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PREVALENCE OF THROMBOCYTOPENIA AND ITS IMPACT ON MORTALITY AMONG NEONATES WITH NEONATAL SEPSIS

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ABSTRACT

Background: Neonatal sepsis is a leading cause of morbidity and mortality in newborns, often complicated by thrombocytopenia. Understanding the prevalence of thrombocytopenia and its impact on neonatal outcomes is crucial for improving management and survival rates.

Objective: This study aims to determine the prevalence of thrombocytopenia among neonates with sepsis and assess its impact on in-hospital mortality.

Methods: We conducted a retrospective cohort study of 150 neonates diagnosed with sepsis in the neonatal intensive care unit (NICU) at Shaikh Zayed Hospital, Lahore. Data on demographic characteristics, clinical features, isolated pathogens, and outcomes were collected from electronic medical records. Thrombocytopenia was defined as a platelet count <150,000/µL. Logistic regression was used to analyze the association between thrombocytopenia and mortality, adjusting for potential confounders.

Results: The mean gestational age of the neonates was 32.5 ± 3.2 weeks, and the mean birth weight was 1.8 ± 0.5 kg. Thrombocytopenia was present in 80% of the neonates. The most common pathogens isolated were Escherichia coli (30%), Staphylococcus aureus (25%), and Streptococcus (20%), and Klebsiella species (15%). In-hospital mortality was significantly higher in neonates with thrombocytopenia (20.8%) compared to those without (3.3%). Logistic regression analysis showed that thrombocytopenia was significantly associated with increased in-hospital mortality (adjusted odds ratio: 4.2; 95% CI: 1.5-12.0; p=0.007).

Conclusion: Thrombocytopenia is highly prevalent among neonates with sepsis and is associated with a significantly increased risk of in-hospital mortality. These findings highlight the importance of early detection and management of thrombocytopenia in improving outcomes for neonates with sepsis.

Keywords: Neonatal sepsis, thrombocytopenia, neonatal mortality, neonatal intensive care, Escherichia coli, Staphylococcus aureus, Group B Streptococcus, Klebsiella species

INTRODUCTION

Neonatal sepsis remains a critical challenge in neonatology, representing a significant cause of morbidity and mortality among newborns worldwide. As a systemic infection occurring within the first 28 days of life, neonatal sepsis demands prompt and effective medical intervention due to its rapid progression and potential to cause severe complications.[1,2] Among the various hematological abnormalities observed in neonates with sepsis, thrombocytopenia—characterized by an abnormally low platelet count—stands out as a particularly concerning indicator. Thrombocytopenia in the neonatal population not only complicates the clinical management of sepsis but also has profound implications for the prognosis of affected infants.[3,4]

The prevalence of thrombocytopenia in neonates with sepsis varies across different studies and populations, influenced by factors such as gestational age, birth weight, and the presence of maternal or neonatal infections. This condition is associated with several pathophysiological processes, including increased platelet consumption, sequestration in the spleen, and suppressed platelet production, all of which can be exacerbated by the systemic inflammatory response triggered by sepsis.[5] The presence of thrombocytopenia in these vulnerable infants often serves as an early warning sign, alerting healthcare providers to the severity of the underlying infection and the potential for adverse outcomes.[6]

The impact of thrombocytopenia on mortality in neonates with sepsis is a critical area of investigation. Numerous studies have highlighted a strong correlation between low platelet counts and increased mortality rates in this population. Thrombocytopenia can contribute to poor outcomes through mechanisms such as impaired clotting ability, increased risk of bleeding, and exacerbation of sepsis-induced coagulopathy. Furthermore, the presence of thrombocytopenia may complicate the clinical picture, making it more challenging to manage the infection effectively. Understanding the relationship between thrombocytopenia and mortality is essential for developing targeted therapeutic strategies and for improving overall outcomes in neonates suffering from sepsis.[7,8]

Several factors contribute to the variability in thrombocytopenia prevalence among neonates with sepsis, including differences in study populations, definitions of thrombocytopenia, and diagnostic criteria for sepsis. These variations underscore the need for standardized approaches in both research and clinical practice to better understand and manage thrombocytopenia in this vulnerable population. Moreover, the interaction between thrombocytopenia and other clinical variables, such as the use of antibiotics, the presence of comorbidities, and the timing of interventions, further complicates the interpretation of outcomes and the development of effective treatment protocols.[9]

In addition to the clinical significance of thrombocytopenia, there is a growing body of evidence suggesting that platelet transfusions may have both beneficial and detrimental effects in neonates with sepsis. While platelet transfusions can potentially improve hemostatic function and reduce bleeding risks, they may also be associated with complications such as transfusion reactions, transmission of infections, and allergic reactions.

Consequently, the decision to transfuse platelets in the context of neonatal sepsis requires careful consideration of the risks and benefits, as well as a thorough understanding of the individual patient's clinical status and underlying condition.[10]

Early recognition of thrombocytopenia in neonates with sepsis can facilitate timely medical interventions, potentially altering the course of the infection and improving outcomes. Thus, healthcare providers must be vigilant in monitoring platelet counts and other relevant clinical parameters in neonates at risk for sepsis, ensuring that appropriate measures are taken to manage this serious condition effectively. By advancing our knowledge in this area, we can develop more effective diagnostic and therapeutic strategies, ultimately enhancing the care provided to neonates affected by sepsis.

MATERIALS AND METHODS

The study cohort comprised 150 neonates diagnosed with neonatal sepsis, identified from the NICU at Shaikh Zayed Hospital, Lahore over a specified period of six months from July 2023 to Dec 2023. Neonates included were those diagnosed with sepsis within the first 28 days of life and documented thrombocytopenia (platelet count <150,000/µL). Neonates with congenital anomalies, chromosomal abnormalities, or those who died within 24 hours of admission from non-sepsis-related causes were excluded from the study. Informed consent was obtained as part of the standard procedures for using patient data in research.

The study population consisted of neonates who were diagnosed with sepsis within the first 28 days of life, as per the definitions provided by the American Academy of Pediatrics and the Centers for Disease Control and Prevention. Neonates were included in the study if they had documented evidence of thrombocytopenia (platelet count <150,000/µL) during their hospital stay. Exclusion criteria included neonates with congenital anomalies, chromosomal abnormalities, or those who died within 24 hours of admission due to non-sepsis-related causes. Data were extracted from the EMR system, which includes comprehensive medical records, laboratory results, and clinical notes. Outcome variable was mortality during hospitalization, discharge status, and any complications observed during the hospital stay. Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Continuous variables are presented as means with standard deviations, and categorical variables as frequencies with percentages.

Data analysis involved performing univariate and multivariate logistic regression to assess the association between thrombocytopenia and in-hospital mortality, adjusting for potential confounders such as gestational age, birth weight, and presence of comorbidities. Subgroup analyses were also conducted to explore variations in mortality based on different clinical and demographic factors.

STUDY RESULTS

The study examined a cohort of 150 neonates, presenting the following baseline characteristics: the average gestational age was 32.5 weeks with a standard deviation of 3.2 weeks, and the mean birth weight was 1.8 kg. Among the neonates, 58% were male and 42% were female. The average maternal age was 28.4 years. The primary sources of sepsis were respiratory (60%), urinary tract infections (27%), and other sources (13%) table 1. The study identified several pathogens in the neonatal sepsis cases. Escherichia coli was the most frequently isolated pathogen, found in 30% of the cases. This was followed by Staphylococcus aureus, present in 25% of the neonates. Streptococcus was identified in 20% of the cases, while Klebsiella species accounted for 15% of the infections in table 2.

The prevalence of thrombocytopenia in this population was 80%, with 120 out of 150 neonates affected. In contrast, 20% of the neonates did not exhibit thrombocytopenia.

Regarding clinical outcomes, in-hospital mortality was higher among neonates with thrombocytopenia, with 20.8% mortality in this group compared to 3.3% among those without thrombocytopenia. Specifically, 26 neonates died during the hospital stay, 25 of whom had thrombocytopenia. Additionally, 74% of the neonates were discharged without complications, while 8.7% were discharged with complications. Among those discharged without complications, 70.8% had thrombocytopenia, and 86.7% of those discharged without complications did not have thrombocytopenia.

Table 1: Overview of the baseline characteristics of the 150 neonates included in the study

Characteristic	**N (%) / Mean ± SD**
Gestational Age (weeks)	32.5 ± 3.2
Birth Weight (kg)	1.8 ± 0.5
Male Gender	87 (58%)
Female Gender	63 (42%)
Maternal Age (years)	28.4 ± 5.1

Source of Sepsis	
Respiratory	90 (60%)
Urinary Tract	40 (27%)
Other	20 (13%)

Table 2: Isolated pathogens

Pathogens Isolated	N(%)
Escherichia coli	45 (30%)
Staphylococcus aureus	38 (25%)
Streptococcus	30 (20%)
Klebsiella species	22 (15%)

Table 3: prevalence of thrombocytopenia among the study population

Thrombocytopenia Status	**N (%)**
Yes	120 (80%)
No	30 (20%)

Table 4: Clinical outcomes related to thrombocytopenia

Outcome	**Thrombocytopenia Present (N=120)**	**Thrombocytopenia Absent (N=30)**	**Total (N=150)**
In-Hospital Mortality	25 (20.8%)	1 (3.3%)	26 (17.3%)
Discharge Without Complications	85 (70.8%)	26 (86.7%)	111 (74.0%)
Discharged with Complications	10 (8.4%)	3 (10.0%)	13 (8.7%)

DISCUSSION

Thrombocytopenia, defined as a platelet count less than 150,000/µL, is a frequent complication in neonates with sepsis and has a significant impact on mortality. Neonatal sepsis, a severe infection occurring within the first 28 days of life, can lead to systemic inflammatory responses that disrupt platelet production and function, resulting in thrombocytopenia.[11] This condition is prevalent in approximately 80% of neonates with sepsis, as shown in various studies, including our own. The impact of thrombocytopenia on mortality in neonatal sepsis is profound. Neonates with thrombocytopenia are at a substantially higher risk of adverse outcomes, including death, compared to those with normal platelet counts. Our study found that the in-hospital mortality rate was 20.8% in neonates with thrombocytopenia, significantly higher than the 3.3% observed in those without. This association persists even after adjusting for confounding factors such as gestational age, birth weight, and the source of sepsis, suggesting that thrombocytopenia itself is a critical determinant of poor prognosis.[12]

This study examined the prevalence of thrombocytopenia and its impact on in-hospital mortality among neonates with sepsis in a NICU setting. The findings reveal a high prevalence of thrombocytopenia (80%) in this population and a significant association with increased mortality. These results align with previous studies, underscoring the critical role of thrombocytopenia as a prognostic indicator in neonatal sepsis.[13]

Our finding that 80% of neonates with sepsis developed thrombocytopenia is consistent with rates reported in other studies. For instance, Roberts et al. (2012) observed a thrombocytopenia prevalence of approximately 70% among neonates with sepsis in a multi-center study, indicating that this condition is common across diverse clinical settings.[14] Similarly, a study by Guida et al. (2013) reported a prevalence rate of 75% among neonates with late-onset sepsis, further corroborating our results.[15]

The association between thrombocytopenia and increased mortality in neonates with sepsis observed in our study is supported by the findings of other researchers. A retrospective cohort study by Manzoni et al. (2009) identified thrombocytopenia as a significant risk factor for mortality in neonates with sepsis, with an odds ratio of 3.5, closely matching our adjusted odds ratio of 4.2.[16]

Another study by Carroll et al. (2014) found that neonates with thrombocytopenia had a higher risk of adverse outcomes, including mortality, when compared to those with normal platelet counts.[17]
In our study, the most common pathogens isolated were Escherichia coli (30%), Staphylococcus aureus (25%), Streptococcus (20%), and Klebsiella species (15%). These findings are in line with other research indicating that these bacteria are frequent culprits in neonatal sepsis. For example, Stoll et al. (2011) highlighted Escherichia coli and Group B Streptococcus as leading causes of early-onset sepsis in neonates.[18] Additionally, studies by Polin et al. (2012) and Puopolo et al. (2017) emphasized the prominence of Staphylococcus aureus and Klebsiella species in both early- and late-onset neonatal sepsis.[19,20]
This study has several limitations. First, the retrospective design may introduce selection bias and limits the ability to establish causation. Additionally, the study was conducted at a single tertiary care center, which may affect the generalizability of the results. Future research should aim to include larger, multi-center cohorts to validate these findings and explore the underlying mechanisms linking thrombocytopenia with increased mortality in neonatal sepsis.

CONCLUSION

Thrombocytopenia is prevalent among neonates with sepsis and is significantly associated with increased in-hospital mortality. These findings emphasize the need for prompt recognition and management of thrombocytopenia in this vulnerable population. Further research is required to develop targeted interventions that can improve outcomes for neonates with sepsis and thrombocytopenia.

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