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Original Research Article

Neonatal thrombocytopenia and associated factors

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ABSTRACT

Background: The aim is to study neonatal thrombocytopenia and associated factors and compare the results with recent studies in neonates with thrombocytopenia admitted in neonatal intensive care unit (NICU).
Methods: After taking detailed consent from parents/guardians, detailed maternal obstetrics and neonatal history were taken and complete physical examination was done and details of the investigations done and outcome was noted and evaluated. Relevant data was entered in the predesigned proforma and was analyzed. Immediate outcome was assessed by outcome or death.
Results: The most common cause of neonatal thrombocytopenia was preterm gestational age. There were 68 (27.2%) neonates in the age group 28-32 weeks, 107 (42.8%) were in the age group 32-37 weeks and 75 (27.2%) were in the age group 37-42 weeks. Majority of the neonates were in the age group 32-37 weeks. We assessed outcome which was as follows, 98 (39.2%) neonates had expired and 152 (60.8%) neonates had survived in our study.
Conclusions: We studied the etiology of neonatal thrombocytopenia and associated factors. The most common cause of neonatal thrombocytopenia found was preterm gestational age. The most common type of neonatal thrombocytopenia found in our study was moderate to severe thrombocytopenia. In our study, there was 39.6% was neonatal death rate. In our study, neonatal thrombocytopenia was associated with the following factors gestational age, intrauterine growth retardation, pre-eclampsia, multiple pregnancy, eclampsia, birth asphyxia, x-ray chest/abdomen, ultrasonography (USG) abdomen, USG cranium, liver function tests and renal function tests.

Keywords: Neonatal thrombocytopenia, Preterm gestational age, Neonatal sepsis, Maternal risk factors, Intraventricular hemorrhage, Respiratory distress syndrome

INTRODUCTION

Neonatal thrombocytopenia is a common haematological problem seen in a neonatal intensive care unit.[1,2] Irrespective of the gestational age a value less than150000/ul is to be considered as thrombocytopenia. On the basis of platelet count, thrombocytopenia can be grouped into mild (platelet count: 100,000-150,000/µl), moderate (platelet count: 50000-99000/µl), severe (platelet count: <50000/µl), and very severe (platelet count: <30000/µl). The common aetiologies of neonatal thrombocytopenia include prematurity, sepsis, respiratory distress syndrome, birth asphyxia, meconium aspiration syndrome, hyperbilirubinemia and intra-uterine growth retardation.

Aims and objectives

This study aims to establish etiological and clinical correlation with immediate outcome of neonatal thrombocytopenia. Objectives were to study the etiology of thrombocytopenia in newborns, to calculate prevalence of thrombocytopenia in newborns, to assess the immediate outcome of neonatal thrombocytopenia, to study the association of selected demographic variable and lab profile with neonatal thrombocytopenia.

METHODS

Study type

It was a prospective and retrospective observational type of study.

Study place

The study was conducted at the Sri Aurobindo Institute of Medical Sciences and Research Centre, Indore, Madhya Pradesh.

Study duration

The duration of the study was 18 months from September 2018 to August 2020.

Inclusion criteria

Subjects with age less than 28 days were selected for the study.

Exclusion criteria

Subjects with age more than 28 days, severe congenital malformations, and newborns taking LAMA from NICU were excluded from the study.

Sample size

A minimum of 250 cases were studied.

Statistical analysis and plan

Descriptive stats were used to represent the features and characteristics of the collected samples. Descriptive and inferential strategy both were used. Chi square test was used for qualitative data. T test will be used for quantitative data. P value (probability value) <0.05 was considered significant.

Procedure of the study

Aim of the study was to study neonatal thrombocytopenia and associated factors and objectives were as follows: to study the etiology of thrombocytopenia in newborns; to calculate prevalence of thrombocytopenia in newborns; to assess the immediate outcome of neonatal thrombocytopenia and; to study the association of selected demographic variable and lab profile with neonatal thrombocytopenia.

After taking detailed consent from parents/guardians, detailed maternal obstetrics and neonatal history were taken and complete physical examination was done and details of the investigations done and outcome was noted and evaluated. Relevant data was entered in the predesigned proforma and was analyzed. Immediate outcome was assessed by outcome or death.

RESULTS

We studied the etiology of neonatal thrombocytopenia.

Causes were divided into 2 broad categories: maternal factors and neonatal factors.

Table 1: Causative factors.

Causative factors	Number	Percentage
Maternal factors		
Hypertension	56	22.4
Preeclampsia	19	7.6
Twins	23	9.2
Gestational diabetes mellitus	11	4.4
Eclampsia	9	3.6
Bleeding p/v	2	0.8
Neonatal factors		
Gestational age	175	70
IUGR	138	55.2
Neonatal sepsis	122	48.8
Birth asphyxia	113	45.2
Metabolic disorder	3	1.2

Distribution according to severity of thrombocytopenia

8 (3.2%) neonates had mild thrombocytopenia, 150 (60.0%) had moderate thrombocytopenia and 92 (36.8%) had severe thrombocytopenia. Majority of the neonates had moderate to severe thrombocytopenia.

Distribution according to sex

There were 111 (44.4%) females and 139 (55.6%) males, showing a male preponderance.

Distribution according to maternal complications

Hypertension was seen in 56 (22.4%), twin pregnancy in 23 (9.2%), preeclampsia in 19 (7.6%), severe oligohydramnios in 15 (6.0%), gestational diabetes mellitus in 11 (4.4%), eclampsia in 9 (3.6%), anemia in 2 (0.8%), bleeding per vaginum in 2 (0.8%) and polyhydramnios in 1 (0.4%) patient.

In 134 (53.6%) women, no maternal complications were seen.

Distribution according to gestational age

175 (70.0%) neonates were preterm born and 75 (30.0%) neonates were term born. Majority of the neonates were preterm born.

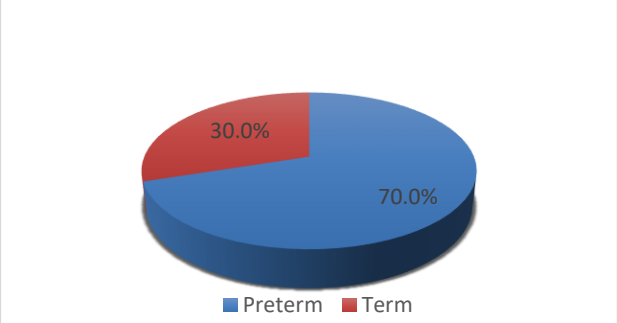

Figure 1: Distribution of neonatal thrombocytopenia and gestational age.

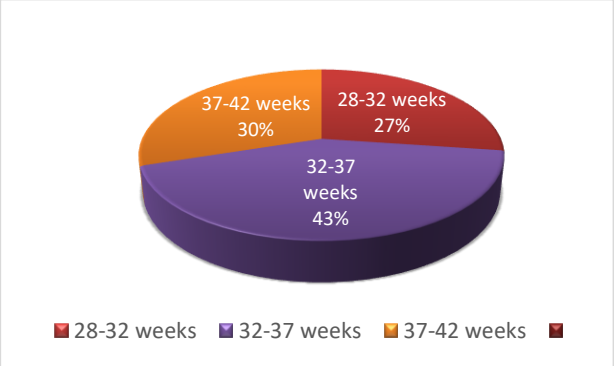

Figure 2: Distribution according to class of preterm gestational age.

Distribution according to outcome

98 (39.2%) neonates had expired and 152 (60.8%) neonates had survived in our study.

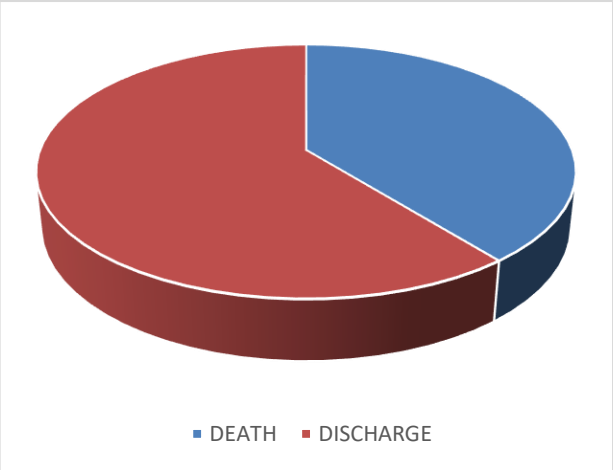

Figure 3: Distribution according to outcome.

There were 68 (27.2%) neonates in the age group 28-32 weeks, 107 (42.8%) were in the age group 32-37 weeks and 75 (27.2%) were in the age group 37-42 weeks.

Majority of the neonates were in the age group 32-37 weeks.

Table 2: Association between maternal risk factors and thrombocytopenia.

Maternal risk factors	Thrombocytopenia, N (%)			Total
	Mild	Moderate	Severe	
Absent	5 (4.3)	48 (41.4)	63 (54.3)	116 (100.0)
Present	3 (2.2)	102 (76.1)	29 (21.6)	134 (100.0)
Total	8 (3.2)	150 (60.0)	92 (36.8)	250 (100.0)

Pearson Chi square value=31.372, df=2, p value=0.001, significant

Table 3: Association between gestational age and thrombocytopenia.

Gestational age	Thrombocytopenia, N (%)			Total
	Mild	Moderate	Severe	
Preterm	5 (2.9)	89 (50.9)	81 (46.3)	175 (100.0)
Term	3 (4.0)	61 (81.3)	11 (14.7)	75 (100.0)
Total	8 (3.2)	150 (60.0)	92 (36.8)	250 (100.0)

Pearson Chi square value=22.604, df=2, p value=0.001, significant

Table 4: Association between IUGR and thrombocytopenia.

IUGR	Thrombocytopenia, N (%)			Total
	Mild	Moderate	Severe	
Absent	4 (3.6)	84 (75.0)	24 (21.4)	112 (100.0)
Present	4 (2.9)	66 (47.8)	68 (49.3)	138 (100.0)
Total	8 (3.2)	150 (60.0)	92 (36.8)	250 (100.0)

Pearson Chi square value=20.724, df=2, p value=0.001, significant

Table 5: Association between thrombocytopenia and final outcome.

Thrombocytopenia	Final outcome, N (%)		Total
	Death	Discharge	
Mild thrombocytopenia	2 (25.0)	6 (75.0)	8 (100.0)
Moderate thrombocytopenia	24 (16.0)	126 (84.0)	150 (100.0)
Severe thrombocytopenia	72 (78.3)	20 (21.7)	92 (100.0)
Total	98 (39.2)	152 (60.8)	250 (100.0)

Pearson Chi square value=93.447, df=2, p value=0.001, significant

DISCUSSION

In our study, we first grouped neonates with thrombocytopenia into three categories, that is: mild thrombocytopenia - 8 (3.2%) neonates had mild thrombocytopenia; moderate thrombocytopenia - 150 (60%) neonates had moderate thrombocytopenia and; severe thrombocytopenia - 92 (36.8%) had severe thrombocytopenia.[3-5]

Our aim was to study neonatal thrombocytopenia and associated factors.

We have studied the aetiology of thrombocytopenia in new-borns, our objective was to calculate the prevalence of thrombocytopenia in new-borns, assess the immediate outcome of neonatal thrombocytopenia and to study the association of selected demographic variables and lab profile with neonatal thrombocytopenia. We compared results of our study with other recent studies.

Comparison with various studies

Khalessi et al conducted a study on "the prevalence and risk factors for neonatal thrombocytopenia among new-borns admitted to intensive care unit of Aliasghar children's hospital". A cross sectional study in which the platelet counts of 364 neonates admitted to neonatal intensive care unit of Aliasghar children's hospital, Tehran, Iran, were assessed. Maternal and neonatal medical conditions, risk factors and drug history were also recorded.

Patients were divided into 4 groups according to the severity of thrombocytopenia: mild (100-149×109/l), moderate (50-99×109/l), severe (30-49×109/l) and very severe (<30×109/l). They were also grouped as presenting early (less than 72 hours after birth) and late (more than 72 hours after birth) thrombocytopenia. Demographic data and haemorrhagic manifestations were also recorded.[6,7]

Sixty-two (17.9%) of neonates were thrombocytopenic. The average gestational age at birth for the thrombocytopenic neonates was significantly lower than the non-thrombocytopenic neonates (32.2±2.5 weeks versus 34.9±2.5, P=0.0001), and also the average birth weight was significantly lower among the thrombocytopenic neonates (1979±517 gr versus 2371±480 gr, P=0.0001). Neonatal sepsis was significantly associated with thrombocytopenia (24.1% versus 5.9%, P=0.0001).

The conclusion was a high prevalence of thrombocytopenia among neonates admitted to NICU and its association with low birth weight, prematurity, and neonatal sepsis. Regarding the importance of life-threatening events among the thrombocytopenic new-borns, it is best to keep the risk factors in mind to prevent the future complications.

Resch et al conducted a study on "neonatal thrombocytopenia-causes and outcomes following platelet transfusions". This study evaluated the causes for neonatal thrombocytopenia (NT), the duration of NT, and the indications of platelet transfusions (PT) by means of a retrospective cohort study over a 23-year period. Neonates with NT were identified via ICD-10 code D69.6. Of 371 neonates (1.8/1000 live births) with NT, the majority (312; 84.1%) had early onset thrombocytopenia, and 282 (76%) were preterm born. The most frequent causes for NT were early and late onset sepsis and asphyxia. The mean duration of thrombocytopenia was 10.2 days and was negatively correlated (KK=−0.35) with the number of PT. PT were given to 78 (21%) neonates, 38 (49%) of whom had very severe NT. The duration of NT was positively related to the severity of NT and the number of subsequent PT. A mortality rate of 10.8% was significantly associated with bleeding signs ($p<0.05$) and correlated with increasing number of PT ($p<0.05$) but not with the severity of NT ($p=0.4$). In the case of relevant haemorrhage, PT did not influence the mortality rate ($p=0.09$). All deaths followed neonatal sepsis.

Conclusions was prematurity and diagnoses including early and late onset sepsis and asphyxia were the most common causes of NT. Mortality was not associated with the severity of NT but increased with the number of PT. In the study, there were 111 (44.4%) females and 139 (55.6%) males, but we found no association of neonatal thrombocytopenia with gender of the new born.[8-10]

We grouped causative factors into two broad categories: maternal factors and neonatal factors.

Maternal risk factors are as follows: hypertension, preeclampsia, twins, gestational diabetes mellitus, eclampsia and bleeding per vaginum. Neonatal factors were as follows: gestational age, IUGR neonatal sepsis, birth asphyxia and metabolic disorder.

Neonatal thrombocytopenia and maternal risk factors

We first studied maternal risk factors and we found that 116 neonates had no maternal risk factors whereas, 134 neonates had maternal risk factors.

Association with maternal hypertension

It showed that thrombocytopenia is not dependent on the maternal hypertension.

Association with preeclampsia

Our study showed that the prevalence of severe thrombocytopenia was higher in mothers who had preeclampsia in comparison to the mothers who did not have preeclampsia.

Association with multiple pregnancy

Our study showed that thrombocytopenia was dependent on multiple pregnancy.

Association with gestational diabetes mellitus

Our study shows that neonatal thrombocytopenia is not dependent on gestational diabetes mellitus.

Association with eclampsia

Our study showed that neonatal thrombocytopenia is dependent on eclampsia.

Association with bleeding per vaginum

Our study showed that neonatal thrombocytopenia is not dependent on bleeding per vaginum.

Neonatal thrombocytopenia and gestational age

We grouped preterm neonates into 3 categories: extremely preterm (below 28 weeks), very preterm (28-32 weeks) and moderate to late preterm (32-37 weeks).

Of the 68 neonates in the category, very preterm, that is, gestational age 28-32 weeks, 26 (38.2%) had moderate thrombocytopenia and 42 (61.8%) had severe thrombocytopenia.

Of the 137 neonates in the category moderate to late preterm, that is, gestational age 32-37 weeks, 6 (5.7%) had mild thrombocytopenia, 68 (63.5%) had moderate and 33 (30.8%) had severe thrombocytopenia.

Of the 75 neonates in the category term neonates, that is, gestational age 37-42 weeks, 22 (29.3%) had mild thrombocytopenia, 46 (61.3%) had moderate and 7 (9.3%) had severe thrombocytopenia.

Higher severity was seen in moderate to late preterm, followed by term, followed by very preterm. Our study shows that neonatal thrombocytopenia is dependent on gestational age.

Neonatal thrombocytopenia and IUGR

In the neonates without IUGR, 4 (3.6%) had mild thrombocytopenia, 84 (75.0%) had moderate thrombocytopenia and 24 (21.4%) had severe thrombocytopenia.

In the neonates with IUGR, 4 (2.9%) had mild thrombocytopenia, 66 (47.8%) had moderate thrombocytopenia and 68 (49.3%) had severe thrombocytopenia.

In the neonates with IUGR, prevalence of severe thrombocytopenia is higher than in neonates without IUGR. Hence, our study showed that thrombocytopenia is dependent on IUGR of the neonate.

Neonatal thrombocytopenia and sex of the new born

Our study shows that neonatal thrombocytopenia is not dependent on sex of the new born.

Limitations

Our study did not include neonates of age more than 28 days, severe congenital malformations and newborns taking LAMA from NICU.

CONCLUSION

In our study, the final aetiology was studied and was divided into maternal and neonatal factors. Maternal factors were Hypertension was seen in 22.4% cases, Preeclampsia was seen in 7.6% cases, multiple pregnancy was seen in 9.2%, gestational diabetes mellitus was seen in 2.2%, eclampsia was seen in 3.6%, bleeding per vaginum was seen in 0.8%. Neonatal factors were seen were preterm risk factor was seen in 70%, IUGR risk factor was seen in 55.2%, neonatal sepsis (culture proven) was in 48.8%, birth asphyxia risk factor was seen in 45.2%, metabolic disorder risk factor was seen in 1.2%. Our second objective was to study the prevalence of neonatal thrombocytopenia in our study and we found that 8 (3.2%) neonates had mild thrombocytopenia, 150 (60.0%) had moderate thrombocytopenia and 92 (36.8%) had severe thrombocytopenia. Most common finding in our study was moderate to severe thrombocytopenia. Our third objective was to assess the immediate outcome of neonatal thrombocytopenia and in our study, 98 (39.2%) neonates had expired and 152 (60.8%) neonates had survived. Factors that were dependent on neonatal thrombocytopenia were gestational age, intrauterine growth retardation, pre-eclampsia, multiple pregnancy, eclampsia, birth asphyxia, x-ray chest/abdomen, USG abdomen, USG cranium, liver function tests, and renal

function tests. Factors that were independent of neonatal thrombocytopenia were maternal hypertension, gestational diabetes mellitus, bleeding per vaginum, sex of the neonate, metabolic syndrome, and cerebrospinal fluid analysis findings. Hence, our study advances knowledge and understanding in the field of neonatal thrombocytopenia.

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