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ORIGINAL ARTICLE

Association of Maternal Thrombocytopenia with Neonatal Platelet Count

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ABSTRACT

OBJECTIVE: to evaluate the association of maternal thrombocytopenia with neonatal platelet count

METHODOLOGY: This cross-sectional study was conducted among females admitted for delivery in the obstetric unit of Liaquat College of Medicine & Dentistry from May 2024 to January 2025. Seventy-six patients with low platelet counts were included using a nonprobability sampling technique; miscarriages and anomalies were excluded. Samples taken for maternal CBC, LFTs, PT, APTT, and cord blood were assessed for neonatal platelet count. The chi-square test was used to determine the association between maternal thrombocytopenia and neonatal platelet counts.

RESULTS: Mean age of participants is 27.4±4.7 years, while the mean gestational age of delivery is 37 weeks ± 1.9. Most patients are multigravida, with a mean parity of 2.4±1.5 and a mean number of live births of 1.03±1.39. EL LSCS is the most common mode of delivery (36.8%), followed by Em LSCS (31.6%). Instrumental Vaginal Delivery (IVD) is the least common (3.9%). The average platelet count at birth is 104.9 x9 µl, with a mean cord blood platelet count of 217 x9 µl. The most common cause identified was gestational thrombocytopenia (46.1%), and 78.9% had no reported complications, indicating a generally favourable clinical outcome.

CONCLUSION: Thrombocytopenia in pregnancy, largely gestational and benign, showed no significant impact on fetal outcomes, cord blood platelet count, or need for NICU. Maternal thrombocytopenia cannot be regarded as the sole considerable risk factor for neonatal thrombocytopenia in term pregnancies.

KEYWORDS: thrombocytopenia, gestational, HELLP syndrome, neonatal thrombocytopenia, cord blood platelets.

INTRODUCTION

Thrombocytopenia is the second most common hematological disorder in pregnancy after anemia, with an incidence of around 10–12% [1]. The etiology of thrombocytopenia ranges from benign conditions like gestational thrombocytopenia with minimal complications to severe pathologies like immune thrombocytopenia, which predisposes the women and fetus to morbidity and even mortality[2]. Thrombocytopenia is a common finding in pregnancy commonly observed in third trimester, the platelet count may decrease by approximately 6–7% and it generally occurs due to hemodilution, increased platelet consumption, and increased platelet aggregation due to increased levels of thromboxane A2 [3] Other causes of low platelet count include pre-eclampsia, HELLP syndrome, gestational thrombocytopenia, ITP, TTP and vector borne diseases like malaria and dengue which is of more concerning in our population. Decreased production is uncommon, and when it occurs, it is mainly associated with nutritional deficiencies such as B12[4].

Literature search indicates the incidence of pre-eclampsia in our population is around 14.4% [5], while that of HELLP syndrome and autoimmune conditions like ITP/TTP is around 15.6% [6] and 0.01 to 0,05% [7], respectively. Interestingly, more than 60% of the Pakistani population is at risk of malaria infection, with an estimated 100,000 new cases and approximately 1000 malaria-related deaths occurring annually[8,] adding further to the causes of thrombocytopenia in our population.

Fetal and neonatal platelet counts, such as those of neonatal alloimmune thrombocytopenia (NAIT), an unusual platelet condition, are also of great concern in addition to the mother's platelet count which is caused by maternal alloimmunization to human-specific antigens (HPAs) that are paternally inherited, resulting in low fetal/neonatal platelet levels and debilitating effects on the newborn[9] The incidence of NAIT is 1 in every 1000 live births within the United States; it is the most common cause of severe thrombocytopenia (<30 × 109/L) and intracranial hemorrhage in term newborns[10]. For the assessment of neonatal conditions, Umbilical cord blood (UCB) is commonly collected immediately after delivery and used for various laboratory tests, including platelet count. Studies have demonstrated that platelet counts obtained from UCB are comparable to those from neonatal peripheral blood samples, and research indicates no significant differences in platelet counts between cord blood and peripheral blood collected within the first 24 hours of life[11,12].

Extensive literature is available regarding the prevalence, incidence and management of thrombocytopenia in pregnancy, with a focus on specific causes like ITP, pre-eclampsia and other etiologies. Still, a general overview of the condition and its relationships with various situations and maternal and fetal complications is less well studied in our population. Moreover, evidence suggests a considerable association between neonatal and maternal thrombocytopenia in certain conditions, such as ITP/TTP and hypertensive disorders of pregnancy[13]. We aim to determine the level of neonatal platelet count in mothers presenting with reduced platelet count in pregnancy.

The rationale of the study is to determine whether routine screening of neonatal platelet count at the time of delivery, via a noninvasive method such as umbilical cord blood sampling in thrombocytopenic mothers, could help identify high-risk neonates who need of NICU care and further management.

METHODOLOGY

This cross-sectional study was conducted in the Obstetrics & Gynaecology department of Liaquat College of Medicine and Dentistry / Darul Sehat Hospital from May 2024 to January 2025.

Sample size is determined by keeping a 5.8% margin of error, a 95% confidence interval and a frequency of thrombocytopenia in pregnancy around 9-10% [7]. Based on these assumptions, the actual sample size was determined by using the formula.

Sample size n = [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)]

The sample size is calculated using the OpenEpi version 3 sample size calculator. The desired sample size is 76.

Pregnant patients at term gestation, whether singleton or twins, with a platelet count of less than $150x10^9$ /L diagnosed at any trimester are included in the study, while pregnancies ended in termination due to congenital anomalies or miscarriages before 24 weeks of gestation are excluded. Consecutive patients admitted to the labor ward for normal vaginal delivery or for cesarean sections were screened for thrombocytopenia, and patients with platelet count < $150x10^9$ /L included in the study, either diagnosed currently or reported previously at any stage of pregnancy. A convenient non-probability sampling technique is used. The study was conducted after obtaining approval from the Institutional Ethical Committee and written informed consent from the patients. A pre-designed, structured pro forma is used as a tool to assess information. A detailed history and physical examination, and necessary investigations, including CBC, PT & APTT, uric acid, LFTs, renal function tests, and LDH, were carried out in all patients as part of the standard protocol and management. The patients were then categorized into mild, moderate and severe thrombocytopenia according to platelet count, i.e < 50 x 10^9 /L, 50-100 x10^9 /L and 100 -149x10^9 /, respectively. We observed the following data from the patient's chart: maternal age, parity, gestational age at the time of diagnosis and at the time of delivery, cause of thrombocytopenia, mode of delivery like normal vaginal delivery or LSCS, type of anesthesia given for LSCS whether regional or general anesthesia (GA), requirement of platelet transfusion, any complications like APH, PPH, requirement of ICU admission, and mortality. We also drew a sample of cord blood at the time of delivery for fetal platelet count and observed the outcome of the fetus and the requirement of NICU admission.

Data analysis procedure

Qualitative data are represented of frequencies and percentages. Quantitative data, such as age, gestational age, haemoglobin count, and maternal and fetal platelet counts, are presented as mean ± SD. The association between qualitative variables was assessed using the Chi-square test with continuity correction. The relationship between the fetal platelet count and the severity of thrombocytopenia was ascertained using conventional statistical techniques like ANOVA and the Student's "t" test. SPSS version 23 was used for the analysis

RESULTS

The study results show that the mean age of participants is 27.4±4.7 years with a range of 18 to 43 years of age. The mean gestational age of delivery is 37 weeks ±1.9 with a minimum of 32 weeks and a maximum of 41 weeks. Most patients were multigravida, with a mean parity of 2.4±1.5 and a mean number of live births of 1.03±1.39. The majority of participants have received some level of formal education, with the highest proportion having SSC (38.2%) and HSC (21.1%) qualifications. EL lscs (Elective Lower Segment Cesarean Section) was the most common mode of delivery (36.8%), followed by Em lscs (Emergency Lower Segment Cesarean Section) at 31.6%, and normal vaginal delivery being 21%. In comparison, Instrumental Vaginal Delivery (IVD) was the least common (3.9%). The average platelet count observed at time of birth is 104.9 x9 µl. Mild thrombocytopenia was the most prevalent in this study (55.3%), as shown in **Table I**.

Table I: Demographic Characteristics

	Mean ± (SD)	**n**	**%**
Age	27.432± (4.7)	--	--
Gestational age	37.4± (1.9)	--	--
Hb% at time of birth (gm/dl)	10.9± (13.4)	--	--
Platelet at time of birth (x9 µl)	104.9± (35.8)	--	--
Birth weight (kg)	3.2± (2.9)	--	--
Cord blood platelet count (x9 µl)	217± (75.5)	--	--
Education Level			
	Illiterate	4	5.3
	Primary	17	22.4
	HSC	16	21.1
	SSC	29	38.2
	Graduate	10	13.2
MOD	SVD	21	27.6
	IVD	3	3.9
	Em lSCS	24	31.6
	EL lSCS	28	36.8
Gravida	Primi gravida	22	28.9
	Multi gravida(2-3)	38	50
	Grand Multi gravida >4	16	21
Miscarriages	No	62	81.6
	1	3	3.9
	2	10	13.2
	3	1	1.3

Thrombocytopenia	mild	42	55.3
	moderate	21	27.6
	severe	13	17.1
NICU admission	No	44	57.9
	Yes	31	40.8
Platelet transfusion	No	26	34.2
	Yes	50	65.8

Out of the 76 cases analyzed, 78.9% (n=60) had no reported complications (**Table II**), indicating a generally favorable clinical outcome. However, 21.1% (n=16) of cases experienced complications, with the most common being Antepartum/Postpartum Hemorrhage (APH/PPH) at 15.8% (n=12). Other complications, including eclampsia, neonatal death (NND), intensive care unit (ICU) admission, and secondary postpartum hemorrhage (PPH), were relatively rare (each at 1.3%, n=1).

Table II: Complications of maternal thrombocytopenia

Complications	n	%
Nil	60	78.9
Antepartum Hemorrhage	12	15.8
Pre-eclampsia/Eclampsia	1	1.3
Neonatal death	1	1.3
ICU admission	1	1.3
Sec PPH	1	1.3

The most common cause identified was gestational, accounting for 46.1% (n=35) of cases, indicating that pregnancy-related factors were the predominant contributors, as shown in **Figure 1.**

Other notable causes included viral infections (including dengue/ chickun gunya) (23.7%, n=18), followed by viral Hepatitis (3.9%, n=3), immune thrombocytopenic purpura (ITP) (3.9%, n=3), pre-eclampsia (PE) (3.9%, n=3), protein C deficiency (3.9%, n=3), and other less frequent causes such as antiphospholipid antibody syndrome (APLA), vitamin B12 deficiency, hereditary thrombophilia such as protein S deficiency (each ranging from 1.3% to 2.6%).

The predominance of gestational and viral causes of thrombocytopenia highlights the need for enhanced prenatal screening and infectious disease management to mitigate risks. Additionally, the presence of thrombotic and hematologic conditions (APLA, ITP, PE, protein C/S deficiencies) underscores the importance of coagulation screening in high-risk pregnancies to ensure timely intervention.

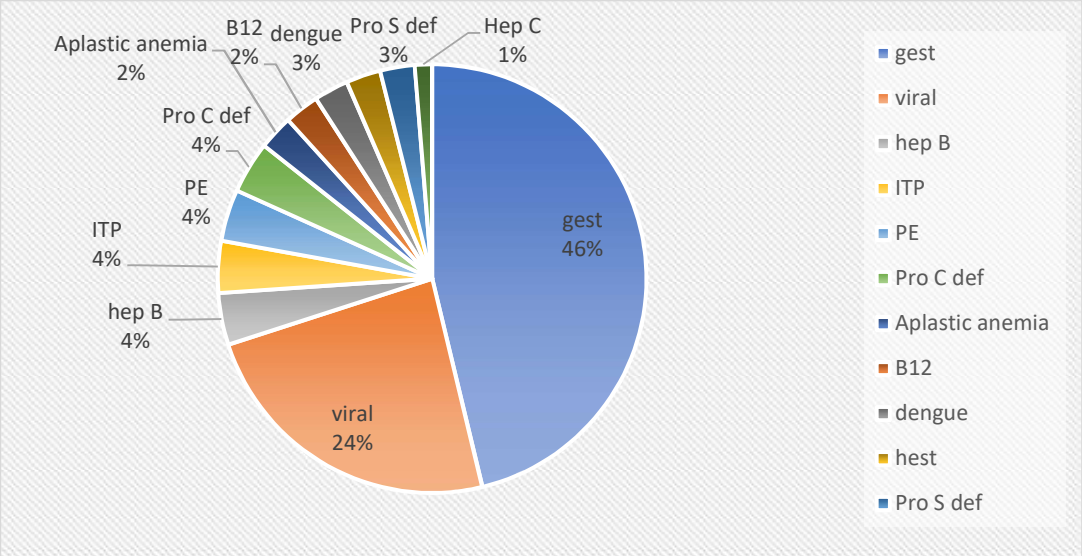

Figure 1: Causes of thrombocytopenia

Regarding the severity of the count, the majority of the study population had mild thrombocytopenia (42 [55%]), while 21 (27.6%) had moderate and 13 (17.1%) had severe thrombocytopenia. When assessing platelet counts by trimester, the majority of the population has a normal platelet count at the beginning of pregnancy (83%), then shows a declining pattern, with only 6.6% of samples remaining with a normal platelet count at term. Similarly, the second trimester is the period in which the majority of low platelets were first detected (55.3%), followed by the third trimester of detection of thrombocytopenia (51.3%). In the third trimester, maternal thrombocytopenia severity significantly affects Hb levels, suggesting worsening anemia as pregnancy progresses ($p<0.011$). In the second trimester, thrombocytopenia severity begins to have a significant impact ($p< 0.026$). At birth, the thrombocytopenia severity is strongly associated with the lowest platelet levels <0.001, highlighting the risk of peripartum bleeding and the need for transfusion. **(Table III)**

Table III: Maternal platelet counts in different trimesters

Trimester	Normal platelet >150x9	Mild thrombocytopenia (100 – 150x9)	Moderate thrombocytopenia (80 – 100x9)	Severe thrombocytopenia (<80x9)
	(n)%	(n)%	(n)%	(n)%
1st trimester	63(82.9)	8(10.5)	3(3.9)	1(1.3)
2nd trimester	2(28.9)	42(55.3)	7(9.2)	4(5.3)
3rd trimester	5(6.6)	39(51.3)	21(27.9)	11(14.5)
At delivery	7(9.2)	30(39.5)	24(31.6)	15(19.7)

As thrombocytopenia severity increases, the likelihood of requiring a platelet transfusion also increases significantly. This suggests that severe thrombocytopenia is a strong predictor of the need for platelet transfusion. However, it is not significantly related to poor fetal outcome and neonatal ICU admission. Birth weight is affected considerably by maternal thrombocytopenia severity, suggesting that severe thrombocytopenia may contribute to intrauterine growth

restriction (IUGR) or fetal distress (p 0.038). The Cord blood platelet count is not significantly different across groups, indicating that fetal platelet levels remain stable despite maternal thrombocytopenia. (p 0.248)

Monitoring hemoglobin and platelet levels is crucial in severe thrombocytopenia, especially in the third trimester and around delivery. Patients with severe thrombocytopenia may require closer surveillance for fetal growth restriction and interventions to optimize maternal and neonatal outcomes. (**Table IV)**

Table IV: Association of degrees of thrombocytopenia with different variables

		Mild thrombocytopenia	Moderate thrombocytopenia	Severe thrombocytopenia	p -value
cord blood PLT	Mild	2	3	1	0.248
	Moderate	1	3	0	
	Severe	1	1	1	
Fetal outcome	Alive	21	11	4	0.241$^{\perp}$
	IUD	1	1	0	
	Premature birth	0	1	1	
Mode of delivery	El lSCS	8	3	1	0.701$^{\perp}$
	Em LSCS	8	5	1	
	IVD	0	1	0	
	SVD	6	4	3	
PLT transfusion	Yes	2	8	5	<0.001*
	No	20	5	0	
ICU admission	Yes	5	5	4	0.136$^{\perp}$
	No	15	8	1	
Birth weight	SGA	2	4	5	0.038
	AGA	24	20	9	
	LGA	4	0	1	

*Note: **PLT** = Platelet count, **IUD** = Intrauterine death, **EL LSCS** = Elective lower segment cesarean section, **EM LSCS** = Emergency lower segment cesarean section ,**IVD** = Instrumental vaginal delivery ,**SVD** = Spontaneous vaginal delivery, **SGA** = Small for gestational age, **AGA** = Appropriate for gestational age, **LGA** = Large for gestational age ,**ICU** = Intensive care unit, **frequency (n)**, ⊥ **Chi-square test** was applied ,p < 0.05 was considered statistically significant*

DISCUSSIONS

This prospective study aimed to observe the association of varying degrees of maternal thrombocytopenia with neonatal platelet count in a tertiary healthcare setup.

Our study showed the prevalence of mild, moderate, and severe thrombocytopenia to be 55.3%, 27.6%, and 17.1%, respectively. Similar findings for mild and moderate thrombocytopenia were reported in an Indian study by Begam A 2017[14] in which 51% had mild thrombocytopenia, 33.3% had moderate thrombocytopenia, and 9.4% of pregnant women had severe thrombocytopenia. Another recent study from Ethiopia reported a prevalence of thrombocytopenia among pregnant women, with 72.4% categorized as mild, 17.2% as moderate, and 10.4% as severe [15]. Similar observations were documented by Belayneh F 2015[16], where the prevalence of mild, moderate, and severe thrombocytopenia was 73.3%, 15.38%, and 11.54%, respectively. Possible reasons for this diversity might include varied socioeconomic and geographic conditions, dietary variation, and health-seeking habits. Furthermore, the severity of thrombocytopenia increased proportionately with advancing gestational age, a finding consistent with many earlier studies worldwide. The underlying factors for this decrease might be hemodilution, increased platelet aggregation and consumption, and intraplacental immune response.

We have only an urban cohort, so our study cannot compare the prevalence of thrombocytopenia between urban and rural participants. A study conducted in 2022 in Rahim Yar Khan, Pakistan, on 500 pregnant subjects, of whom 63.2% were from urban settings, showed no statistically significant difference in low platelet counts between urban and rural cohorts[17]. However, contrasting findings were reported in studies from Ethiopia, where rural or urban residence was one of the independent predictors of maternal thrombocytopenia, among others [18].

In line with other studies like one being conducted in south Pakistan, gestational thrombocytopenia was the most common observation in our cohort as well accounting for 46.1% of cases similar to incidence of gestational thrombocytopenia (57.5%), followed by eclampsia (16.1%), pre-eclampsia (16.1%), HELLP syndrome (12.0%), DIC (3.4%) and immune thrombocytopenic purpura (3.3%)[19].

Regular hematological monitoring in late pregnancy and around delivery is crucial to anticipate potential complications and optimize maternal and fetal outcomes. In most cases (78.9%), no complications are reported. Antepartum /Postpartum hemorrhage was reported in 15.8% of cases, while eclampsia, neonatal death (NND), intensive care unit (ICU) admission, and secondary postpartum hemorrhage (PPH) were relatively rare (each at 1.3%). Our study added to the existing literature on the multifactorial nature of thrombocytopenia in pregnancy, with lead-by gestational thrombocytopenia followed by viral infections, immune-mediated thrombocytopenia, and coagulation disorders[20]. Infectious causes such as malaria, dengue, and leptospirosis are also significant causes of thrombocytopenia in the South Asian region, as shown in a study conducted in a neighbouring country, where these cases were found in 12.7% of pregnant females with low platelet count[21]. In comparison, in our study, the estimate is 23.7%. The difference might be the season or weather at the time of the study, and the endemic of chikungunya in Karachi in 2024 [22].

Our study has documented a statistically significant correlation between the severity of thrombocytopenia and platelet transfusion requirements ($p < 0.001$) because these patients need close monitoring for platelet transfusions to counter the risk of intrapartum or peripartum bleeding, as noted in the study by Geetha DMI 2019[24].

We did not find any statistically significant association between the severity of maternal thrombocytopenia and compromised fetal outcome. (IUD, prematurity (p=0.241). This finding contradicts the work reported by Urmi NS et al.[25] who reported prematurity and LBW as adverse fetal outcomes with gestational thrombocytopenia. On the contrary, severe maternal thrombocytopenia, primarily if associated with pre-eclampsia or HELLP syndrome, may increase the risk of compromised fetal outcomes. The association of maternal thrombocytopenia with neonatal outcome was guarded, and NICU admissions did not reach statistical significance (p=0.136), which aligns with the work reported by Houri O 2024[26]. This finding suggested that maternal platelet counts did not directly influence the neonatal outcome. However, prematurity, sepsis, and maternal comorbidities may play a crucial role in determining NICU requirements. Certain studies have highlighted the increased need for NICU care for neonates with thrombocytopenic mothers[26].

In addition, maternal platelet count at delivery did not predict neonatal platelet count as depicted by cord blood samples, a finding supported by earlier studies[27]. This underscores the need to evaluate every neonate individually instead of relying solely on maternal platelet counts.

These findings suggest that underlying maternal comorbidities may be linked to adverse perinatal outcomes rather than only maternal thrombocytopenia. Furthermore, fetal thrombocytopenia cannot be predicted solely by maternal platelet counts, as our study failed to establish a correlation between maternal and cord blood platelet counts. Further work with large sample sizes and longitudinal studies is needed to elucidate fetomaternal and neonatal outcomes better.

CONCLUSION

Thrombocytopenia in pregnancy, largely gestational and benign, showed no significant impact on fetal outcomes, cord blood platelet count, or need for NICU. Maternal thrombocytopenia cannot be regarded as the sole considerable risk factor for neonatal thrombocytopenia in term pregnancies.

Ethical Permission: Liaquat College of Medicine & Dentistry, Karachi, Pakistan, IRB letter No. IRB/M-000075/24.
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AUTHOR CONTRIBUTION

Nasim A: Conception of the work, revision and accountability
Saboohi E: Critical review and approval for final version
Tahir H: Data analysis and interpretation
Anjum S: Data analysis and critical review
Qasim S: Revision and accountability
Shahid A: Data analysis and acquisition

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