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Original Research Article

INCIDENCE OF THROMBOCYTOPENIA IN NEONATAL SEPSIS

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ABSTRACT

Background: Neonatal sepsis is a systemic infection that found in under one-month newborns. Though a lot advances in medical and surgical fields are available but the rate of morbidity and mortality from neonatal sepsis is still high. **Objectives:** The objectives of this studyare to determine the frequency of thrombocytopenia in neonatal sepsis.

Materials and Methods: The study was a prospective observational cross-sectional study conducted in the Department of Paediatrics of Guntur Medical College and tertiary care centre in Andhra Pradesh, India. Data was obtained from NICU records comprising 1 year, from January 2022 to December 2022. Clinical and laboratory data have been collected from newborns' records, including laboratory reports and case notes during admission.

Results: The study comprised 186 infants who met the specified inclusion criteria for the study population. Of 186 newborns, 96 were male (51.61%) and 90 were female (48.38%). According to our study's severity grading, 22.6% of neonates had mild thrombocytopenia, 29.0% had moderate thrombocytopenia, and 48.4% had severe thrombocytopenia. The predominant organisms identified in blood cultures were Staphylococcus aureus in 13 cases (30.23%), followed by Coagulase Negative staphylococcus in 12 cases (27.90%), Klebsiella pneumoniae in 10 cases (23.25%), Pseudomonas spp.in 3 cases (6.97%), Methicillin-resistant Staphylococcus aureus 2 cases (4.65%) cases and followed by Acinetobacter baumannii, Proteus mirabilis, Candida sepsis. Of 186 thrombocytopenic neonates, 88.70% stayed less than 10 days, and 11.3% lasted more than 10 days.

Conclusion: Thrombocytopenia was prevalent in sepsis caused by Staphylococcus aureus, Coagulase Negative staphylococci, and Klebsiella pneumonia. Severe thrombocytopenia is strongly linked to a higher risk of serious bleeding and death. An ideal large-scale, prospective multicentre investigation could elucidate several parameters related to death in newborn sepsis.

Keywords: Neonate, thrombocytopenia, neonatal intensive care unit, pattern of thrombocytopenia.

INTRODUCTION

India contributes to 20% of worldwide live births and almost 25% of neonatal fatalities. Neonatal sepsis is a significant issue in the country. Hospital-based research shows an incidence rate of 30 per 1000 live births, whereas community-based studies suggest an incidence rate ranging from 2.7% to 17% of all live births.[1] Approximately 20% of newborns are diagnosed with sepsis in the hospital, with the rate increasing to 50% for those with culture-proven sepsis. When the hospitalisation term is prolonged, patients require extra resources. These patients are also highly susceptible to significant neurodevelopmental problems in later years.[2,3]

Thrombocytopenia, which includes a platelet count lower than 150*10^9/L, is a common issue in neonatal critical care units, affecting 22–35% of intensive care admissions.[4-6] Thrombocytopenia and its relationship with platelet count and bleeding have garnered substantial attention recently. The association seems

less evident than once thought. However, platelet counts remain widely utilised in transfusion protocols. Factors outside platelet count appear to have a more significant impact on the risk of bleeding in newborns, indicating a need for further investigation into thrombocytopenia.[7] Sepsis is a substantial factor in causing thrombocytopenia in newborns, and the platelet count can drop to its lowest level within 24-48 hours after the illness begins.[8]

The cause of low platelet count in newborn sepsis is not fully known and could provide insights into the relationship between platelet count and bleeding. It has been proposed that in neonatal sepsis, endothelial damage triggers the elimination of platelets by reticuloendothelial cells. Thrombocytopenia happens when the formation of platelets cannot keep up with the rate at which they are being used, with serum thrombopoietin levels playing a part in causing this imbalance.[9-12]

Thrombocytopenia was identified as a significant independent risk factor for sepsis-related mortality in extremely low-birth-weight newborns, highlighting its importance in the link between the two conditions. Adults with sepsis hospitalised in an intensive care unit who had platelet counts below 100*10^9/L were more critically unwell, experienced more shock and organ failure, and had a higher fatality rate up to 1 year following admission to the intensive care unit. This requires a more detailed explanation of thrombocytopenia's diagnostic and prognostic significance in sepsis. This study seeks to elucidate neonatal sepsis and thrombocytopenia by examining their severity, clinical progression, and the fate of thrombocytopenia.[13,14]

Sepsis should not be considered a uniform entity, as it overlooks the pathogenic and clinical distinctions across different causative microorganisms and clinical syndromes and presentations of newborn sepsis. In this work, we have separately reported the characteristics of sepsis-related thrombocytopenia for Gram-positive and Gram-negative bacteria.[15] Prior research has shown no significant distinction in the development and progression of thrombocytopenia in sepsis caused by Gram-positive or Gram-negative bacteria or indicated a higher prevalence of thrombocytopenia in Gram-negative sepsis.[16-19] These results are difficult to interpret due to the varied gestational ages of the populations studied and the fact that most studies focus on highly preterm newborns.

The aim of this study is to know the incidence of thrombocytopenia in neonatal sepsis and to evaluate the feasibility of neonatal thrombocytopenia as a screening tool for neonatal thrombocytopenia.

MATERIAL AND METHODS

The study was a prospective observational cross-sectional study conducted in the Department of Paediatrics of Guntur Medical College and tertiary care centre in Andhra Pradesh, India. Data was obtained from NICU records comprising 1 year, from January 2022 to December 2022. Clinical and laboratory data have been collected from newborns' records, including laboratory reports and case notes during admission. Approval from the Institutional Research and Ethical Committee was obtained before starting the project.

In the current investigation, only neonates with culture-positive sepsis who were younger than 28 days were considered for inclusion. Babies who were born with a meagre birth weight (LBW) of less than 1000 grammes, who were older than 28 days, neonates who had a maternal history that indicated placental insufficiency, neonates who had a family history of bleeding symptoms, and mothers who had low platelet counts were not included in the study. Blood cultures were collected from the neonates to obtain information regarding the isolated organism, demographic profile, type of sepsis (EOS/LOS), presentation (non-specific/systemic), and haematology. Complete blood cells, blood culture, C-reactive protein, and erythrocyte sedimentation rate were carried out as part of the septic screening procedure, which was carried out by the hospital procedures.

During this study's intent, the definitions used were as follows: (a) the term "neonatal period" was employed to refer to the age of less than 28 days following birth. In the case of a newborn with a clinical picture that is suggestive of septicaemia, pneumonia, or meningitis, as well as the isolation of the pathogen from blood, the diagnosis of culture-proven sepsis comes into play. (c) A platelet count of more than 150,000/mm3 was considered within the normal range. It was determined that newborns with platelet counts lower than 150,000/mm3 were supposed to have thrombocytopenia. Platelet counts within the range of 100,000 to 150,000/mm3, 50,000 to 100,000/mm3, and less than 50,000/mm3 were used to create the classifications of mild, moderate, and severe thrombocytopenia, respectively. Prevalence, however, refers to the percentage of a population affected by a particular disease.

RESULTS AND DISCUSSION

Neonatal thrombocytopenia is frequently encountered in clinical practice and indicates several illness states in newborns. Platelets are present in the foetal circulation as soon as 5 weeks during gestation. The platelet count reaches 150,000 to 450,000 per microliter by the second trimester and remains stablethroughout adulthood. The relationship between the severity of thrombocytopenia and the risk of bleeding is not clearly understood, even though neonatal platelet counts below 50X10^9/L are generally considered a sign that extra therapeutic attention is needed.

The study comprised 186 infants who met the specified inclusion criteria for the study population. Of 186 newborns, 96 were male (51.61%) and 90 were female (48.38%) (Table 1). Malik H et al,[20]

reported 65 male infants (72%) and 25 female neonates (28%). In another study conducted by Mittal et al., the distribution of sepsis cases included 52% males and 47.8% females, similar to the demographics of our study.[21] In another study by Bhat Y R et al., 64.1% of the neonates were male, and 35.9% were female.[22]

According to our study's severity grading, 22.6% of neonates had mild thrombocytopenia, 29.0% had moderate thrombocytopenia, and 48.4% had severe thrombocytopenia (Table 2). In a study by Karne et al,[23] severe thrombocytopenia was found in 57.5% of patients with confirmed sepsis, while mild and moderate thrombocytopenia were observed in 22.5% and 20.0% of cases, respectively. Nandyal SS, [24] conducted a study revealing that 17.1% of newborns had mild thrombocytopenia, 17.1% had moderate thrombocytopenia, and 65.6% had severe thrombocytopenia. Severe thrombocytopenia was mainly seen in neonates with neonatal sepsis (77.2%), birth asphyxia (75%), prematurity (65.7%), and respiratory distress syndrome (71.4%). Rabindran et al. also found a thrombocytopenia prevalence of approximately 56.94% in late-onset sepsis and 48.38% in early-onset neonatal sepsis.[25] In comparison, Jeremiah ZA et al. reported a thrombocytopenia prevalence of 84.84% in early-onset sepsis. The results of our investigation align precisely with these findings.[26]

There was a high prevalence of thrombocytopenia (54.83%) in babies diagnosed with sepsis through positive culture tests (Table 3). Rabindran PH et al,[27] conducted a study that found a high prevalence of thrombocytopenia (73.07%) in infants with culture-positive sepsis. Guida JD et al,[28] and Mannan MA et al,[29] observed that 50% of newborns with culture-positive sepsis had this condition.

The predominant organisms identified in blood cultures were Staphylococcus aureus in 13 cases (30.23%), followed by Coagulase Negative staphylococcus in 12 cases (27.90%), Klebsiella pneumoniae in 10 cases (23.25%), Pseudomonas spp.in 3 cases (6.97%), Methicillin-resistant Staphylococcus aureus 2 cases (4.65%) cases and followed by Acinetobacter baumannii, Proteus mirabilis, Candida sepsis(Table 4).Chate S et al,[30] conducted a similar study and found that K.pneumoniae was the most common organism followed byPseudomonas (15), Staphylococcus (9), and E. coli (9). Similar results were found by Singh et al,[31] where K.pneumoniae wasfound in 44.8% (47/105) newborns followed by Pseudomonas spp. 24.8% (26/105), E. coli 13.3% (14/105), S. aureus 10.5% (11/105), andCandida spp. 1.9% (2/105). Verma and Sadawarte,[32] found that S. aureus (58.62%) was the most common, followed by Klebsiella (16.09%) coagulase-negative Staphylococcus (6.89%) . Karne et al. found that Pseudomonas aeruginosawas the most common organism causing neonatal sepsis accompanying severe thrombocytopenia (64.7%) than mild or moderate thrombocytopenia.[33] In a studyby Workman et al., Enterobacter was themost common organismcausing neonatalsepsis with thrombocytopenia.[34] Khassawnehet al., from Jordan, alsoreported Gram-negative organismsas the mostcommon cause of neonatal sepsis.[35] S. aureuscolonizes skin, nasopharynx, and gastrointestinal tractand spreads throughhands of health care workers. This suggests a prerequisite forbetter adherence to hygiene practices and isolation of health care workers.

Of 186 thrombocytopenic neonates, 88.70% stayed less than 10 days, and 11.3% lasted more than 10 days. Among them, 12 perished. Arbari Saha [36] conducted a study where he observed a mortality rate of 35.4% in thrombocytopenic neonates, compared to 8.6% in non-thrombocytopenic neonates. A survey by Bonifacio L. et al,[37] showed that the mortality rate was 1.4% in non-thrombocytopenic neonates, compared to 16.7%, 32.4%, and 45.8% in preterm neonates with varying degrees of thrombocytopenia. Another study by Sola MC. et al,[38] found a mortality rate of 34% in preterm neonates. The findings and interpretations are limited because it was a prospective observational study and may be biased. This study lacked the statistical power to assess variations in bleeding events. It did not fully consider the timing of bleeding events about the onset of thrombocytopenia or other factors that could affect the risk of bleeding, such as hemodynamic instability.

Table 1: Represents the Distribution according age

Gender	Number	%(percentage)
Male	96	51.61
Female	90	48.38

Table 2: Represents the Various grades of thrombocytopenia

Grades of thrombocytopenia	To. No. (68)	% (Percentage)
Mild (platelet count 1,00,000 – 1,50,000)	42	61.76
Moderate (50,000 – 1,00,000)	18	26.47
Severe (<50,000)	8	11.76

Table: 3 Represents the sepsis positive in the study group

Test NNT Sepsis	To. No. (186)	% (Percentage)
Positive	102	54.83
Negative	84	45.16

Table 4: Severity of thrombocytopenia as per organism found in blood culture

Organism Found	Total No (43)	%(percentage)
Staphylococcus aureus	13	30.23
Coagulase-Negative Staphylococci	12	27.90
Klebsiella pneumoniae	10	23.25
Pseudomonas spp.	3	6.97
Methicillin-resistant Staphylococcus aureus	2	4.65
Acinetobacter baumannii	1	2.32
Proteus mirabilis	1	2.32
Candida sepsis	1	2.32

Table: 5 Represents the outcomes of the study group.

Variable		To. No. (186)	% (Percentage)
Length of Hospital stay	<10 days	165	88.70
	>10 days	09	11.3
Survival (No, %)		174	93.54
Death (No, %)		12	6.45

CONCLUSION

Thrombocytopenia was prevalent in sepsis caused by Staphylococcus aureus, Coagulase Negative staphylococci, and Klebsiella pneumonia. Severe thrombocytopenia is strongly linked to a higher risk of serious bleeding and death. An ideal large-scale, prospective multicentre investigation could elucidate several parameters related to death in newborn sepsis.

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