]. Using a 95% confidence level, a 5% margin of error, and a population proportion (p) of 0.146, the required sample size was determined to be 192 participants. The formula used by Open Epi is: $n = (Z^2 \times p \times (1-p)) / d^2$. Where: n=required sample size, Z=Z-score for 95% confidence (1.96), p=expected proportion (0.146) and d=precision or margin of error (0.05). Inclusion criteria were pregnant women aged 18–45 years, with thrombocytopenia (platelet count <150,000/µL) confirmed via complete blood count (CBC), diagnosed during routine antenatal visits. Exclusion criteria included: Pre-existing hematological disorders (e.g., ITP, aplastic anemia), known autoimmune diseases, chronic liver

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disease, known malignancies, and patients who declined participation or had incomplete records. A non-probability consecutive sampling technique was used. All pregnant women who met the inclusion criteria and presented to the Obstetrics and Gynecology Department during the study period were enrolled until the desired sample size was achieved. This approach minimized selection bias by ensuring that each eligible case was included in the analysis in the order of presentation. To ensure accurate differentiation between benign gestational thrombocytopenia and other pregnancy-related causes of thrombocytopenia, such as preeclampsia, HELLP syndrome, and thrombotic microangiopathies, all patients underwent a comprehensive multi-step clinical and laboratory evaluation. This included a detailed medical and obstetric history, serial blood pressure monitoring, urinalysis for proteinuria, liver function tests, renal function tests, and peripheral blood smear review. Women with elevated blood pressure (≥140/90 mmHg), significant proteinuria, elevated liver enzymes, evidence of hemolysis, or signs suggestive of systemic disease were thoroughly assessed for preeclampsia, HELLP syndrome, or other hematological disorders. Patients diagnosed with any secondary cause of thrombocytopenia were excluded from the study. Furthermore, any patient who developed features of hypertensive disorders or other systemic complications later in pregnancy was also excluded from the final analysis. This rigorous approach ensured that the study population was limited to women with isolated gestational thrombocytopenia, minimizing diagnostic overlap. Data were collected through a standardized, pre-tested proforma that included demographic details (age), clinical parameters (gestational age at diagnosis, platelet count), and maternal outcomes (incidence of APH, PPH, and placental abruption). Platelet count severity was stratified as: Mild: 100,000-150,000/µL, moderate: 50,000-99,999/µL and Severe: <50,000/µL. Data analysis was performed using SPSS Version 26.0. Descriptive statistics (means, standard deviations, frequencies, and percentages) were used to summarize participant characteristics. To evaluate associations between categorical variables, such as thrombocytopenia severity (mild, moderate, severe) and maternal outcomes (presence or absence of PPH, APH, or placental abruption), the Chi-square test was applied. Specifically, cross-tabulations were created comparing the distribution of each maternal outcome across the thrombocytopenia severity groups. The Chi-square test then determined whether these distributions differed significantly, identifying whether increasing severity of thrombocytopenia was associated with a higher frequency of adverse maternal outcomes. Additionally, Pearson correlation analysis was used to explore the relationship between continuous variables, namely platelet count and gestational age, as well as platelet count and maternal age. The rationale for using Pearson correlation was to determine whether a linear relationship existed between the degree of thrombocytopenia and either gestational progression or maternal demographic factors. This helped assess whether declining platelet counts correlated with advancing gestation or maternal age, which could influence clinical decision-making. Together, these methods allowed for a two-pronged approach: Chi-square testing assessed whether the categorical grouping of thrombocytopenia severity correlated with adverse outcomes. Pearson correlation identified potential linear trends in platelet counts with continuous variables such as gestational age. At this stage, no additional statistical models were applied because the primary objective was to explore bivariate associations. However, recognizing the potential influence of confounding variables (e.g., maternal age, gestational age), we plan to conduct logistic regression analysis in future or larger datasets to validate these findings and adjust for possible confounders. For the current study, results were considered statistically significant at $p<0.05$.

RESULTS

The study analyzed 192 participants. The average age was 30.20 years with a standard deviation of 7.985, indicating a diverse age range. The mean platelet count was 193,292.96 platelets per microliter, showing substantial variation among participants as suggested by a standard deviation of 101,167.246. The gestational age at diagnosis averaged 26.51 weeks with a standard deviation of 3.400, reflecting diagnoses made primarily in the mid to late second trimester. The distribution of thrombocytopenia severity across different age groups reveals varying patterns. In the Young Adult group (18–25 years), thrombocytopenia was categorized as mild in 27 cases (42.19%), moderate in 25 cases (39.06%), and severe in 12 cases (18.75%) out of a total of 64 cases. This indicated a relatively even spread of severity among the younger age group. For the Adult group (26–35 years), there was a noticeable shift towards milder forms of thrombocytopenia, with 38 cases (57.58%) recorded as mild, while moderate and severe cases are comparatively less frequent at 18 (27.27%) and 10 (15.15%) respectively, out of 66 total cases. This suggests that thrombocytopenia tends to present less severely as the age within this cohort increases. The Middle Age group (36–45 years) shows a distribution of 28 cases (45.16%) with mild thrombocytopenia, 22 cases (35.48%) moderate, and 12 cases (19.35%) severe, out of a total of 62 cases. This pattern is somewhat similar to that observed in the Young Adult group, indicating that the severity of thrombocytopenia does not significantly taper off with

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advancing age in this cohort. A p-value of 0.467 indicates no statistically significant association between age groups and thrombocytopenia severity, suggesting that observed variations across age groups do not differ meaningfully on a statistical basis (Table 1).

Table 1: Association of Age Group with Severity of Thrombocytopenia

Age Group	Severity of Thrombocytopenia, n (%)			Total	p-Value
	Mild	Moderate	Severe		
Young Adult (18-25 Years)	27 (42.19%)	25 (39.06%)	12 (18.75%)	64	0.467
Adult (26-35 Years)	38 (57.58%)	18 (27.27%)	10 (15.15%)	66	
Middle Age (36-45 Years)	28 (45.16%)	22 (35.48%)	12 (19.35%)	62	

The data illustrated a distinct pattern where Antepartum Hemorrhage (APH) was exclusively associated with severe thrombocytopenia, with all 34 cases of APH occurring in this group (100%). There were no occurrences of APH in the mild or moderate thrombocytopenia groups. This highlights a critical and significant relationship between the severity of thrombocytopenia and the likelihood of experiencing APH, as supported by a p-value<0.001. This indicates a statistically significant association, where the severity of thrombocytopenia appears to be a determinant factor in the occurrence of APH (Table 2).

Table 2: Association of Antepartum Hemorrhage with severity of Thrombocytopenia

Antepartum Hemorrhage	Severity of Thrombocytopenia, n (%)			Total	p-Value
	Mild	Moderate	Severe		
No	93 (58.86%)	65 (41.14%)	0 (0%)	158	<0.001
Yes	0 (0%)	0 (0%)	34 (100%)	34	
Total	93 (48.44%)	65 (33.85%)	34 (17.71%)	192	

The analysis of the relationship between the severity of thrombocytopenia and the incidence of postpartum hemorrhage (PPH) reveals a statistically significant correlation (p-value=0.007). The data demonstrate that as the severity of thrombocytopenia progresses from mild to severe, there is a notable shift in the incidence and severity of PPH. Specifically, the proportion of patients experiencing no PPH declines markedly from 49 (52.69%) in mild cases to only 6 (17.65%) in severe cases. Conversely, the frequencies of mild PPH increase from 26 (27.96%) in mild thrombocytopenia to 13 (38.24%) in severe, and similar trends are observed in moderate and severe PPH, which rise from 14 (15.05%) and 4 (4.30%) in mild cases to 9 (26.47%) and 6 (17.65%) in severe cases, respectively. This progression underscores the clinical importance of closely monitoring and managing thrombocytopenia in pregnant patients to reduce the risks associated with more severe outcomes of PPH (Table 3).

Table 3: Association of PPH with severity of Thrombocytopenia

Postpartum Hemorrhage	Severity of Thrombocytopenia, n (%)			Total	p-Value
	Mild	Moderate	Severe		
No PPH	49 (52.69%)	21 (32.31%)	6 (17.65%)	76	<0.001
Mild PPH	26 (27.96%)	24 (36.92%)	13 (38.24%)	63	
Moderate PPH	14 (15.05%)	12 (18.46%)	9 (26.47%)	35	
Severe PPH	4 (4.30%)	8 (12.31%)	6 (17.65%)	18	
Total	93 (100%)	65 (100%)	34 (100%)	192	

The association between the severity of thrombocytopenia and the occurrence of placental abruption is highlighted by a statistically significant link (p-value<0.001). The data clearly show that placental abruption is uniquely associated with severe thrombocytopenia, with all instances (n=9, 26.47%) occurring in this group, while no cases of placental abruption are observed in the mild or moderate thrombocytopenia groups. Notably, among those with severe thrombocytopenia, approximately one-quarter experience placental abruption, contrasting sharply with the absence of this complication in the milder categories. This significant association underscores the critical need for monitoring thrombocytopenia severity in pregnant patients to preemptively manage and mitigate the risk of severe outcomes such as placental abruption (Table 4).

Table 4: Association of Placental Abruption with Severity of Thrombocytopenia

Placental Abruption	Severity of Thrombocytopenia, n (%)			Total	p-Value
	Mild	Moderate	Severe		
No	93 (100%)	65 (100%)	25 (73.53%)	183	<0.001
Yes	0 (0%)	0 (0%)	9 (26.47%)	9	
Total	93 (100%)	65 (100%)	34 (100%)	192	

The correlation analysis provides insights into the relationships among age, platelet count, and gestational age at diagnosis. The correlation between the age of the patient and platelet count was found to be very weak and not statistically significant (r=0.004, p=0.953, 95% CI: -0.137 to 0.145), indicating that maternal age has no meaningful linear association with platelet count in this cohort. Similarly, the correlation between maternal age and gestational age at diagnosis demonstrated a weak negative trend (r=-0.137, p=0.058, 95% CI: -0.270 to 0.003), suggesting that older patients may tend to be diagnosed earlier in pregnancy; however, the association did not reach statistical significance and the confidence interval includes zero, implying uncertainty about the direction or strength of this relationship. In contrast, a moderate and statistically significant positive correlation was observed between platelet count and gestational age at diagnosis (r=0.478, p<0.001, 95% CI: 0.345 to 0.592). This indicates that higher platelet counts were more frequently observed at later gestational ages, supporting the possibility that

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gestational thrombocytopenia tends to present or worsen earlier in pregnancy and then stabilize or improve in the later stages. The confidence interval here does not include zero, reinforcing the robustness of this association. These findings provide a more precise understanding of how thrombocytopenia may evolve during pregnancy and offer useful insights for monitoring trends in platelet levels throughout gestational progression (Table 5).

Table 5: Correlation Analysis

Variable Pairs	Pearson Correlation (r)	p-Value	n	95% CI for r	Interpretation
Age of Patient and Platelet Count	0.004	0.953	192	-0.137 to 0.145	Very weak positive correlation, not significant
Age of Patient and Gestational Age at Diagnosis	-0.137	0.058	192	-0.270 to 0.003	Weak negative correlation, not significant
Platelet Count and Gestational Age at Diagnosis	0.478	<0.001	192	0.345 to 0.592	Moderate positive correlation, statistically significant

DISCUSSION

The investigation into the implications of gestational thrombocytopenia on maternal outcomes reveals intricate relationships between the severity of thrombocytopenia and various adverse maternal events. Our findings extend and corroborate previous research, establishing severe thrombocytopenia as a critical predictor of increased maternal risk. This discussion integrates and contrasts our findings with seminal studies in the field, enhancing our understanding and management of this prevalent condition. Our study's observation that severe thrombocytopenia markedly increases the incidence of placental abruption and postpartum hemorrhage aligns with Qureshi *et al.*, who documented significant maternal complications in thrombocytopenic pregnancies, including a 21.8% incidence of placental abruption and a 14.6% incidence of postpartum hemorrhage. This alignment underscores the importance of proactive management in severe cases to prevent such adverse outcomes [11]. Similarly, Bai *et al.*, found that gestational thrombocytopenia was the most common cause of thrombocytopenia in their cohort [12]. This supports our findings and highlights the frequent, albeit often benign, occurrence of this condition in pregnancies, necessitating vigilant clinical monitoring. Further echoing our results, Roy *et al.*, reported that the incidence of thrombocytopenia varies across its severity, influencing clinical outcomes [13]. Current study also noted that as thrombocytopenia severity increases, so does the incidence of complications such as antepartum and postpartum hemorrhages. The clinical implications noted in Abro et al., resonate with our findings, where severe thrombocytopenia was significantly linked to adverse feto-maternal outcomes, emphasizing the necessity for multidisciplinary management strategies to mitigate associated risks [14]. Taş *et al.*, reported significant perinatal complications associated with severe thrombocytopenia, including lower birth weights and earlier deliveries, a pattern also discernible in our study, which suggests that severe thrombocytopenia may predispose to earlier and more complicated deliveries [15]. Mumtaz *et al.*, observed that thrombocytopenia significantly elevated the risk of severe maternal outcomes like placental abruption and the need for blood transfusions, findings that are consistent with our observations of increased complications with progressing thrombocytopenia severity [16]. Sumathi *et al.*, and A Dar *et al.*, provide further context to our results, highlighting the broader spectrum of thrombocytopenia's impact on maternal health and reiterating the critical nature of its management within obstetric care [17, 18]. Harde *et al.*, discuss the complications associated with thrombocytopenia in Indian pregnant women, noting a high correlation with conditions like preeclampsia and infectious causes, which is a crucial consideration that aligns with our findings on the complexity of managing thrombocytopenia [19]. Finally, Chauhan et al., emphasize the prevalence and management complexities of thrombocytopenia in Indian women, highlighting the need for tailored management strategies based on severity, similar to the implications derived from our study [20].

CONCLUSIONS

It was concluded that this study evaluated the effects of thrombocytopenia severity on key maternal outcomes, specifically antepartum hemorrhage, postpartum hemorrhage, and placental abruption. The findings demonstrate that increasing thrombocytopenia severity is significantly associated with a higher risk of these adverse maternal events. Early identification and accurate classification of thrombocytopenia severity are essential for guiding clinical monitoring and implementing timely interventions to improve maternal safety and outcomes.

Authors Contribution

Conceptualization: HM
Methodology: SZC
Formal analysis: SU
Writing review and editing: NH

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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