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Dr. Meenakshi Chauhan
Professor, Department of Obstetrics and Gynaecology, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India

Dr. Sushila Chaudhary
Professor, Department of Obstetrics and Gynaecology, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India

Dr. Kavita Mehta
Junior Resident, Department of Obstetrics and Gynaecology, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India

Dr. Vani Malhotra
Professor, Department of Obstetrics and Gynaecology, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India

Dr. Smiti Nanda
Senior Professor and Head, Department of Obstetrics and Gynaecology, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India

Dr. Vandana Rani
Professor, Department of Obstetrics and Gynaecology, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India

Corresponding Author:
Dr. Kavita Mehta
Junior Resident, Department of Obstetrics and Gynaecology, Pt. B.D. Sharma PGIMS, Rohtak, Haryana, India

A prospective study to evaluate the role of maternal thrombocytopenia on maternal and fetal outcome

Dr. Meenakshi Chauhan, Dr. Sushila Chaudhary, Dr. Kavita Mehta, Dr. Vani Malhotra, Dr. Smiti Nanda and Dr. Vandana Rani

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Abstract
Introduction: Thrombocytopenia is a very common finding in pregnancy, occurring in approximately 10% of women and it is the second most common hematological abnormality during pregnancy.
Aims and Objective: To study the cases of thrombocytopenia during pregnancy, its cause and effect on feto-maternal outcome.
Material and Methods: Prospective observational study included 1000 women (>30 weeks of gestation) out of which 104 women were found to had thrombocytopenia and 896 women had normal platelet count.
Results: Mean age among thrombocytopenic women was 23.89±3.31 years and in without thrombocytopenia, it was 24.34±3.79 years. 39(37.5%) women with thrombocytopenia and 471(52.56%) women without thrombocytopenia were nulliparous, 65(62.5%) women with thrombocytopenia and 425(47.44%) women without thrombocytopenia were multiparous. Mean gestational age was 37.05±2.26 weeks observed in women with thrombocytopenia and in women without thrombocytopenia, it was 37.46±2.35 weeks. Mean platelet counts of pregnant women with thrombocytopenia was 98028.84±25679.67/µL and in pregnant women without thrombocytopenia, it was 243198.66±49245.80/µL. A total of 56(53.85%) women had mild thrombocytopenia, 41(39.42%) had moderate and 7(6.73%) women had severe thrombocytopenia. Most common diagnosis observed was gestational thrombocytopenia i.e. 72(69.23%) cases followed by preeclampsia (16.34%). Vaginal delivery found to be most common i.e. 72(69.23%) followed by 32(30.77%) cases of cesarean delivery. Fetal distress was the most common indication of cesarean section i.e. 18 (17.30%) cases. Mean birth weight was 2.84±0.62kgs. Apgar score of 7/9 observed in 96(92.30%) neonates. Out of 104 babies, 4(3.84%) intrauterine death were occurred and 18(17.30%) babies were premature. Mean hospital stay of the women was 5.01±4.25 days. In mild category, mean hospital stay was 4.75±3.89 days, in moderate it was 5±4.18 days and in severe in severe, it was 6.71±0.677 days (p >0.05).
Conclusion: Present study **c**oncluded that early interdisciplinary evaluation of thrombocytopenia in pregnancy is required for optimal care of mother and the neonate as risk varies greatly depending on cause of thrombocytopenia. Accurate etiological diagnosis is essential for optimal therapeutic management and timely monitoring of platelet count is mandatory.

Keywords: Maternal thrombocytopenia, maternal outcome, fetal outcome

Introduction

Thrombocytopenia is a very common finding in pregnancy, occurring in approximately 10% of women [1]. Although most women maintain a normal platelet count throughout gestation, the normal range of platelet counts decreases, and it is not uncommon for the platelet count to decrease as pregnancy progresses because of the normal physiological changes during pregnancy.

There are diverse etiologies for thrombocytopenia, some of which are unique to pregnancy. Several pathological conditions cause thrombocytopenia which can have a significant impact on mother and baby. At the same time various physiological changes in platelet count also occur during pregnancy. Thrombocytopenia is the second most common hematological finding in pregnancy after anemia. The normal range of platelets in nonpregnant women is 150000-400000/µL. Thrombocytopenia is defined as a drop in platelet count below 150000/µl [2].

Thrombocytopenia in pregnancy can be isolated or can be associated with systemic disorders like hemolysis, elevated liver enzymes, low platelets syndrome (HELLP), severe preeclampsia or acute fatty liver of pregnancy. Furthermore, autoimmune diseases, including hemolytic uremic syndrome, antiphospholipid syndrome, thrombotic thrombocytopenic purpura, systemic

lupus erythematosus, and immune thrombocytopenia may relapse or be first detected during pregnancy.

Major mechanisms for thrombocytopenia are decreased production and increased destruction of platelets, platelet sequestration and hemodilution, increased platelet aggregation driven by increased level of thromboxane A_2. Thrombocytopenia may also be the primary manifestation of viral infections (Cytomegalovirus, Ebstein Barr virus, human immunodeficiency virus), or a common adverse reaction from many drugs (antibiotics, non-steriodal anti-inflammatory drugs, heparin, diuretics). Magann and Martin, classified thrombocytopenia according to its severity into: mild (100 to $<150\times10^9$/L), moderate (50 to $< 100 \times 10^9$/L), and severe ($< 50\times10^9$/L) [3].

There are no diagnostic tests for gestational thrombocytopenia. The disease is diagnosed by exclusion and is defined by the platelet count of no less than $70x10^9$/L, with the count returning to normal within 12 weeks after delivery [3].

The most common causes of thrombocytopenia during pregnancy are gestational thrombocytopenia and idiopathic thrombocytopenic purpura. Pre-pregnancy thrombocytopenia and response to immune modulation with steroids and immunoglobulin favors idiopathic thrombocytopenic purpura. Unfortunately, there are no laboratory tests to differentiate between the two conditions.

Various pregnancy related conditions cause morbidity or even death if not treated promptly, though most instances of thrombocytopenia are benign. Severe neonatal thrombocytopenia is infrequent; however, the incidence varies according to the causes of maternal thrombocytopenia [4, 5].

Newborns of mothers with gestational thrombocytopenia do not generally develop thrombocytopenia. In the mother who had ITP during pregnancy, fetal thrombocytopenia can occur as these antibodies can cross placenta. Hence, fetal platelet count monitoring is important in a patient with ITP to prevent complications. Since antibodies are of the IgG subtype, they can cross the placenta and cause thrombocytopenia in the fetus and neonates. Some studies reported that there is no correlation between maternal and fetal platelet levels and maternal response to treatment does not protect the fetus from a possible neonatal thrombocytopenia. When platelet count in the newborn found to be below 50000/µL, there is a risk of 0.5-1.5%, of intracranial hemorrhage. When the platelet count is between 30000 to 50000/µL, IVIG treatment should be started. With platelet count under 30000/µL platelet transfusion along with IVIG is recommended [6].

Gestational thrombocytopenia is commonest platelet disorder in pregnancy, but present study ruled out various other causes of thrombocytopenia in pregnancy which had deleterious effect on mother and fetus. There is a scarcity of literature on the fetomaternal outcome in pregnant women with thrombocytopenia in Indian population, thus the present study was conducted to analyse the cases of thrombocytopenia during pregnancy, its cause and effect on feto-maternal outcome.

Material and Methods

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology at Pt. B.D. Sharma PGIMS, Rohtak over a period of one year. Women with >30 weeks of gestation admitted in labour room were included in the present study. Women with known history of Diabetes mellitus, Collagen disorders, Tuberculosis and Epilepsy were excluded from the study. A total of 1000 women were taken up for the study after obtaining their written and informed consent. Study was approved by Institutional Ethics Committee. Out of total 1000 women, 104 women had thrombocytopenia and 896 women had normal platelet count. An incidence of 10.40% of thrombocytopenia was observed in the present study.

Methodology

After taking a proper consent, a detailed history was taken. History including fever, jaundice, headache, blurring of vision, epigastric pain, pedal edema, easy fatigability, breathlessness, nose and gum bleeding, hematuria, gastrointestinal bleeding, intracranial bleeding, piles, infection site discoloration, petechiae and any previous history of blood and blood products transfusion was taken. Obstetric and menstrual history was noted down. Thorough general physical examination and obstetric examination was done. Complete hemogram including platelet count of all the women was sent. Women with thrombocytopenia were further evaluated. Platelet count of 100000 to 150000/µl, 50000 to 100000/µl and <50000/µl were classified as mild, moderate and severe thrombocytopenia respectively according to classification of Magann and Martin [3].

Routine investigations were sent in the form of random blood sugar, ABoRh, urine for albumin, hemoglobin, bleeding time, clotting time, total leucocyte count, differential leucocyte count, platelet counts, HbsAg, HCV and HIV. Wherever indicated, other tests like detection of malaria by antigen detection (Rapid diagnostic test or RDTs) and/or peripheral blood smear, dengue IgM and IgG antibody titers, liver function test, renal function test was noted.

The women with thrombocytopenia were followed up till delivery to record any complications during antenatal, intrapartum and immediate post partum. Duration of pregnancy at the time of delivery, indication and method of induction (if required) and mode of delivery including indication for instrumental delivery or caesarean section was also recorded. Apgar score of all neonates was noted and they were further evaluated for Neonatal intensive care unit (NICU) admission, or any other complications.

Statistical Analysis

The data so collected was analysed by Statistical Package for Social Sciences (SPSS version 22). For descriptive parameters, mean, standard deviation, frequencies was calculated. For comparison of various quantitative parameters, Student's t-test was used. For qualitative data, Chi-square test was used. For multi-group comparison, Analysis of Variance was used. A probability value (p) of less than 0.05 was considered as statistically significant.

Results

In the present study, maximum number of women belonged to 21-25 years age group i.e. 50 (48.07%) in pregnant women with thrombocytopenia and 501 (55.91%) in pregnant women without thrombocytopenia. Mean age among thrombocytopenic women were 23.89±3.31 years and in without thrombocytopenia, it was 24.34±3.79 years ($p > 0.05$). Residential status of the women with thrombocytopenia shows that 55.76% women belonged to rural area and 46(44.24%) belonged to urban areas. With regard to women without thrombocytopenia, 475(53.01%) belonged to rural area and 421(46.98%) belonged to urban area ($p > 0.05$). A total of 39(37.5%) women with thrombocytopenia and 471(52.56%) women without thrombocytopenia were nulliparous. Similarly, a total of 65(62.5%) women with thrombocytopenia and 425(47.44%) women without thrombocytopenia were multiparous.

Mean gestational age was 37.05±2.26 weeks observed in women with thrombocytopenia and in women without thrombocytopenia, it was observed 37.46±2.35 weeks (p>0.05).

Mean platelet counts of pregnant women with thrombocytopenia and without thrombocytopenia, is shown in Table 1.

Table 1: Platelet counts among study population

Investigation	Women with thrombocytopenia Mean±SD n=104	Women without thrombocytopenia Mean±SD n=896	Statistical analysis
Platelet counts (/µL)	98028.84±25679.67	243198.66±49245.80	<0.001 HS
Range	14000-145000	160000-380000	

Further sub-division of the women of thrombocytopenia according to severity of thrombocytopenia showed that 56(53.85%) women had mild thrombocytopenia, 41(39.42%) had moderate and 7(6.73%) women had severe thrombocytopenia as shown in Table 2. In mild women, mean platelet count was 116073.17±14389.91/µL, in moderate women 82964.28±12762.10/µL and 36428.576267.83/µL in severe category of women (p< 0.001). Table 3 shows various diagnosis observed in women with thrombocytopenia.

Table 2: Thrombocytopenia according to severity

	Mild (Platelet 100000-149999/µL)	Moderate (Platelet 50000-99999/µL)	Severe (Platelet <50000/µL)
Number of cases (%)	56(53.85%)	41 (39.42%)	7 (6.73%)
Mean platelet count (/µL)	116073.17 ± 14389.91	82964.28 ± 12762.10	36428.57 ± 6267.83

Table 3: Diagnosis of thrombocytopenia cases according to etiology

Diagnosis	No. of women (n=104)	Percentage
Gestational thrombocytopenia	72	69.23
Preeclampsia with thrombocytopenia	14	13.46
Gestational thrombocytopenia with severe anemia	7	6.73
Preeclampsia, anemia and thrombocytopenia	5	4.80
HELLP syndrome	2	1.92
Preeclampsia, thrombocytopenia, anemia with human immunodeficiency virus positive	1	0.96
Gestational thrombocytopenia, anemia with jaundice	1	0.96
Aplastic anemia	1	0.96
Immune thrombocytpenic purpura	1	0.96

Majority of women i.e. 73(70.19%) had gestational age within 36-40 weeks followed by 29 (27.88%) women within a range of 30-35 weeks. Mean gestational age at the time of delivery was 37.20±2.24 weeks with a range of 32-41 weeks. 77(74.03%) women had spontaneous labour and 25(24.03%) were induced in the present study. Vaginal delivery found to be most common i.e. 72(69.23%) followed by 32(30.77%) cases of cesarean delivery out of which 2 were done electively. In mild women, vaginal delivery was occurred in 44(78.57%) women, in moderate women 23(56.10%) and in severe category of women, vaginal delivery was carried out in 5 (71.42%). Similarly, cesarean delivery was carried out in 12(21.43%), 18(43.90%) and 2(28.57%) women with respect to mild, moderate and severe category, respectively (p< 0.05). Most common indication of cesarean section in the present study was fetal distress i.e. 18 (17.30%) cases.

Postpartum haemorrhage was the most common complications observed in 7(6.73%) women followed by generalized oozing in 4 (3.84%) women. Abruptio placenta occurred in two women but both were the cases of pregnancy induced hypertension. Table 4 shows Maternal complications in women with thrombocytopenia according to severity.

Table 4: Maternal complications in women with thrombocytopenia according to severity

Complications	Mild (Platelet 100000-149999/µL) (n=56)	Moderate (Platelet 50000-99999/µL) (n=41)	Severe (Platelet <50000/µL) (n=7)	Statistical analysis
1. Antepartum i. Abruptio placentae	1(1.78%)	1(2.43%)	0	0.904 NS
2. Intrapartum i Generalized oozing during cesarean section	1(1.78%)	2(4.87%)	1(14.28%)	0.243 NS
3. Postpartum Postpartum haemorrhage	4(7.14%)	2(4.87%)	1(14.28%)	0.645 NS
i) Medical Management	1(1.78%)	0	0	0.122 NS
ii) Medical + balloon tamponade	3(5.35%)	1(2.43%)	0	
iii) Medical + Hayman suture	0	1(2.43%)	0	
iv) Medical + B-lynch suture	0	0	1(14.28%)	

*In another 9 cases prophylactic balloon tamponade was inserted.

In our study, maximum number of women 79(75.96%) did not required any type of blood and blood products transfusion. In 25(24.04%) cases blood and blood products transfusion was used. In mild category 8(14.28%) women received blood and blood products transfusion. In moderate category, a total of 12(20.26%) and in severe category, 5(71.42%) women received blood and blood products transfusion (p<0.001).

Perinatal outcome: Mean birth weight was 2.84±0.62 kgs. Apgar score of 7/9 observed in 96(92.30%) neonates.

Table 5: Mean birth weight in women with thrombocytopenia according to severity

	Mild (Platelet 100000-149999/µL) (n=56)	Moderate (Platelet 50000-99999/µL) (n=41)	Severe (Platelet <50000/µL) (n=7)	Statistical analysis
Mean birth weight (kgs)	2.88±0.63	2.82±0.61	2.76±0.62	F=0.174, p=0.841 NS

In mild category, mean birth weight was 2.88±0.63 kgs, in moderate it was 2.82±0.61 kgs and in severe, it was 2.76±0.62 kgs (p >0.05) (Table 5). Table 6 shows perinatal complications in women with thrombocytopenia,

Table 6: Perinatal complications in women with thrombocytopenia

	No.	Percentage
Neonatal complications		
Intrauterine death	4	3.84
Prematurity	18	17.30
Shifted to neonatal intensive care unit	10	9.61
Indication for neonatal intensive care unit transfer		
Prematurity	**7**	**6.73**
i) Birth asphyxia	2	1.92
ii) Respiratory distress syndrome	1	0.96
iii) Early onset neonatal sepsis	1	0.96
iv) Respiratory distress syndrome with hypoglycemia	1	0.96
v) Necrotising enterocolitis with hyaline membrane disease	1	0.96
vi) Jaundice	1	0.96
Respiratory Distress	**3**	**2.88**
i) Sepsis	1	0.96
ii) Birth asphyxia	2	1.92
Stay in neonatal intensive care unit (days)		
1-5	5	4.80
6-10	2	1.92
>10	3	2.88
Discharge history		
Healthy	98	94.23
Intrauterine death	4	3.84
Expired	2	1.92

Mean hospital stay of the women was 5.01±4.25 days with a range of 2-29 days. Majority of women 87(83.65%) stayed in the hospital for <5 days. In mild category, mean hospital stay was 4.75±3.89, in moderate it was 5±4.18 and in severe in severe, it was 6.71±0.677 (p >0.05).

Discussion

Platelets are non-nucleated cellular fragments of megakaryocytes, they play a role in hemostasis. As the pregnancy advances, platelet count decreases. This is due to hemodilution, secondary to expansion of plasma volume. Platelet count in normal pregnancy may decrease by approximately 10%. Most of this decrease occurs during third trimester though the absolute platelet count remains within the normal range in most pregnant women. Thrombocytopenia in pregnancy occurs four times more frequently than in thrombocytopenia in non-pregnant women.

In the present study, the incidence of maternal thrombocytopenia was 10.40% which was almost comparable to the results of other studies [7, 8]. However, incidence was low (4.30%) in the study conducted by Lin *et al.* [9] as they excluded women with major systemic diseases as well as those with gestational hypertension. Slightly higher incidence (13.5%) was noted in study by Ajibola *et al.* [10]

Mean age of women with thrombocytopenia was 23.89±3.31 years and in pregnant women without thrombocytopenia it was 24.34±3.79 years with being comparable (p >0.05) and is similar to study conducted by Chauhan *et al.* [11] i.e. 25.74±3.86 years. At the same time, in other studies the mean age was higher [4, 12]. This difference may be due to fact that these studies were conducted in European countries where general age of child birth is higher as compared to our country.

In our study, as compared to urban women, rural pregnant women were more i.e. 55.76% versus 44.24%. In our study, 37.5% of the pregnant women with thrombocytopenia were primigravida. Similar distribution of women is seen in the study of Brohi *et al.* [13] where 40.8% women were primigravida where as in the study conducted by Won *et al.* [14] 51.6% of participants were primigravida which was higher than our study. The difference may be due to large family norm in our country as compared to western countries accounting for more number of multigravida in our study.

The mean platelet count in pregnant women without thrombocytopenia in present study was 243198.66±49245.80/µl which is in the normal range for pregnant women. Jaleel *et al.* [15] found mean platelet count to be 203400±25040.00/µl which is comparable to our study. Mean platelet count in our study in pregnant women with thrombocytopenia was 98028.84±25679.67/µl which is almost similar to study conducted by Chauhan *et al.* [11] where it was 106907.7±30136.52/µl.

In our study, majority of women (53.85%) had mild thrombocytopenia, though this incidence is slightly lower than other studies reported by Zutshi *et al.* [16] and Singh *et al.* [17] and Chauhan *et al.* [11] (62%, 74.3% and 63%, respectively).

In the present study moderate thrombocytopenia was found in 39.42% women. This was similar to studies conducted by Chauhan *et al.* [11] and Zutshi *et al.* [16] (35.4% and 31% respectively) where in the studies conducted by Singh *et al.* [17] and Vishwekar *et al.*, [18] the incidence of moderate thrombocytopenia was lower as compared to our study (17.9% and 15.2% respectively).

In the present study, severe thrombocytopenia was seen in 6.73% of pregnant women which is almost similar to the study conducted by Singh *et al.* [17] (7.4%), Vishwekar *et al.* [18] (6.4%) and Zutshi *et al.* [16] (7%). Severe thrombocytopenia was seen in higher percentage of pregnant women (20%) in the study by Pandey *et al.* [19] However, Chauhan *et al.* [11] observed a very low (1.5%) incidence of severe thrombocytopenia the reason of which was not explained by them.

Table 7: Comparison of degrees of severity of thrombocytopenia in various studies

Study	Mild	Moderate	Severe
Singh *et al.* [17]	74.7%	17.9%	7.4%
Vishwekar *et al.* [18]	78.4%	15.2%	6.4%
Chauhan *et al.* [11]	63.1%	35.4%	1.5%
Zutshi *et al.* [16]	62%	31%	7%
Pandey *et al.* [19]	22%	58%	20%
Present study	53.85%	39.42%	6.73%

Mean platelet count in pregnant women with mild thrombocytopenia was 116073.17±14389.91/µl, 82964.28±1276.10/µl in women with moderate thrombocytopenia and 36428.5±6267.83/µl in women with severe thrombocytopenia (p< 0.001).

In our study, gestational thrombocytopenia (69.23%) was the commonest etiology which was similar to the study conducted by Vishwekar *et al.* [18] (68.46%) and Chauhan *et al.* [11] (68.2%). The incidence of thrombocytopenia in neonates born to gestational thrombocytopenic women is similar to those reported

in non gestational thrombocytopenia women [20].

Thrombocytopenia due to pregnancy induced hypertension was the second most common etiology in the present study. The association of thrombocytopenia with pregnancy induced hypertension was seen in 21.15% pregnant women with thrombocytopenia which was similar to various other studies [7, 17].

Table 8: Distribution of pregnant women according to association with pregnancy induced hypertension

Study	Association with pregnancy induced hypertension
Vyas *et al.* [21]	22%
Singh *et al.* [17]	24.2%
Onisai *et al.* [7]	22.44%
Brohi *et al.* [13]	26.7%
Parnas *et al.* [5]	23.1%
Arora *et al.* [22]	24%
Kapadiya *et al.* [23]	21.67%
Chauhan *et al.* [11]	26.3%
Present study	21.15%

In our study, HELLP syndrome was observed in 1.9% of the thrombocytopenic women which was statistically similar to the study conducted by Chauhan *et al.* [11] (1.5%) whereas studies by Parnas *et al.* [5] and Onisai *et al.* [7] documented higher incidence of HELLP syndrome in pregnant women with thrombocytopenia (12.06% and 5.77%, respectively).

The low incidence of HELLP in our study may be due to the fact that as per the protocol of our department, pregnancies complicated with hypertension are terminated timely and complications are minimized.

In our study, there was one patient of ITP out of 1000 pregnant women (0.01%) which is almost equal to the incidence quoted for ITP in pregnant women [24] Incidence of ITP in pregnant women with thrombocytopenia in present study was 0.96% which is less than the incidence quoted by Kelton [25] for pregnant women with thrombocytopenia (approximate 3% at the time of delivery) as well as by Sainio *et al.* (3%) [1].

Aplastic anemia is a peripheral blood pancytopenia (anemia, neutropenia and thrombocytopenia) associated with unexplained hypocellularity of the bone marrow. The incidence of aplastic anemia in Asia is 4-6 per million, which is higher than 2 per million in Western countries [26]. One patient presented to our department at 36 weeks 3 days period of gestation as a known case of aplastic anemia since 5 years. In overall, aplastic anemia severity of neutropenia may affects prognosis as infectious disease is known to be the major cause of death in severe aplastic anaemia [27].

In our study, 1 woman was positive for HIV (0.96%) out of 104 pregnant women with thrombocytopenia.

In the present study, the mean gestational age at delivery was 37.20±2.24 weeks which is similar to the study conducted by Lin *et al.* [9] and Kasai *et al.* [28] (39 weeks and 38 weeks respectively) whereas in the study conducted by Bouzari *et al.* [29] the mean age was 35.83±3.61 weeks which was lower than our study because in their study they analysed only patients with severe pre-eclampsia and HELLP syndrome.

In the present study, 24.03% women required induction of labour for various obstetrical indications which is almost similar to studies conducted by Parnas *et al.* [5] and Chauhan *et al.* [11] (27.20% and 30%, respectively). In the present study, 30.77% women were delivered by LSCS and 69.23% women delivered vaginally which was similar to the various studies i.e. Chauhan *et al.* [11] and Singh *et al.*, [17] whereas incidence was higher in the studies conducted by Pafumi *et al.* [30] (55%) and Yuce *et al.* [31] (56%). It is possible that in these cesarean section rate is high in these institutes in general which is not documented by them. Most common indication of cesarean section in the present study was fetal distress.

In women with mild thrombocytopenia, vaginal delivery occurred in 44(78.57%) women. In cases of moderate thrombocytopenia 23(56.10%) women delivered vaginally while in severe thrombocytopenia 5 (71.42%) women delivered vaginally. Cesarean section was carried out in 12(21.43%), 18(43.90%) and 2(28.57%) women with mild, moderate and severe thrombocytopenia respectively In all patients with severe thrombocytopenia, platelets were transfused before induction of labour / cesarean section to bring the platelet count to >50000/µl.

The most common complication in present study was postpartum hemorrhage which was present in 7 cases (6.73%). Out of these 7 patients, 1 (14.28%) was having severe thrombocytopenia, 2 (4.87%) out of 7 were having mild thrombocytopenia and 4(7.14%) out of 7 were having moderate thrombocytopenia. Out of these 7 cases, 1 woman was managed medically, 4 women required balloon tamponade insertion in addition to medical management, two patients were managed surgically. Hayman suture was applied in one and B-lynch suture was applied in the other. None of the patients required hysterectomy for postpartum haemorrhage ($p > 0.05$).

These complications were similar in all three subgroups as we managed all categories timely and appropriately. All severe thrombocytopenia were given platelets and blood before delivery. Similar incidence of PPH was noted in studies conducted by Dwivedi *et al.* [8] (4.2%) and Zutshi *et al.* [16] (3.5%).

In our institute, it is the protocol to insert balloon tamponade as a prophylactic measure to prevent PPH in cases of moderate and severe thrombocytopenia. There were 9 such cases where balloon tamponade was put even though no significant PPH occurred. There was no maternal death in our study reflecting good antenatal care. Also no hematoma at any site was found in our study.

In the present study, 2 (1.92%) women suffered abruption. Both had PIH in this pregnancy and this appears to be the cause of abruptio placentae rather than thrombocytopenia. The incidence is similar to the study conducted by Zutshi *et al.* [16] (2.5%) and Dwivedi *et al.* [8] (2.4%).

The most important predisposing factor in the etiology of abruption is pre-eclampsia. The relative risk of abruption is 3.8 for severe pre-eclampsia and 2.8 for chronic hypertension with superimposed pre-eclampsia [31].

In the present study, 24.04% women required blood or blood products transfusion. However, need for blood and blood products transfusion was lower in the studies of Yuce *et al.* [31] (10%) and Parnas *et al.* [5] (16.6%). The requirement of blood in our study was due to the fact that 12.5% women were anemic and were transfused blood before delivery while in other studies the requirement is taken after delivery [5, 8].

The mean neonatal weight in our study was 2.84±0.62 (kgs) which is similar to the mean neonatal weight in the study conducted by Onisai *et al.* [7] (2.9±0.23 kgs) and Chauhan *et al.* [11] (2.80±0.32 kgs), whereas the mean weight was lower in study by Bouzari *et al.* [29] (2.58±0.8 kgs) as they included patients of only hypertensive disorder (HELLP, pre-eclampsia and eclampsia).

The mean birth weight in women with mild thrombocytopenia

was 2.88±0.63 kgs, in moderate it was 2.82±0.61 kgs and in severe, it was 2.76±0.67 kgs (p >0.05). In our study, 9.61% neonates required NICU admission. 6.73% required admission due to prematurity and its associated complications and 2.88% required NICU admission due to other causes like sepsis and birth asphyxia. In the study conducted by Vyas *et al.* [21], 13.20% neonates were admitted in NICU. In a study by Chauhan *et al.* [11], 6.15% required NICU admission which is less as compared to our study.

In our study, out of 104 neonates, four (3.84%) were intrauterine death, 2 cases of IUD were due to abruption and 1 IUD occurred due to maternal fever for 1 week and no cause could be identified in the fourth fetus. Two babies expired in our study in NICU, 1 was having severe birth asphyxia born to mother of severe preeclampsia and intrauterine growth restriction and PROM. The other neonatal death occurred due to extreme prematurity (1.1 kgs). The mother was a primigravidae with 31^{+5} weeks gestation with severe pregnancy induced hypertension with intrauterine growth retardation.

After delivery, platelet count of all the neonates of the mother enrolled for study was done. Out of the 100 live births, 97 had platelet count more than 150000/µL and only 3 neonates (2.88%) had thrombocytopenia with platelet count between 100000 to 149999/µL. Out of 3, one neonate was born to mother with ITP, another was born to mother with aplastic anemia. Neonatal bleeding symptoms were not observed in our study. This collaborate well with the study of Zutshi *et al.* [16]

In our study, 1.92% neonates had Apgar score less than 7 at 5 minutes which is comparable to the study by Parnas *et al.* [5] (2.4%). In the study by Lin *et al.* [9], 0.3% neonates had Apgar score <7 at 5 minutes which is lower as compared to our study.

Mean duration of hospital stay in our study was 5.01±4.25 days with a range of 2-29 days. In mild category, mean hospital stay was 4.75±3.89 day, in moderate it was 5±4.18 day and in severe category it was 6.71±0.617 day. The difference in hospital stay was not statistically significant in the 3 subgroups indicating well planned management of cases of thrombocytopenia in pregnancy.

Conclusion

Thrombocytopenia is one of the important hematological disorders during pregnancy. It was concluded that early interdisciplinary evaluation of thrombocytopenia in pregnancy is required for optimal care of mother and the neonate as risk varies greatly depending on cause of thrombocytopenia. The common causes of thrombocytopenia in pregnancy were found to be gestational thrombocytopenia and preeclampsia. Gestational thrombocytopenia is associated with better maternal and perinatal outcome as compared to preeclampsia and HELLP syndrome which expose them to life threatening complications may be due to their associated inherent problem such as placental abruption, postpartum hemorrhage, birth asphyxia and stillbirth. Gestational thrombocytopenia does not have dire maternal and perinatal consequences but at the same time, there are other important obstetric causes which can have maternal, fetal & neonatal complications. Thus accurate etiological diagnosis is essential for optimal therapeutic management. Therefore timely monitoring of platelet count is mandatory. Proper antenatal care and institutional deliveries enable obstetricians to diagnose thrombocytopenia & its complications at an early stage and early intervention results in better outcome, so that one can reduce morbidity & mortality due to thrombocytopenia, which is one of the preventable cause to improve feto-maternal outcome.

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