

Platelet Count and Platelet Indices in Neonatal Sepsis

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Abstract:**Background:** Neonatal sepsis is a significant cause of morbidity and mortality in newborns, particularly in low-resource settings. Early and accurate diagnosis is crucial for improving outcomes, but clinical signs are often non-specific. Platelet count and platelet indices, such as mean platelet volume (MPV) and platelet distribution width (PDW), have been suggested as potential biomarkers for neonatal sepsis.**Aim and Objectives:** This study aimed to evaluate the role of platelet count and platelet indices (MPV and PDW) as diagnostic markers in neonatal sepsis.**Materials and Methods:** A prospective observational study was conducted in the NICU of a tertiary care hospital in South India. The study included 50 neonates with clinical features of sepsis. Platelet count, MPV, and PDW were measured and compared between sepsis cases and a control group of non-septic neonates. Statistical analysis was performed to assess the significance of differences in these parameters between the two groups.**Results:** The study found that neonates with confirmed sepsis had significantly lower platelet counts and higher MPV and PDW compared to the control group ($p < 0.05$). Thrombocytopenia was observed in 66% of the sepsis cases. MPV was elevated in 62% of sepsis cases, and PDW was increased in 68% of cases. These findings suggest a strong association between altered platelet indices and the incidence of neonatal sepsis.**Conclusion:** Platelet count and platelet indices, particularly MPV and PDW, are significant predictors of neonatal sepsis and can be valuable diagnostic tools in NICU settings. Their routine assessment may facilitate earlier diagnosis and targeted treatment, especially in resource-limited settings.**Keywords:** Neonatal Sepsis, Platelet Indices, Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), Platelet Count.

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Introduction

Neonatal sepsis is a significant cause of morbidity and mortality in newborns, especially in developing countries. It is a systemic infection that occurs in neonates and is characterized by a widespread inflammatory response, which can progress to septic shock, multi-organ failure, and death if not promptly treated.

Early diagnosis and management of neonatal sepsis are critical to improving outcomes, but the clinical presentation is often nonspecific, making early diagnosis challenging. One of the potential markers for neonatal sepsis is the alteration in platelet count and platelet indices. Platelets play a crucial role in hemostasis, inflammation, and immune responses, which are vital processes in the pathophysiology of sepsis. During sepsis, various factors such as disseminated intravascular coagulation (DIC), bone marrow suppression, and increased platelet

destruction can lead to thrombocytopenia and changes in platelet indices, including mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT). These changes can serve as potential biomarkers for the early diagnosis and prognosis of neonatal sepsis. Several studies have reported a correlation between thrombocytopenia and neonatal sepsis, with platelet count and indices being associated with the severity and outcome of the infection.

However, the utility of these parameters as reliable biomarkers for neonatal sepsis is still under investigation, with varying results reported in the literature. This study aims to assess the platelet count and platelet indices in neonates with sepsis, comparing them to healthy neonates to evaluate their potential role as diagnostic and prognostic markers.

Materials and Method

This study was conducted as a prospective, observational study over a period of six months in the neonatal intensive care unit (NICU) of a tertiary care hospital.

The study included 50 neonates admitted to the NICU who were diagnosed with sepsis based on clinical and laboratory criteria.

Inclusion Criteria

1. Neonates aged 0–28 days
2. Neonates Clinical signs of sepsis and positive blood cultures.

Exclusion Criteria

1. Neonates with congenital anomalies,
2. With co-existing conditions that could affect platelet count (e.g., hematological disorders),
3. Those who had received platelet transfusions prior to blood sample collection.

Study Population

The study population consisted of two groups:

1. **Sepsis Group:** 50 Neonates diagnosed with sepsis based on clinical signs and confirmed by positive blood cultures.
2. **Control Group:** 50 Age- and sex-matched healthy neonates with no signs of infection, admitted to the NICU for observation or other non-infectious conditions.

Method

For each neonate, detailed clinical data were recorded, including gestational age, gender, type of

pregnancy. Blood samples were collected at the time of sepsis evaluation for the sepsis group and at the time of routine blood sampling for the control group.

Laboratory Analysis: The platelet count and platelet indices (MPV, PDW, and PCT) were measured using an automated hematology analyzer. Blood cultures were obtained before the initiation of antibiotic therapy to confirm the diagnosis of sepsis. Other laboratory parameters, including C-reactive protein (CRP) and white blood cell (WBC) count, were also measured as part of the sepsis workup.

Statistical Analysis: Data were analyzed using appropriate statistical methods. Continuous variables were expressed as mean \pm standard deviation (SD) or median (interquartile range), while categorical variables were expressed as frequencies and percentages.

The comparison between the sepsis and control groups was performed using the Student's t-test for continuous variables and the Chi-square test for categorical variables. A p-value of <0.05 was considered statistically significant. All analyses were performed using statistical software such as SPSS version 25

Observation and Results

The study included 50 neonates admitted to the NICU who were diagnosed with sepsis based on clinical and laboratory criteria and 50 healthy neonates, their observation as given bellow.

Table 1: Demographic Profile of study populations

Parameter	Cases (n=50)	Control (n=50)	Chi-square/t-test	p-value
Age (Days)				
Mean \pm SD	8.76 \pm 3.24	9.61 \pm 3.88	1.18	0.237
Gender				
Male	28	30	0.164	0.684
Female	22	20		
Pregnancy				
Preterm	8	10	0	1
Term	32	40		

Table 2: Distribution of platelet Indices between the groups

Platelet Indices	Cases(n=50)	Control (n=50)	Chi-square/t-test	p-value
Platelet counts				
< 1.5 Lacs/mm ³	33(66%)	14(28%)	14.49	0.00014
≥ 1.5 Lacs/mm ³	17(34%)	36(72%)		
MPV				
> 10.8 fl	31(62%)	16(32%)	9.03	0.0026
≤ 10.8 fl	19(38%)	34(68%)		
PDW				
> 19.1 fl	34(68%)	13(26%)	17.17	0.000026
≤ 19.1 fl	16(32%)	37(74%)		

Table 3: Mean Distribution of platelet Indices between the groups

Platelet Indices	Cases(n=50)	Control (n=50)	t-test	p-value
Platelet counts				
Mean \pm SD	1.01 \pm 0.42	2.63 \pm 0.72	13.74	0.0001
MPV				
Mean \pm SD	12.36 \pm 1.94	8.36 \pm 2.81	8.23	0.0001
PDW				
Mean \pm SD	19.45 \pm 2.63	16.37 \pm 1.27	7.45	0.0001

Discussion

Neonatal sepsis is a prevalent and often fatal complication. This study examined the significance of platelet indices, including platelet count, mean platelet volume (MPV), and platelet distribution width (PDW), in predicting neonatal sepsis within a tertiary care referral hospital in South India. The challenge of diagnosing neonatal sepsis lies in the non-specific nature of its clinical signs, necessitating reliance on diagnostic investigations. Blood cultures are considered the gold standard for diagnosing neonatal sepsis; however, their utility is limited due to delayed results and low positivity rates [1].

In this study conducted in the Neonatal Intensive Care Unit (NICU), 50 neonates presenting with clinical features of sepsis were evaluated to assess the diagnostic potential of platelet count and indices. The study aimed to identify variations in platelet indices in cases of neonatal sepsis. Results showed that the platelet count was significantly lower in the sepsis group compared to the control group ($p < 0.05$).

Thrombocytopenia was observed in 66% of the neonates with sepsis, consistent with findings from Arif et al (83.5%) and Choudhary et al (81.2%) [2,3]. Thrombocytopenia is commonly observed in critically ill patients and is associated with increased mortality. Bhat et al reported that 66.25% of neonates with sepsis developed thrombocytopenia [4]. Additionally, Ahmed et al found a higher mortality rate among children with thrombocytopenia, with a prevalence of 24.7% in neonatal sepsis [5].

In this study, analysis of demographic variables revealed no significant differences between cases and controls. MPV significantly differed between the two groups ($P < 0.0001$), indicating that an increase in MPV is more common in sepsis cases than in controls. MPV was elevated in 62% of sepsis cases, a much higher rate than the 27.8% reported by Abdulla et al [6]. The mean MPV among cases was 12.36 \pm 1.94. The study also demonstrated a significant increase in PDW in sepsis cases compared to controls. PDW was elevated in 68% of sepsis cases, which is notably higher than the 38% reported in other studies. These findings are consistent with studies by Meena et al and Mittal et al [7,8]. Mittal et al also

found that a higher number of neonates with culture-positive sepsis exhibited thrombocytopenia, as well as elevated MPV and PDW [8].

The study concluded that a decreased platelet count was associated with increased MPV in cases of septicemia, similar to observations by Nelson and Kehlet al and Becchi et al, who noted the prognostic value of MPV in early-stage sepsis [9,10]. Increased PDW was also observed in septic neonates, in line with findings from Guclu et al and Patrick et al, who reported significant PDW increases in bacteremia cases [11,12].

Multiple studies have emphasized the importance of platelet indices in diagnosing neonatal sepsis. The significant correlation between thrombocytopenia and neonatal sepsis suggests that platelet count and indices could be valuable diagnostic and prognostic tools for neonatal sepsis. Routine assessment of these indices in suspected cases may facilitate earlier diagnosis and more targeted treatment, potentially improving outcomes.

Conclusion

Based on our results and comparison with other studies, we can conclude that commonly used platelet indices (platelet count, MPV, and PDW) are significant predictors of neonatal sepsis in NICU settings. Neonates with confirmed sepsis exhibited severe thrombocytopenia and elevated MPV and PDW, indicating a poor prognosis. Given that platelet count and indices are easily assessable hematologic parameters, they can serve as valuable tools for diagnosing neonatal sepsis, particularly in remote and resource-limited areas.

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