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Role of Platelet Indices in The Diagnosis and Assessment of Severity of Neonatal Sepsis

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Abstract

Background: In this context, the present study, entitled "Role of Platelet Indices in the Diagnosis and Assessment of Severity of Neonatal Sepsis," is proposed to evaluate platelet count and selected platelet indices in neonates with suspected or confirmed sepsis. The study aims to examine the alterations in these parameters, determine their association with the presence of neonatal sepsis, and assess their relationship with clinical severity. The findings may contribute to a better understanding of the utility and limitations of platelet indices as readily available, cost-effective adjuncts in the early evaluation and monitoring of neonatal sepsis.

Methods: This prospective observational study was conducted on 100 consecutive neonates (both inborn and out born), with clinical signs and symptoms of sepsis along with either positive culture (confirmed neonatal sepsis) or other laboratory findings suggestive of bacterial and fungal infection in absence of positive cultures (probable sepsis), were included after written informed consent from parents.

Results: 71 (71.00%) out of 100 cases had increased values of Platelet Distribution Width. In Proven sepsis group 31(86.11%) cases had increased values of PDW, in Probable sepsis 31(63.27%) and in No sepsis group 9(60.00%**)** cases were having increased values of PDW. This difference was statistically not significant (P value is 0.08).

Conclusion: Platelet count and platelet indices may serve as useful, readily available, and cost-effective adjuncts in the diagnosis and assessment of the severity of neonatal sepsis. Neonates with sepsis may exhibit thrombocytopenia and alterations in mean platelet

volume (MPV) and platelet distribution width (PDW). Evaluation of these parameters as part of a routine complete blood count may provide additional information regarding haematological changes associated with neonatal sepsis. Their relationship with clinical severity may also help identify neonates who require closer monitoring. However, platelet count and platelet indices lack sufficient specificity to establish the diagnosis of neonatal sepsis independently, and their interpretation should take into account gestational age, birth weight, associated conditions, and laboratory-related factors. Therefore, platelet indices may be considered supplementary tools alongside clinical assessment, blood culture, and other relevant laboratory investigations. Further well-designed studies are required to establish their diagnostic accuracy, prognostic value, and appropriate clinical cut-off values in different neonatal populations.

Keywords: Sepsis, TPC, MPV, PDW.

Introduction

Neonatal sepsis is a major cause of morbidity and mortality among newborns, particularly in developing countries. It is a systemic infection occurring during the neonatal period, usually defined as the first 28 days of life. It may result from bacterial, viral, or fungal infections and can progress rapidly to severe illness, multiorgan dysfunction, and death if not diagnosed and treated promptly. Despite advances in neonatal intensive care, antimicrobial therapy, and supportive management, neonatal sepsis remains a significant public health concern, especially among preterm and low-birth-weight infants.[1]

The clinical presentation of neonatal sepsis is often nonspecific and may include poor feeding, lethargy, temperature instability, respiratory distress, apnea, and circulatory disturbances. These manifestations may overlap with those of several noninfectious neonatal conditions, making early diagnosis challenging. Blood culture remains an important method for confirming bacterial sepsis; however, its diagnostic utility may be limited by low blood volume, prior antibiotic administration, delayed reporting, and variable culture positivity. Therefore, laboratory parameters that are readily available, inexpensive, and capable of supporting early clinical decision-making are of considerable importance in the management of neonatal sepsis.[2-3]

Platelets play an important role in primary haemostasis, vascular integrity, inflammation, and immune responses. In addition to their function in blood clot formation, platelets participate in interactions with leukocytes and endothelial cells and contribute to the host response during infection. During neonatal sepsis, inflammatory mediators, endothelial injury, platelet activation, increased platelet consumption, and disturbances in platelet production may result in quantitative and qualitative changes in circulating platelets. These alterations may be reflected in platelet count and platelet indices, which can be measured as part of a routine complete blood count.[4-5]

In this context, the present study, entitled “Role of Platelet Indices in the Diagnosis and Assessment of Severity of Neonatal Sepsis,” is proposed to evaluate platelet count and selected platelet indices in neonates with suspected or confirmed sepsis. The study aims to examine the alterations in these parameters, determine their association with the presence of neonatal sepsis, and assess their relationship with clinical severity. The findings may contribute to a better understanding of the utility and limitations of platelet indices as readily

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available, cost-effective adjuncts in the early evaluation and monitoring of neonatal sepsis.

Materials and Methods

This prospective observational study was conducted on 100 consecutive neonates (both inborn and out born) with clinical signs and symptoms of sepsis along with either positive culture (confirmed neonatal sepsis) or other laboratory findings suggestive of bacterial and fungal infection without positive culture (probable sepsis) were included after taking written informed consent from parents.

Inclusion criteria:

1. All neonates (<28 days) with symptoms and signs of sepsis like poor feeding, lethargy, tachypnea, hypothermia, convulsion etc. along with either positive culture or other laboratory findings (C-reactive protein and CSF culture positive) suggestive of bacterial or fungal infection without positive culture.
2. Neonates of mother with predisposing factors were included in the study.

Exclusion criteria:

1. Neonates with congenital anomalies, Hypoxic ischemic encephalopathy, Hyaline membrane disease, congenital heart disease.
2. All newborns with neonatal hyperbilirubinemia due to causes other than sepsis like physiological jaundice, Rh, ABO incompatibility, TTN, MAS without clinical or laboratory suspicion of sepsis.
3. Congenital and acquired causes of thrombocytopenia other than sepsis.
4. Babies without parental consent.
5. PIH and pre-eclampsia in mother.
6. Familial causes of thrombocytopenia (Storage disorders).

Statistical Analysis

The quantitative parameters such as age, platelet indices, mean and median were computed, and standard deviation was estimated as a measure of variation. The platelet count was grouped into mild, moderate and severe degree. Frequencies were expressed in percentages. The differences in quantitative variables between groups were assessed by means of the unpaired t test. ANOVA was used to assess the quantitative variables. The chi square test was used to assess the differences in categorical variables between groups. A p value of <0.05 using a two-tailed test was taken as being of significance for all statistical tests. All data were analyzed with a statistical software package. (SPSS, version 21.0 for windows)

Results

Table 1: General feature of study subjects

Age (days)	3.1±0.92 days
Male: female	59: 41
Birth weight	2.59±0.29 Kg

Table 2: Sepsis in relation to platelet count of study subjects

Platelet count	Proven sepsis		Probable sepsis		No sepsis	
	N	%	N	%	N	%
Normal	4	11.11	9	18.37	4	26.67
Mild thrombocytopenia	9	25.00	21	42.86	5	33.33

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Moderate thrombocytopenia	11	30.55	9	18.37	3	20.00
Severe thrombocytopenia	12	33.33	10	20.41	3	20.00
Total	36	100	49	100	15	100

P = 0.126 (NS)

Table 2 shows that out of 100 cases 83(83.00%) had thrombocytopenia, out of which 35(35.00%) had mild degree of thrombocytopenia, 23(23.00%) had moderate degree of thrombocytopenia and 25(25.00%) neonates had severe degree of thrombocytopenia.

Table 3: Sepsis in relation to MPV (fl)

MPV (fl)	Proven sepsis		Probable sepsis		No sepsis	
	N	%	N	%	N	%
≤10.8	3	8.33	9	18.37	7	46.67
> 10.8	33	91.67	40	81.63	8	53.33
Total	36	100	49	100	15	100

P = 0.01 (S)

Table 3 shows that 81(81.00%) out of 100 cases had increased values of Mean Platelet Volume. In sepsis proven group 33 (91.67%) cases had increased values of MPV. In probable sepsis 40(81.63%) and in no sepsis group 8(53.33%) cases had increased values of MPV. This difference was statistically significant (P value is 0.01).

Table 4: Sepsis in relation to PDW (fl)

PDW (fl)	Proven sepsis		Probable sepsis		No sepsis	
	N	%	N	%	N	%
≤19.1	5	13.89	18	36.73	6	40.00
> 19.1	31	86.11	31	63.27	9	60.00
Total	36	100	49	100	15	100

P = 0.08 (NS)

Table 4 shows that 71 (71.00%) out of 100 cases had increased values of Platelet Distribution Width. In Proven sepsis group 31(86.11%) cases had increased values of PDW, in Probable sepsis 31(63.27%) and in No sepsis group 9(60.00%**)** cases were having increased values of PDW. This difference was statistically not significant (P value is 0.08).

Discussion

Sepsis is the commonest cause of neonatal mortality and is probably responsible for 30 to 50% of total neonatal deaths each year in developing countries. One of the most difficult tasks faced by the neonatologist is to clinically differentiate between septicemic and non septicemic cases. This is because several conditions like birth asphyxia, hypoglycemia, hypothermia, prematurity and intracranial haemorrhage have clinical features similar to septicemia.

The gold standard for diagnosis of neonatal sepsis is a positive blood culture which requires a minimum period of 48-72 hours and yields positive results in 25-70% of cases. [6]

In our study 81(81.00%) out of 100 cases had increased values of Mean Platelet Volume. In sepsis proven group

33 (91.67%) cases had increased values of MPV. In probable sepsis 40(81.63%) and in no sepsis group 8(53.33%) cases had increased values of MPV. This difference was statistically significant (P value is 0.01). 71 (71.00%) out of 100 cases had increased values of Platelet Distribution Width. In Proven sepsis group 31(86.11%) cases had increased values of PDW, in Probable sepsis 31(63.27%) and in No sepsis group 9(60.00%**)** cases were having increased values of PDW. This difference was statistically not significant (P value is 0.08). It was in concordance with the study by Ishwar et al[7] in which 84.6% cases of Sepsis proven and 59% cases of No sepsis group had increased values of MPV. Similar results were found in study by Ishwar et al[7] where increased values of PDW were found in 79% cases of Sepsis proven group and 63% cases of non-sepsis group.

Conclusion

Platelet count and platelet indices may serve as useful, readily available, and cost-effective adjuncts in the diagnosis and assessment of the severity of neonatal sepsis. Neonates with sepsis may exhibit thrombocytopenia and alterations in mean platelet volume (MPV) and platelet distribution width (PDW). Evaluation of these parameters as part of a routine complete blood count may provide additional information regarding haematological changes associated with neonatal sepsis. Their relationship with clinical severity may also help identify neonates who require closer monitoring. However, platelet count and platelet indices lack sufficient specificity to establish the diagnosis of neonatal sepsis independently, and their interpretation should take into account gestational age, birth weight, associated conditions, and laboratory-related factors. Therefore, platelet indices may be considered supplementary tools alongside clinical assessment, blood culture, and other relevant laboratory investigations. Further well-designed studies are required to establish their diagnostic accuracy, prognostic value, and appropriate clinical cut-off values in different neonatal populations

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