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Original Research Article

Study prognostic significance of low platelet count in newborn admitted in neonatal intensive care unit (NICU) at tertiary care center

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ABSTRACT

Introduction: One of the most frequent haematological abnormalities found in new-borns is Thrombocytopenia. In neonates admitted to ICUs, thrombocytopenia develops in 18–35 % of all patients. With decreasing gestational age and birth weight, the incidence are increasing. Platelets are formed by megakaryocytes and are present in the bloodstream for 5–7 days. Platelets are known as regulators of haemostasis and thrombosis. Platelets become active in the blood resulting vascular injury. Thrombopoiesis is the formation of platelets in the Bone marrow. Thrombopoietin is the main regulator of thrombopoiesis. Thrombopoietin affects most aspects of the production of platelets. The process of Thrombopoiesis is caused by the breakdown of proplatelets (mature megakaryocyte membrane pseudopodia projections).

Aim and Objective: Aim is to assess the prevalence, causes, treatment modalities, and prognostic outcomes of thrombocytopenia in neonates.

Materials and Methods: Research design was carried out in the Department of paediatrics and neonatology, Government Medical College, Surat from October 2020 to April 2022. Data were collected from MRD section. Platelet numbers were estimated from whole blood EDTA sample taken from neonates for routine medical management. Data were analysed for Age, Sex, Intraventricular haemorrhage, other bleeding manifestation, Necrotising enterocolitis, Sepsis, Fungal infection & final outcome.

Result: Out of 1265 neonates admitted to the NICU at Department of paediatrics and neonatology, GMC, Surat 450 neonates were found to have thrombocytopenia. Male neonates are more significantly affected than female neonates.

Conclusion: The early platelets drop even without the later development of thrombocytopenia is an early indicator of poor outcome and major morbidities, mainly infection.

1. Introduction

Neonatal thrombocytopenia is defined as a platelet count of<150×10^9/L in any neonate of a viable gestational age.[1] Thrombocytopenia is one of the most shared haematological anomalies found in newborns.[2,3] Several studies have shown a prevalence of thrombocytopenia in 1 to 5 % of all new-borns; though, the prevalence varies depending upon the population studied.[4,5] In neonates admitted to intensive care units, thrombocytopenia develops in 18–35 % of all admissions. The occurrence increases with decreasing gestational age and birth weight.[6–9] The furthermost common cause of early-onset thrombocytopenia is associated with chronic foetal hypoxia, as it arises in infants born to mothers with pregnancy-induced hypertension or diabetes and/or in those with intrauterine growth restriction

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(IUGR).[10,11] On the other hand, thrombocytopenia which presents after the first 3 days of life is due to sepsis or necrotizing enterocolitis (NEC) in >80 % of cases.[12] The mechanisms underlying thrombocytopenia in neonates are the same as in adults: increased platelet consumption, decreased platelet production, hypersplenism, or a combination of these. Thrombocytopenia is one of the most common abnormality in new born. The causes, treatment modalities, and consequences of neonatal thrombocytopenia have to be evaluated for providing better care. Neonatal thrombocytopenia can be early onset when it is occurred within 72 hour of life, or late onset when it is occurred beyond 72 hours of life, and the cause are different for them.[13] The mechanism involved in thrombocytopenia during septicemia are endothelial dysfunction, coagulopathy, hemodilution and altered thrombopoiesis. Neonatal thrombocytopenia in first 24 hour of life may be due to alloimmune thrombocytopenia.[14,15] Neonatal alloimmune thrombocytopenia can have wide-ranging presentation ranging from mild to moderate bleeding which resolves in a week to severe intracranial haemorrhage leading to death or neurological developmental sequelae.[16,17] Disseminated intravascular coagulopathy and necrotising enterocolitis is also independently related to thrombocytopenia.[18,19] The early platelet drop even without the later development of thrombocytopenia is an early indicator of poor outcome and major morbidities, mainly infection. So, there is a necessity to explore this observation in prospective study design.

2. Aim & Objectives

To document neonatal causes of thrombocytopenia and treatment modality of lower platelet count. To assess prognostic outcome of thrombocytopenia in neonate in terms of morbidity and mortality. To guide the clinician for rational and judicial use of antibiotics for the management of the patients in any infection. Provide a differential diagnosis for thrombocytopenia in NICU and discuss the management of thrombocytopenia in the neonate.

3. Materials and Methods

The study was carried out in neonatal intensive care unit of tertiary care center, Surat. It is hospital based Prospective Observational study. In this study sample size of 450 during any 6-month duration between October 2020 to April 2022. All cases of having Thrombocytopenia in newborn patients admitted in Neonatal care units (NICU) of tertiary care center, Surat who presented with clinical condition and investigation suggestive of Thrombocytopenia were included in this study. All routine information was collected from each newborn patient's parents while eliciting history and examination at the time of admission in hospital were noted. Clinical history of each newborn patient was taken either from parents or any close relative and recorded on proforma. Signs and symptoms suggestive of thrombocytopenia were noted. From all newborn patients who had clinical features suggestive of thrombocytopenia, blood was collected for complete blood count (CBC) and other investigations to rule out thrombocytopenia. With all aseptic precaution venous blood sample will be taken by needle or intracath (24 no.) from superficial vein. Whole blood EDTA sample approximately 0.5 ml amount will be taken. All routine investigation will be done at tertiary care hospital. No such specific investigation will be done.

3.1. Sample participants

An area of approximately 5 cm over the venipuncture site was disinfected with 70% alcohol, rubbing gently and allowed to dry. This was followed by application of povidine Iodine in concentric circles over the site and allowed to dry for at least 1 minute. About 2 to 5 ml of blood from pediatric patients and 5 to 10 ml of blood from adult patients was drawn using a sterile syringe and needle; sample was inoculated into the BHIB (Brain Heart Infusion Broth) culture medium bottle at bed side.

3.2. Inclusion criteria

All Sick Newborn with thrombocytopenia admitted in NICU, gestational age b/w 28 to 42 weeks, newborn without any Life-Threatening congenital malformation (Anencephaly, Encephalocele, Severe Meningomyelocele, Hypoplastic Left Heart Syndrome.)

3.3. Exclusion criteria

All the patients whose parents will not give informed written consent, gestational age < 28 week, with Life Threatening congenital malformation, any maternal medical condition or history of medication which can cause thrombocytopenia.

Ethical committee was taken before starting the study. Written and informed consent was taken from all patients who participated in the study.

4. Results

Prevalence of Low Platelet count new born (thrombocytopenic new born) in NICU is 35.57% in present study. Incidence of low platelet count among males is 39.50%; whereas incidence of infection among females is 30.13%. Incidence of low platelet count is more commonly seen among Pre term Neonates with incidence of 38.16% than Full term Neonates with incidence of 33.82% and Incidence of low platelet count is more commonly seen among Neonates <7 days (early presentation) with incidence of 38.08% than Neonates >7 days (late presentation) with incidence of 31.04%. Incidence of low platelet count is seen among Neonates with normal birth

weight is 160 (35.6%), followed by Low Birth Weight is 290 (64.45%) (Very Low Birth Weight (VLBW) is 135 (30%), Low Birth Weight (LBW) is 110 (24.5%), Extreme Low Birth Weight (ELBW) is 45 (10%)). In total of 450 Neonates with low platelet count, 162 neonates were on ventilatory support and 288 neonates on other support (108 on BCPAP, 97 on HFNC and 83 on Oxygen prongs). Incidence of outcome, 392 low platelet count Neonates got discharged and 58 low platelet count Neonates expired due to underlying complication. 39 pre term neonates and 19 full term neonates. In present study most common cause of death in full term neonate was perinatal asphyxia (73.7%), followed by pneumonia (26.3%) and in pre term neonate cause of death was RDS (71.8%), followed by NEC (20.5%) and IVH (7.7%) associated with thrombocytopenia in all.

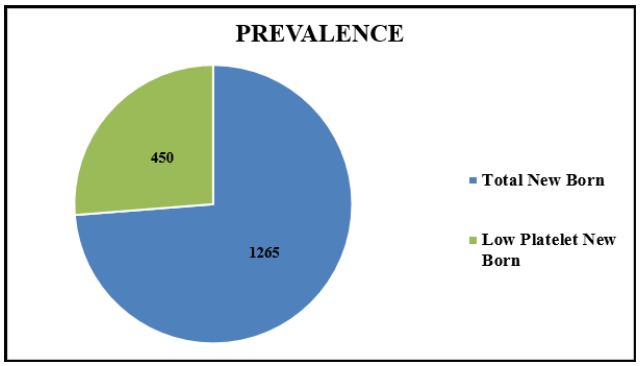

Fig. 1: Prevalence of low platelet count new born

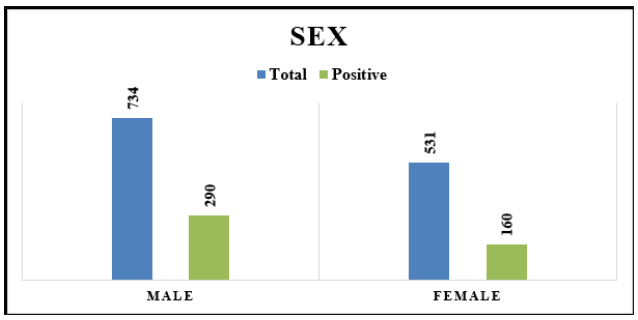

Fig. 2: Incidence in relation to sex

5. Discussion

Thrombocytopenia develops in 18–35 % of all patients admitted to ICUs,. The incidence increases with decreasing gestational age and birth weight.[6–9] Thrombocytopenia develops in 22–35% of all babies admitted to NICUs and in up to 50% of those admitted to NICUs who require intensive care. A considerable proportion (20%) of these episodes of thrombocytopenia are severe.[7,8,10,12] This study

Table 1: Incidence in relation to gestational age and age of presentation

Gestational Age	**No. of New Born**	**Low Platelet Count**	**Percentage**
Pre Term (<37 weeks)	511	195	38.16%
FULL TERM (>=37 weeks)	754	255	33.82%
Age of Presentation	**NO. of New Born**	**Low Platelet Count**	**Percentage**
Early (<=7 Days)	814	310	38.08%
Late (>7 Days)	451	140	31.04%

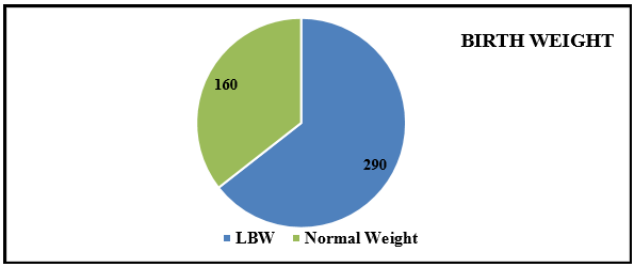

Fig. 3: Incidence in relation to birth weight

Table 2: Etiology associated with thrombocytopenia

Pre-Term (195)		**Full Term (255)**	
RDS	108 (55.5%)	Perinatal Asphyxia	92 (36.1%)
NEC	41 (21%)	Pneumonia	53 (20.8%)
Perinatal Asphyxia	35 (17.9%)	Meconium aspiration syndrome	52 (20.4%)
IUGR	8 (4.1%)	Late Onset Sepsis	25 (9.8%)
IVH	3 (1.5%)	IUGR	17 (6.6%)
-	-	Meningitis	16 (6.2%)

Table 3: Incidence related to oxygen support

Oxygen Support			
Ventilatory Support	**Other Support (288)**		
	BCPAP	**HFNC**	**Oxygen Prong**
162	108	97	83
36%	24%	21.5%	18.5%

Table 4: Incidence related to c- reactive protein and blood culture

Total Low Platelet Count New Born	Positive CRP	Negative CRP
	285	165
450	Positive blood culture	Negative blood culture
	95	355

Table 5: Incidence in relation to outcome

Outcome		
Discharge	Death (12.8%) Pre term	Full term
392	39	19
87.2%	8.6%	4.2%

Table 6: Different causes of mortality

Total mortality (58) (12.8%)			
Pre-term 39 (8.6%)		Full term 19 (4.2%)	
RDS	28 (6.2%)	Perinatal asphaxia	14 (3.1%)
Nec	8 (1.8%)	Pneumonia	5 (1.1%)
IVH	3 (0.6%)	-	-

revealed that 450 (35.57%) out of 1265 total new born were positive for the low platelet count. A study done by Mehta P, et al (1980),[8] had reported the frequency of low platelet count was 33.75%. In contrast to the above reports, the studies done in India, by Rohitkumar V et al, Neumann L et al, have reported high frequency of low platelet count accounting for 35%, 33.9%, respectively.[8] As per guidelines, Gestational age of new born is classified into Pre term i.e < 37 weeks and Full term i.e > 37 weeks. Out of 1265 new born baby, 511 were born before term that is belong to Pre term gestational age and 754 were born at full term. Out of them 195 were having low platelet count in gestational age < 37 weeks and 255 were having low platelet count in gestational age > 37 weeks. Present study is compatible with Andrew M, Vegh P, Caco C, et al. study.[20] Prolong stay in NICU, neonates having congenital malformation, focal infection; LBW and premature expose to external instrumentation have more chances to develop late sepsis. Incidence of low platelet count is seen among Neonates with normal birth weight is 160 (35.6%), followed by Very Low Birth Weight (VLBW) is 135 (30%), Low Birth Weight (LBW) is 110 (24.5%), Extreme Low Birth Weight (ELBW) is 45 (10%). Present study is compatible with Mehta P, Rohitkumar V, Neumann L et al., study.[8] 450 were having low platelet count in which 290 (39.50%) were male new born and 160 (30.13%) were female new born. This is comparable with study by Shahsanam Gheibi et al.[21] Nawashad Uddin Ahmed et al.[22] shows it was 35.2% and 26.4% respectively. Ayenger et al.[23] in whom study it was 37.6% and 29.72% respectively. The mechanism involved in thrombocytopenia during septicemia are endothelial dysfunction, coagulopathy, hemodilution and altered thrombopoiesis. Neonatal thrombocytopenia in first 24 hour of life may be due to alloimmune thrombocytopenia.[14,15] Neonatal alloimmune thrombocytopenia can have varied presentation ranging from mild to moderate bleeding which resolves in a week to severe intracranial hemorrhage leading to death or neurodevelopmental sequelae.[16,17] Disseminated intravascular coagulopathy and necrotizing enterocolitis is also independently related to thrombocytopenia.[18,19] In total of 450 Neonates with low platelet count, 285 neonates were CRP Positive. Infection rate is 63.40%. Chandna A et al, 1988, Moodely GP et al 2008 and Gardes et al 2014 shows near by our study.[24] In the present study klebsiella is most frequently encountered organisms followed by E.coli, Staph.aureus, Pseudomonas, Acinetobacter. In recent past most of the studies have reported higher incidence of klebsiella septicemia. In most of the studies, gram-negative bacilli have taken over the gram-positive organisms, especially in hospital settings. Mehta et al.[25] have reported the incidence of 80.96% for gram-negative and 18% for gram-positives.

6. Conclusion

In present study most common cause of thrombocytopenia in full term baby is Perinatal Asphyxia (36.1%) followed by pneumonia (20.8%) and in Preterm baby respiratory distress syndrome (55.5%) is most common cause of thrombocytopenia followed by NEC (21%). The risk of intracranial bleeding especially in premature infants is troublesome because of long term neurological morbidity. It is not surprising therefore that a significant difference happens among clinicians globally, with regard to the management of thrombocytopenia. The majority of platelet transfusions are destructively prescribed for episodes of minor or no bleeding. Though, platelet transfusion guidelines are empiric and based on practiced harmony. In conclusion, during the recent years it is found that the prevalence of thrombocytopenia decreased significantly and the distribution of causes of thrombocytopenia according to years has changed in our neonatal facility and NICU. Outcome (mortality) of thrombocytopenia has also been decreased up to 12% to 13%. This study shows that the rate of thrombocytopenia may be dropped by removing avoidable factors of thrombocytopenia in neonates, and as a result, complications and risks of thrombocytopenia and the need for platelet transfusion may be decreased.

7. Source of Funding

None.

8. Conflict of Interest

None.

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