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ORIGINAL RESEARCH

Evaluation of platelets and platelet indices as a diagnostic tool in neonatal sepsis

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ABSTRACT

Introduction: Neonatal sepsis is the one of the most important and a major cause of neonatal morbidity and mortality. Thrombocytopenia is a common manifestation in neonatal sepsis. Platelet indices change can be an early sign of sepsis and may correlate with its severity.

Aims & Objectives: The aim of the study was to evaluate thrombocytopenia and variations in platelet indicesin neonatal sepsis.

Materials and Methods: This cross-sectional observational research study was carried out at neonatal intensive care unit ofAdesh Medical College and Hospital, Shahbad.All neonates (<28 days) with clinically diagnosed neonatal sepsis were included except those who fell into exclusion criteria. Statistical tests (chi square, t-test) were applied using SPSS (Statistical Package for Social Sciences) version 21.0 software.

Results: Out of 54 cases of neonatal sepsis with thrombocytopenia,Gam positive organisms associated with thrombocytopenia comprises of 40% cases whereas gram negative organisms associated with thrombocytopenia in 60% cases. 31 out of 54 cases (58%) with neonatal sepsis had increased values of MPV and 39 out of 54 cases (73%) with sepsis had increased values of PDW (73%).8 out of 39 cases with increased PDW values showed severe degree of thrombocytopenia.

Conclusions: Thrombocytopenia,high PDW and high MPV are more associated with neonatal sepsis. So, platelet and its indices may be used as a sensitive marker to identify neonatal sepsis.

Key words: Thrombocytopenia, platelet indices, neonatal sepsis

INTRODUCTION

Neonatal sepsis is the one of the most important anda major cause of neonatal morbidity and mortality[1].In India, the risk of neonatal sepsis is 11.5-24/1000 live births although, in advanced nations, the occurrence is in 1-5/1000 live births[2,3]. The case fatality rate of sepsis among neonates in India ranges from 25% to 65%[4].Hematological changes induced by neonatal sepsis like total leucocyte count (TLC), absolute neutrophil count, peripheral smear for band cells, Micro ESR, CRP (C reactive protein) have been used to make an early diagnosis. Sepsis screen will be considered positive if 2 or more parameters are positive[5].

Platelet count and indices such as MPV and PDW have emerged as potential diagnostic tools. Thrombocytopenia is a common manifestation in neonatal sepsis which has been linked to a higher risk of morbidity and mortality in newborns. Platelet indices change can be an early sign of sepsis and may correlate with its severity. A higher MPV has been associated with bacterial infections and a higher PDW has been shown to increase in the presence of infection and inflammation[6,7]. The aim of the study was to evaluate thrombocytopenia and variations in platelet indices in neonatal sepsis.

MATERIAL AND METHODS

This cross-sectional observational research study was carried out at neonatal intensive care unit of Adesh Medical College and Hospital, Shahbad after taking written informed consent from the parents and ethical clearance from the institutional ethics committee. Inclusion criteria were all neonates (<28 days) with clinically diagnosed cases of neonatal sepsis with symptoms and signs like refusal of feeds, irritability,

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fever, hypothermia, vomiting, abdominal distension, respiratory distress, seizures. Exclusion Criteria were severe birth asphyxia, presence of congenital anomaly, suspected metabolic disorder, Congenital and acquired platelet disorders, babies of mothers on anticonvulsants and aspirin and refusal of parental consent. The data were entered in Microsoft excel sheet. Statistical tests (chi square, t-test) were applied using SPSS (Statistical Package for Social Sciences) version 21.0 software.

RESULTS

The present study was conducted on total 120 neonates (0-28 days) with sepsis and positive blood culture for microorganisms. In our study, out of 120 neonates with sepsis; Coagulase negative Staphylococci was isolated in 59 cases, Klebsiella pneumoniae in 32 cases, Acinetobacter species in 9 cases, Enterococcus faecium in 8 cases, Pseudomonas aeruginosain 6 cases, Candidain 5 cases and Proteus Mirabilis was isolated in 1 case (table 1).

Table 1: Blood culture isolates

Organisms isolated	Number of cases	%
Coagulase negative Staphylococci	59	49%
Klebsiella pneumoniae	32	26%
Acinetobacter Species	9	8%
Enterococcus Faecium	8	7%
Pseudomonas aeruginosa	6	5%
Candida	5	4%
Proteus Mirabilis	1	1%
Total	129	100%

PLATELET COUNT

Neonates with platelet count < 150 x 10^3 /uL were identified as having thrombocytopenia. The degree of thrombocytopenia observed in present study was shown on table 2.

Table 2: Degree of thrombocytopenia

Platelet count-Degree of thrombocytopenia	No of Neonates
Mild((100-150x10^3/uL)	22
Moderate (50-100x10^3 /uL)	20
Severe (>50 x 10^3/uL)	12
Total	54

Out of 120 cases with sepsis; 54 neonates had thrombocytopenia and out of 54 neonates 22 had mild degree thrombocytopenia, 20 had moderate degree thrombocytopenia, 12 had severe degree thrombocytopenia. The degree of thrombocytopenia varied with different organisms isolated in blood culture is shown in Table.3

Table 3: Degree of thrombocytopenia with different

Organisms	Degree of thrombocytopenia			Total cases (%)
	Mild	Moderate	Severe	
Gram positive organisms				
Coagulase negative Staphylococci	9	9	3	21 (39%)
Enterococcus Faecium	1	0	0	1 (2%)
Total				22 (40%)
Gram negative organisms				
Klebsiella pneumoniae	10	10	8	28 (51%)
Acinetobacter Species	0	1	0	1 (2%)
Pseudomonas aeruginosa	3	0	0	3 (6%)
Total				32 (60%)

Gram positive organisms associated with thrombocytopenia comprises of 40% cases whereas gram negative organisms associated with thrombocytopenia in 60% cases. This shows thrombocytopenia is more commonly seen in gram negative septicemia than gram positive septicemia.

PLATELET INDICES VARIATION

In our study we correlated degree of thrombocytopenia with MPV as shown in table 4.

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Table 4: Correlation of degree of thrombocytopenia & MPV (mean platelet volume)

	MPV	
	Increased	**Normal/Decreased**
Mild (100-150x10^3/uL)	13 (60%)	9 (40%)
Moderate (50-100x10^3/uL)	11(56%)	9(44%)
Severe (<50 X 10^3/uL)	7(60%)	5(40%)
Total	31 (58%)	23 (42%)

31 out of 54 cases with sepsis had increased values of MPV (58%). 7 out of 31 cases with increased MPV values showed severe degree of thrombocytopenia.

In our study we also correlated degree of thrombocytopenia with PDW as shown in Table.5

Table 5: Correlation of degree of thrombocytopenia & PDW (platelet distribution width)

		PDW
	Increased	**Decreased**
Mild(100-150x10^3/uL)	17 (75%)	5(25%)
Moderate (50-100x10^3/uL)	14(72%)	6(28%)
Severe (< 50x103/uL)	8(70%)	4(27%)
Total	39(73%)	15(27%)

39 out of 54 cases with sepsis had increased values of PDW (73%).8 out of 39 cases with increased PDW values showed severe degree of thrombocytopenia.

DISCUSSION

Neonatal sepsis continues to remain a leading cause of morbidity and mortality among infants, especially in middle and lower-income countries. In our study among the neonates with gram negative sepsis, Klebseilla pneumoniae was most common cultured organism and in gram positive sepsis, Coagulase negative staphylococcus. A study done byPoonam *et al*. from Northern India observed in their research that among 22363 live births in the study hospital, 883 were screened for sepsis, and out of 883 screenings, 167 (18%) were identified with neonatal sepsis (7.5/1000 live birth)[7] which is similar to our study.

In a study from Tanzania by Kayange *et al*. in the year 2010, the authors reported 300 neonatal sepsis cases out of which positive blood culture reports were observed in 57 (19%) of the neonates while 81% showed negative blood culture reports. Amongst the 57 cases of sepsis, authors reported 121 (40%) with EOS and 179 (60%) with LOS respectively[8].

A study from Pune, India by Misra *et al*. reported 115 cases of clinical neonatal sepsis out of which 75 (65.2%) as culture-positive and 40 (35%) as blood culture-negative respectively[9].

Another study from Karnataka, India by Narayanakar *et al*. in the year 2019 reported 34 neonatal sepsis cases out of which, blood culture was positive in 21 (61.76%) of cases and blood culture-negative in 13 (38.23%)[10].

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In present study, 120 cases of neonatal sepsis are evaluated. The current study was undertaken to evaluate thrombocytopenia and platelet indices variation in neonatal septicaemia and to look into various haematological parameters both individually and in combination as a part of sepsis screening.

There have been studies showing the significant changes in platelet count and platelet indices in patients with neonatal sepsis. These parameters may increase the sensitivity and specificity of the existing sepsis screen when combined with it. It has been seen that platelet count decreases and MPV&PDW increases in neonates with sepsis. High MPV&PDW show more specificity for detecting septicemia (95% and 79% respectively) and have good negative predictive value[12].

Thrombocytopenia commonly accompanies systemic infection in neonates. Initial changes occur in leucocytes, this is soon followed by a drop in platelet count. In Our study out of total sepsis positive cases, thrombocytopenia presented in 48% cases and in mild, moderate and severe thrombocytopenia presented in 18%, 20% and 10% respectively. In neonatal sepsis variation in platelet indices i.e. high MPV and high PDW.

In the sepsis there is decreased platelet count and young platelets which are bigger and more active enter the circulation and hence MPV is increased. Increased MPV indicates increased platelet diameter. Therefore, increased MPV is useful clinically as a marker of production rate and platelet activation[13].In Present study elevation in Platelet indices seen in neonatal sepsis proven cases which is correlated and compared with other study. In our study elevation in MPV seen in 54.47% cases.

PDW is an indicator of volume variability in platelets size and reflects the heterogeneity in platelet morphology[14].PDW is increased in sepsis and it is useful indicator for diagnosis of neonatal sepsis. In our study elevation PDW seen in 72.9% cases.

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CONCLUSION

There is correlation of high MPV and PDW with thrombocytopenia in neonatal sepsis. Thus, platelet count and platelet indices may be used as diagnostic and prognostic biomarkers for neonatal sepsis.

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