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A PROSPECTIVE OBSERVATIONAL STUDY FOR RELATIONSHIP BETWEEN THROMBOCYTOPENIA AND CULTURE POSITIVE NEONATAL BACTERIAL SEPSIS

Dr. Anita Devi, Dr. Rakesh Kumar Sharma[2], Dr. Kapil Kumar[3]
[1-3] IIIrd Year Resident Doctor, Department of Pediatric, Jhalwar Medical College, Jhalawar, Rajasthan.

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Corresponding author: Dr. Rakesh Kumar Sharma
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Abstract

Background: Changes in Platelet parameters like Mean Platelet Volume and Platelet Distribution Width are helpful in diagnosis of neonatal sepsis but these indices have not been extensively studied in neonatal sepsis. Hence, the present study is undertaken to evaluate Platelet count and platelet indices in diagnosis of neonatal sepsis.

Methods: This prospective observational study was conducted over a period of 4 months i.e from December 2019 to March 2020 in neonatal intensive care unit of Jhalawar Medical College & Attached Hospitals, Jhalawar. During the study period 154 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: Out of total (154), 81.8%, 76% and 67.5% of cases had thrombocytopenia, raised MPV (>10.8) and raised PDW respectively. As compared to Non-sepsis group, MPV values were raised in more cases of Sepsis proven group (88%) and the difference was statistically significant with P value of 0.011. PDW values were also more increased in Sepsis proven group compared to Non-sepsis group.

Conclusion: Platelet count and platelet indices, which are easily available hematological parameters in remote & resource poor areas of our country, should be taken into consideration for suspected cases of neonatal sepsis so that prompt treatment can be given, and morbidity and mortality can be reduced.

Keywords: Sepsis, CRP, MPV, PDW.

Introduction

Sepsis in newborn continues to be serious problem leading to significant amount of morbidity and mortiality[1.] The inability of neonates to completely suppress the minimum inflammatory response makes them more susceptible to bacterial invasion of the blood stream than older adults and the risks are even higher in preterm infants[2].

Quantification of acute phase proteins, cytokines, and cell surface antigens and bacterial genomes have been used, either alone or in combination, for early diagnosis of neonatal sepsis. Some of these markers are sensitive and specific but sophisticated or expensive so impractical for developing countries like ours[3].

This life-threatening condition is treatable if diagnosed early but unfortunately, the early signs and symptoms are often non-reliable and confusing which makes it difficult to establish an early clinical diagnosis.

Thrombocytopenia is used as an early but non-specific marker of sepsis in neonates. Platelet size can be analyzed using Mean Platelet Volume and Platelet Distribution Width, and it correlates with platelet activity. High MPV indicates an increased quantity of young platelets in the circulation[3]. In neonatal period, MPV ranges from 10-12fl[4]. There are high MPV levels in destructive thrombocytopenia and low MPV levels in hypo-proliferative thrombocytopenia. Platelet distribution width (PDW) is an indicator of variation in platelet size. Normal values of PDW are between 10 % and 17.9 %[5].

Changes in Platelet parameters like Mean Platelet Volume and Platelet Distribution Width are helpful in diagnosis of neonatal sepsis but these indices have not been extensively studied in neonatal sepsis. Hence the present study is undertaken to evaluate platelet count and platelet indices in diagnosis of neonatal sepsis.

Materials and Methods

This prospective observational study was conducted over a period of 4 months i.e from Dec. 2019 to March 2020 in neonatal intensive care unit of Jhalawar Medical College & Attached Hospitals, Jhalawar. During the study period 154 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: Age and Gender distribution of study subjects

Age (days)	Female		Male		Total	
	N	%	N	%	N	%
0 – 3 days	27	40.29	41	47.12	68	44.15
4 – 28days	40	59.7	46	52.9	86	55.8
Total	67	100	87	100	154	100

Chi-square = 0.716 with 2 degrees of freedom; P = 0.699 (NS)

Table 1 shows that Out of 68 neonates of EOS, 41(47.3%) were male and 27(40.3%) were female. Out of 86 cases of LOS, 46(52.9%) were male and 40(59.7%) were female. This difference was statistically not significant. (P value is 0.699)

Table 2: Sepsis in relation to birth weight of study subjects

Birth weight (Kg)	Proven sepsis		Probable sepsis		No sepsis	
	N	%	N	%	N	%
<2.5 Kg	44	88	43	62.3	18	51.4
≥2.5 Kg	6	12	26	37.7	17	48.6
Total	50	100	69	100	35	100

Chi-square = 14.674 with 2 degrees of freedom; P < 0.001 (S)

Table 2 shows that out of 50 cases of sepsis proven, 44(88%) neonates weighed less than 2.5 kg and out of 69 cases of probable sepsis 43(62.3%) neonates weighed less than 2.5 kg. This difference was statistically significant (P value is <0.001).

Table 3: Sepsis in relation to CRP status of study subjects

CRP	Proven sepsis		Probable sepsis		No sepsis	
	N	%	N	%	N	%
Negative	21	42	11	15.9	27	77.1
Positive	29	58	58	84.1	8	22.9
Total	50	100	69	100	35	100

Chi-square = 37.228 with 2 degrees of freedom; P < 0.001 (S)

Table 3 shows that out of 154 cases, CRP was positive in 95(61%) cases and negative in 59 (39%) cases. 29(58%) cases out of 50 cases of proven sepsis had positive CRP and 58(84.1%) out of 69 cases of probable sepsis had positive CRP and only 8(22.9%) cases out of 35 cases of no sepsis group had positive CRP. This difference was statistically significant (P value is < 0.001).

Table 4: Sepsis in relation to platelet count of study subjects

Platelet count	Proven sepsis		Probable sepsis		No sepsis	
	N	%	N	%	N	%
Normal	7	14	12	17.4	9	25.7
Mild thrombocytopenia	12	24	29	42.0	13	37.1
Moderate thrombocytopenia	13	26	13	18.8	7	20.0
Severe thrombocytopenia	18	36	15	21.7	6	17.1
Total	50	100	69	100	35	100

Chi-square = 8.602 with 6 degrees of freedom; P = 0.197 (NS)

Table 4 shows that out of 154 cases 126(81.8%) had thrombocytopenia, out of which 54(42%) had mild degree of thrombocytopenia, 33(26.1%) had moderate degree of thrombocytopenia and 39(31%) neonates had severe

degree of thrombocytopenia. 18(36%) out of 50 cases of sepsis proven had severe degree of thrombocytopenia and 15(21.7%) out of 69 cases of probable sepsis had severe degree of thrombocytopenia. 6(17%) out of 35 cases of no sepsis group had severe degree of thrombocytopenia. This difference was statistically not significant (P value is 0.197).

Table 5: Sepsis in relation to MPV (fl)

MPV (fl)	Proven sepsis		Probable sepsis		No sepsis	
	N	%	N	%	N	%
≤10.8	6	12	16	23.2	14	40.0
> 10.8	44	88	53	76.8	21	60.0
Total	50	100	69	100	35	100

Chi-square = 9.014 with 2 degrees of freedom; P = 0.011 (S)

Table 5 shows that 118(76%) out of 154 cases had increased values of Mean Platelet Volume. In sepsis proven group 44 (88%) cases had increased values of MPV. In probable sepsis 53(76%) and in no sepsis group 21(60%) cases had increased values of MPV. This difference was statistically significant (P value is 0.011).

Table 6: Sepsis in relation to PDW (fl)

PDW (fl)	Proven sepsis		Probable sepsis		No sepsis	
	N	%	N	%	N	%
≤19.1	11	22	23	33.3	16	45.7
> 19.1	39	78	46	66.7	19	54.3
Total	50	100	69	100	35	100

Chi-square = 5.323 with 2 degrees of freedom; P = 0.070 (NS)

Table 6 shows that 104 (67%) out of 154 cases had increased values of Platelet Distribution Width. In Proven sepsis group 39(78%) cases had increased values of PDW, in Probable sepsis 46(66%) and in No sepsis group19 (54%**)** cases were having increased values of PDW. This difference was statistically not significant (P value is 0.070).

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 C - reactive protein was positive in 95(61%) cases. Similar results were found in study conducted by Karne TK et al.[7] and Choudhary RR et al[8] in which 58.2 % and 58.6% cases were found to be CRP Positive Respectively.

In our study out of total 154 neonates, Increased values of MPV (>10.8) and PDW (>19.1) were present in 118(76.6%) and 104 (67%) cases respectively. This was comparable with study by Ishwar et al[9] where increased value of MPV and PDW was found in 73.4% and 69.1% cases respectively.

In present study Proven sepsis group had elevated MPV values in 44(88%) cases as compared to 21(60%) in Non-sepsis group. This difference was statistically significant (P value is 0.011). It was in concordance with the study by Ishwar et al[9] in which 84.6% cases of Sepsis proven and 59% cases of No sepsis group had increased values of MPV.

In present study PDW values were observed to be increased in 39(78%) of Proven sepsis group and 19(54%) of No sepsis group. This difference was statistically insignificant (P value of 0.070). Similar results were found in study by Ishwar et al[9] where increased values of PDW were found in 79% cases of Sepsis proven group and 63% cases of non-sepsis group.

Conclusion

We concluded that platelet count and platelet indices, which are easily available hematological parameters in remote & resource poor areas of our country, should be taken into consideration for suspected cases of neonatal sepsis so that prompt treatment can be given accordingly, and morbidity and mortality can be significantly reduced.

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