Original Research Article

Platelet count and their indices as a marker of Neonatal sepsis

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Abstract

Objectives: Effect of sepsis on platelet counts and their indices. Monitoring of platelet count and their indices in neonatal sepsis in relation to specific organisms. To identify organism involved in proven neonatal sepsis affecting platelet indices **Design:** Prospective hospital based study **Setting:** The study subjects are all neonates admitted in Basaweshwar and Sangmeshwar Hospital NICU attached to MR Medical College and has proven sepsis **Method:** The study was carried out over a period of one and half years from December 2015 to July 2017 at Sangmeshwar and Basweshwar Hospitals attached to MR Medical College, Kalaburagi. 100 cases were recruited for this study after proper screening for CBC, Platelet Count and their indices like Mean Platelet Volume(MPV), Platelet distribution width(PDW) and CRP and blood culture in neonates admitted in our NICU with proven sepsis. **Results:** A total of 100 neonates with blood culture positive for bacterial cases were considered for the study. Early onset Septicemia(59%) was more common than late onset Septicemia(41%). Out of 100 cases, 57% cases had growth of gram negative organisms, 40% had growth of gram positive organisms and 3% had growth of fungi. 60% neonates had thrombocytopenia of varying severity. Staphylococcus aureus was the most common organism associated with thrombocytopenia(43.3%). MPV was high in 85% of cases and PDW was high in 96% of cases. **Conclusion:** The present study highlights the association of thrombocytopenia, mean platelet volume and platelet distribution width with causative organism in proven neonatal sepsis. Staphylococcus aureus was the most common organism causing thrombocytopenia in our NICU.

Key Words: Neonatal Sepsis, Thrombocytopenia, Staphylococcus aureus, MPV, PDW

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INTRODUCTION

Neonatal Septicemia is a clinical syndrome characterised by signs and symptoms of infection with or without accompanying bacteremia in the first month of life[1] A common complication in the neonatal intensive care unit, it is a major cause of neonatal mortality. It can be caused by various organisms invading the blood stream namely bacterial, viral, fungal and protozoal. In cases of sepsis, the Blood culture which is considered as the gold standard for diagnosing sepsis in neonates[2] may be positive along with thrombocytopenia and elevated C Reactive protein. Septic Shock is the most dangerous complication of Septicemia[3] Thrombocytopenia(Platelet count < 1,50,000/ microlitre) is one of the most common hematological problems in Neonatal Intensive Care Unit(NICU) with 18-35% of NICU patients developing this problem. The mechanism of thrombocytopenia in patients with septicaemia with no evidence of DIC is uncertain, but there may be an immune mechanism as there is presence of circulating immune complexes in septicaemia patients. Thrombocytopenia in DIC occurs mainly due to consumption of certain coagulation factors and circulating platelets. In contrast, only 2% of the neonates are thrombocytopenic at birth with severe thrombocytopenia(Platelet count < 50,000 / micro litre) occurring in less than 3/1000 term infants[4] An earlier study by scheifele *et al.* demonstrated evidence of a relationship between Gram negative infections and thrombocytopenia[5]

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METHODOLOGY

Study Subjects: All neonates admitted in Basaweshwar and Sangmeshwar Hospital NICU attached to MR Medical College with proven sepsis.

Inclusion Criteria: All neonates admitted in our NICU with proven sepsis

Exclusion Criteria:

1. Cases of thrombocytopenia other than sepsis
2. Neonates whose parents or guardians did not agree to be part of study.

Study Design: Prospective hospital based study

Study period: One and half years from December 2015 to July 2017 at Sangmeshwar and Basaweshwar Hospital attached to MR Medical College, Kalaburagi. 100 cases were considered for this study after proper screening for CBC, Platelet count ad their indices like MPV, PDW, CRP and blood culture in neonates admitted in our NICU with proven sepsis. Blood was collected under strict aseptic precautions following the norms of collection for blood culture.

RESULTS

The study reveals that, most patients 53(53.0%), presented within 24 hours of age, followed by 11(11.0%) patients who presented after 48 hours of age. The minimum age of a patient was 1 day(24 hours) and maximum age of a patient was 9 days. The Mean and SD of age of males was 74.51 ± 64.52 hours and females was 71.03 ± 53.49 hours. Overall Mean age of all patients was 72.46 ± 57.23. There was no statistically significant difference of age of patients among males and females(P >0.05). The sex ratio of male to female in the study was observed to be 1.85: 1 Table No.1. Most of the organisms isolated were Gram negative(57%) followed by gram positive(40%) and fungal(3%) as in table 2.It was observed that Intramural patients were 45(45%) and Extramural patients were 55(55.0%). In our study sepsis in patients born outside hospital were more than those inside hospital. Of the extramural, patients born in private hospital were 29% followed by those in Primary Health Centre(16%), Government Hospital(9%) and home delivery(1%). Of those with sepsis, Early Onset Sepsis was seen in 59(59%) and Late onset Sepsis was seen in 41(41%). Early Onset Sepsis is therefore more common than Late Onset Sepsis. 60% of patients had Thrombocytopenia, and the most common organism isolated was Staph Aureus(43.3%), followed by E coli(21.7%), Klebsiella(20%), Pseudomonas(8.3%) and Candida as in Table 2.

Table 1: Distribution of patients according to age and sex

Age in hours	Males		Females		Total	
	No.	%	No.	%	No.	%
24 hours	33	50.7	20	57.1	53	53.0
48 hours	6	9.2	3	8.6	9	9.0
72 hours	7	10.8	4	11.4	11	11.0
96 hours	6	9.2	3	8.6	9	9.0
120 hours	5	7.7	2	5.7	7	7.0
>120 hours	8	12.4	3	8.6	11	11.0
Total	**65**	**100.0**	**35**	**100.0**	**100**	**100.0**
Mean ±SD	74.51±64.52		71.03±53.49		72.46 ±57.23	
t-test value	t=0.78				---	
P-value and significance	P=0.34 NS				---	

NS= Not significant

There was statistically significant difference in Platelet count(per microlitre) among Gram positive, negative and Fungal affected patients.

Table 2: Distribution of Neonatal Thrombocytopenia according to causative organisms

Variable	Organism	No.	%
Gram Positive 27/60(45%)	Staph aureus	26	43.3
	CoNS	1	1.7
Gram – Negative 30/60(50%)	E coli	13	2.17
	Klebsiella	12	20.0
	Pseudomonas	5	8.3
Fungal 3/60(5%)	Candida	3	5.0
Total	---	**60**	**100.0**

The lowest platelet count(11, 000) was found in patient in whom E coli was isolated, followed by S. Aureus(15, 00), Klebsiella(28,000), Candida(60,000) and Pseudomonas(104000). Organism causing severe thrombocytopenia was Ecoli followed by S. Aureus and Klebsiella. In our study, Mean Platelet Volume was 13.3 in CONS, 10.56 in Klebsiella, 10.38

in S. Aureus, 10.1 in Candida,9.82 in E Coli, 9.65 in Pseudomonas. Regarding, PDW, it was 16.4 in CONS, 15.82 in S. Aureus, 15.46 in Klebsiella, 14.73 in E coli. 14.51 in Candida and 14.3 in pseudomonas, as shown in Table No 3. We found that the maximum number of patients - 43(71.1%) had mild thrombocytopenia, followed by 13(21.6%) with Moderate thrombocytopenia and 4(6.7%) with severe Thrombocytopenia. Also, 96(96%) of patients had increased PDW and 85(85%) had increased MPV.

Table 3: Effect of different organisms on Platelet indices in Neonatal sepsis

	Organisms	No. of patients	Platelet count at onset of sepsis(per ml)	Lowest platelet count per ml)	Average MPV(Fl)	MPV range	PDW	PDW Range
Gram Positive	Staph aureus	26	97300	15000	10.38	9.6-13.3	15.82	14.2-17.4
28/60	CoNS	1	148000	60000	13.3	13.3	16.4	16.4
(46.5%)								
Gram Negative	E coli	13	112400	11000	9.82	8.6-12.5	14.73	14.1-16.3
30/60	Klebsiella	12	98250	28000	10.56	8.9-13.7	15.46	14.9-16.8
(48.8%)	Pseudomonas	5	138000	104000	9.65	9.9-11.2	14.3	14.0-15.5
Fungi	Candida	3	131000	60000	10.1	9.2-13.3	14.51	15.3-16.5
3/60(4.7%)								
Total	**---**	**60**	**-**	**-**	**-**		**-**	

DISCUSSION

More than 30-80% of patients with proven infection became thrombocytopenic[5,6] Male to female ratio was 1.8: 1 which was consistent with the study by Woranort *et al.* which showed that males had higher incidence than females.[7] EOS(59%) was common than LOS(41%). This is similar to a study by Antoniette B *et al..*[8] who showed that EOS occurs within 24 hours in 85% of cases. Most common organism causing thrombocytopenia was S aureus(43.3%) next in line was E coli(21.7%), Klebsiella(21%), Pseudomonas(8.3%), candida(5%) and CONS(1.7%). Gram negative organisms are the most common organisms causing Thrombocytopenia(50%) than gram positive organisms(45%) and fungi(5%). In Jack D Guida's study[9], Gram negative were 16% whereas gram positive and fungal were 7.6% and 8% respectively. Sartaj A Bhat *et al.*[10] identified gram negative culture positive in 67.5% and Gram positive as 26.3%, remaining were fungal growth. A study by Bashir etal[11] showed that Klebsiella pneumonia was the most common organism associated with thrombocytopenia(58%). With reference to Mean Platelet Volume(MPV), Decreased platelet count was associated with increase in MPV(85%). Nelson and Kehl *et al..*[12] observed platelet consumption was associated with increase in MPV in human subjects having acute infection. Becchi *et al..*[13] suggested that MPV has an important prognostic value of early stage of sepsis. Jack D Guida reported 54% neonates with thrombocytopenia, of which 61% neonates had increased MPV. The platelet distribution width(PDW) was increased in 96% of cases. E Guclu *et al.*[14] found PDW as a significant parameter in neonates with sepsis. Ferhatcatal *et al..*[15,] found that there is significant difference between control and sepsis group in terms of platelet count, PDW /MPV($p < 0.005$). Patrick CH *et al.*[16] reported that there is significantly increased presence of bacteremia in those neonates with MPV greater than 10.8 fl and /or PDW greater than 19.1%

CONCLUSION

In our study, Staphylococcus aureus was the most common organism responsible for thrombocytopenia. Among thrombocytopenic neonates, 43% had mild thrombocytopenia, 13% had moderate thrombocytopenia, and 4% had mild thrombocytopenia. MPV and PDW varied according to the organism. A larger study may establish the relationship of these indices with the organisms more decisively.

REFERENCES

1. Stoll BJ, Shane AL, Infections of the neonatal infant. Nelson Textbook of pediatrics, 1st south Asia ed. Elsevier Publication; p. 914-5, Stoll BJ, Hansen N, Fanaroff AA, Wright LL, Carlo WA, Ehrenkranz RA *et al...*, Late onset Sepsis in VLBW neonates. The experience of NiCHD in neonatal research network Pediatr. 2002; 10: 285-91.
2. Manroe BL, Weinberg AG, Rosenfeld CR, Browne R, The neonatal blood count in health and disease, Journal of pediatric 1979; 95(1); 89-98.
3. Israels SJ, Rand ML, Michaelson AD, Neonatal function 2003;29.
4. Arif SH, Ahmad, I, Ali SM, Khan HM, Thrombocytopenia and Bacterial sepsis in Neonates, Indian J Hematol Blood Transfus, 2012; 28(3); 147-151.
5. Forsteier F, Daffos F, Galaceteros F, Bardakjian J, Rainaut M, Beuzard Y*et al..*, Haematological values of 163 normal fetuses between 18-30 weeks of gestation, pediatr Res. 1986; 20(4); 342.
6. Laura A Stokowski, neonatal thrombocytopenia evaluation and management, National association of neonatal nurses 22 annual conferenc3 46.

7. Ratanakorn W, Srijariya W, Chamnanvanakij S, Saengaroon P, Incidence of neonatal infection in newborn infants with maternal history of premature rupture of membranes(PROM) for 18 hours or longer by using pharmong Kutklar Hospital clinical practice guide lines(CPG), J.Med Assoc. Thai, 2005;9(7); 973.
8. Antoniette BWM, Flora DIP, Clinical Correlation of Neonatal and maternal Hematological Parameters As predictors of Neonatal Sepsis, PIDSP Journal, 2005, 9(2) 36-43.
9. Guida JD, Kunig AM, Leef KH, McKenzie SE, Paul DA, Platelet count and sepsis in very low birth weight neonates. Pediatrics, 2003 Jun; 111(6) : 1411-5.
10. Bhat SA, Naik SA, Rafiq W, Tariq AS. Incidence of thrombocytopenia and changes in various platelet parameters in neonates with blood culture positive sepsis. Int J Pediatr 2015 Jul 3(19).
11. Charoo BA, Iqbal JI, Iqbal Q. Mushtaq S. Bhat AW, Nawaz I. Nosocomial sepsis-induced late onset thrombocytopenia in a neonatal tertiary care unit a prospective study. Hematol Oncol Stem Cell Ther. 2009;2(2); 349-353.
12. Gao Y. Li Y, Yu X, *et al.*; The impact of various platelet in dices as prognostic markers of septic shock, PLoS one 2014; 13;9.
13. Lee IR, Shin JI, Park SJ, Oh JY, Kim JH. Mean platelet volume in young children with urinary tract infection, Sci Rep. 2015; 5; 18072.
14. Guelu E, Durmaz Y.Karabay O. Effect of severe sepsis on platelet count and their indices. Afr Health Sci. 2013 Jun 13920: 333-8.
15. Catal F, Tayman C. Tonbul A Bilici M. Mean Platelet volume may simply predict the severity of sepsis in preterm infants. Clinical Laboratory, 2014 Aug: 60(7); 1193-200.
16. Patrick CH, Lazarchick J. The effect of bacteremia on automated platelet measurements in neonates. Am J Clin Pathol. 2016; 93(3); 391-4.

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