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ORIGINAL RESEARCH

PLATELET INDICES AS USEFUL INDICATORS OF NEONATAL SEPSIS

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ABSTRACT

Background:Neonatal septicemia is a clinical syndrome characterized by signs and symptoms of infection with accompanying bacteremia in the first month of life. Despite continuing advances in diagnosis and treatment, it remains one of the important causes of higher mortality and morbidity.Aim of our study is to evaluate the changes of platelet count and indices (MPV, PDW) in neonatal sepsis.

Materials and Methods: It is a prospective crossectional study conducted in Tertiary health center (PRATHIMA INSTITUTE OF MEDICAL SCIENCES) in the DEPARTMENT OF PATHOLOGY in colloboration with neonatology section over a time period of 7 months from January to August 2019.Using convenient sampling method, 100 neonates with sepsis and 100 normal neonates without any medical problems, as the control group were selected. Weight and gestational age matched healthy neonates without any infectious disease served as control. The groups were compared for age, WBC count, neutrophil count, platelet count, PDW AND MPV.

Results: In our study out of 100 cases, early onset sepsis was present in 30 cases, while late onset neonatal sepsis was present in 70 cases.40 neonates showed culture positivity and the remaining 60 showed culture negative sepsis. Statistically significant correlation of MPV with platelet count(high MPV in thrombocytopenic neonates) and outcome. Significant difference in PDW in thrombocytopenic neonates and non-thrombocytopenic neonates. Neonates with sepsis have significantly increased MPV, PDW compared to healthy neonates.

Conclusion: Platelet count and indices can be used as early diagnostic markers in neonatal sepsis. Neonates with sepsis have significantly increased MPV, PDW compared to healthy neonates. Platelet indices are inexpensive and easily available tests can be routinely performed for all neonates suspected to be in sepsis.

Keywords: Neonatal septicemia, bacteremia, platelet count, neonates.

INTRODUCTION

Neonatal septicemia is a clinical syndrome characterized by signs and symptoms of infection with accompanying bacteremia in the first month of life. Despite continuing advances in diagnosis and treatment, it remains one of the important causes of higher mortality and morbidity. One of the commonest causes of neonatal mortality contributing to 15% of all

neonatal deaths. Some population-based studies have reported clinical sepsis rates ranging from 49-170/1000 live births in rural India.

Neonatal Sepsis:

Clinical signs and symptoms included reduced activity, lethargy, hypotonia, apnea, cyanosis, respiratory distress, hyporeflexia, irritability, hypothermia, hyperthermia, diarrhea, vomiting and poor breast feeding and laboratory findings such as leucopenia or leucocytosis, increase in neutrophil percentage and ESR. Neonatal sepsis is divided into early-onset and late-onset.

Most common causes are Group B streptococci,E. coli and Listeria monocytogenes in developed countries and gram-negative bacteria and Coagulase negative Staphylococci in developing countries.

Blood culture is still considered to be the gold standard. Due to contamination and negative blood cultures in fatal generalized bacterial infections, its accuracy has been questioned. Hematological changes induced in neonatal sepsis have been used to make an early diagnosis and to detect complications. Thrombocytopenia is an early marker of neonatal sepsis, but nonspecific.

- Platelet size can be analysed using MPV and PDW, as it correlates with platelet activity.
- MPV denotes average size of platelets.
- Platelet distribution width(PDW) - An indicator of variation in platelet size.
- Normal ranges of MPV are between 8.5fl and 12.5fl.
- PDW- normal ranges between 10% and 17%
- Platelet -large cell ratio(P-LCR)- proportion of platelets greater than 12fl.

Aims and objectives

To evaluate the changes of platelet count and platelet indices such as MPV and PDW in neonatal sepsis. which can be used as hematological markers to make an early diagnosis and to detect complications.

MATERIALS & METHODS

Inclusion criteria:

- All Clinically suspected cases of neonatal sepsis in infants of term gestational age

Exclusion criteria:

- Infants of mothers with pregnancy induced hypertension and diabetes mellitus
- Infants with history of asphyxia
- Infants with congenital anomalies
- Infants of preterm gestational age

Using convenient sampling method, 100 neonates with sepsis and 100 normal neonates without any medical problems, as the control group were selected.

Weight and gestational age matched healthy neonates without any infectious disease served as control.

The groups were compared for age, WBC count, neutrophil count, platelet count, PDW AND MPV.

Bacterial Identification:

1ml blood samples were drawn aseptically from all neonates with suspected sepsis, inoculated into a heart infusion broth, transported to respective laboratory and incubated at 37 degree C that was daily checked for bacterial growth upto 7days.

Complete blood count:

1 ml blood samples were taken from all the patients and controls and collected in tubes containing EDTA and analyzed.[5,6]

RESULTS

In our study out of 100 cases, early onset sepsis was present in 30 cases, while late onset neonatal sepsis was present in 70 cases.40 neonates showed culture positivity and the remaining 60 showed culture negative sepsis.

Normal platelet count range is taken as 150,000u/l - 400,000u/l.

Mild thrombocytopenia=100,000u/l-150,000u/l

Moderate thrombocytopenia=50,000u/l-100,000u/l

Severe thrombocytopenia= <50,000u/l

Thrombocytopenia was present in 80% of cases and 20 cases had the normal platelet count. Among them, 61% had severe thrombocytopenia ,32.1% had moderate thrombocytopenia and 6.9% had mild thrombocytopenia.Statistically significant correlation of MPV with age of onset of sepsis, platelet count and outcome

Table 1: Platelet Distribution Width

PDW(%)		MEAN+/-SD	P VALUE
Platelet count	Thrombocytopenia	13.67+/-0.98	<0.001
	No Thrombocytopenia	12.63+/-1.08	
OUTCOME	Discharged(n=98)	12.96+/-1.13	<0.05
	Expired(n=2)	14.60+/-0.28	

*Significant correlation of PDW with thrombocytopenia and outcome

Table 2: WBC and neutrophil percentage in sepsis group compared to healthy group

	Sepsis group	Control group	P value
Age	7.2	2.6	p=0.043
Sex(M:F)	10:10	12:8	p=0.68
WBC(u/l)	14.84+/-2.94	14.79+/-2.98	p=0.99
Neutrophil(%)	60.89+/-14.34	52.77+/-3.92	p=0.58

*In this age mean age was significantly higher than control group.No significant differences were found for sex, WBC and neutrophil percentage in sepsis group compared to healthy group.

Table 3: MPV and Platelet Distribution Width

	Minimum-maximun	Sepsis group (Mean+/-SE)	Control group (Mean+/-SE)	p value
PLT	140-400/ul	43.4+/-28.31	237.65+/-21.74	<0.002
MPV	8.5-11.0fl	10.3+/-0.23	9.3+/-0.19	<0.04
PDW	10-17%	13.5+/-0.5	11.7+/-0.27	<0.003

*In sepsis group, MPV and PDW were significantly increased compared to the control group

DISCUSSION

Of the several platelet indices plateletcrit (PCT) is studied less often in neonatal sepsis. The variation in MPV affects PCT. There is a significant overlap of PCT between thrombocytopenic patients and patients with normal platelet counts. Role of platelet mass in predicting the occurrence of intracranial hemorrhage in neonates with sepsis has been reported by Mitsiakoset al.[7]

MPV, PDW and PCT are not only altered in sepsis but also in other neonatal pathological conditions. This fact further complicates the clinical utility of platelet indices during neonatal sepsis. Gestational age, prematurity and birth asphyxia having some influence on these indices has been reported by Kannaret al.[8]

Premature neonates with sepsis may have other comorbidities such as bronchopulmonary dysplasia (BPD) and intraventricular hemorrhage (IVH). Higher MPV level was noted in BPD and IVH groups in a study by BoloukiMoghaddamet al.[9]

A decreased platelet count and PCT, an increased PDW and no difference in MPV among preterm neonates have been reported by Wasiluk et al,[10] while studying samples from umbilical arterial blood. The large platelet count (LPLT) was found to be diminished in preterm

neonates (5.23%) in comparison with term neonates (6.12%). They also reported higher MPV, lower LPLT and lower PCT among small for gestation neonates. Higher PDW, lower PCT and higher but not statistically significant MPV in preterm neonates compared to term neonates were reported by Sandeep et al.[11]As neonatal sepsis is a life condition, early diagnosis and treatment are mandatory. Need for alternative valid markers arises. Neonatal sepsis is associated with high mortality as diagnosis of sepsis in neonates' presents as a challenge because the clinical signs of sepsis are non-specific, and it mainly depended upon investigation. Among these, blood culture is the gold standard for the diagnosis for neonatal sepsis but it's utility is limited due to delayed reporting and low positivity. There have been studies showing the significant changes in platelet indices in patients with neonatal sepsis. These studies measure Platelet count, MPV (mean platelet volume) and Platelet distribution width (PDW).

Thrombocytopenia was present in 80% of cases and 20% cases had the normal platelet count in present stydy. In our study, high prevalence of thrombocytopenia in neonates with sepsis which was statistically significant. Studies by Sartaj A. Bhat et al were revealed that 66.25% developed thrombocytopenia in cases of neonatal sepsis.

Statistically significant correlation of MPV with platelet count(high MPV in thrombocytopenic neonates) and outcome. Significant difference in PDW in thrombocytopenic neonates and non thrombocytopenic neonates. High MPV and PDW in neonates who developed thrombocytopenia and also in expired babies. Increase in MPV suggests - proportion of younger platelets in blood circulation are increased. Indicates platelet destruction or production. PDW- An indicator of heterogeneity in platelet size. Increase in PDW-large range of platelet because of swelling, immaturity and destruction.

In the present study, there was significant increase in MPV and PDW in neonates with sepsis than healthy neonates.MPV increased in 63 cases when compared with Mittal et al. found, in their study, that MPV was increasedin 70.7% of neonatal sepsis.[12] Choudhary et al. also founda 70.9% increase in MPV value in sepsis cases.[13] It was also seen that sensitivity and specificity of increase in MPV in the diagnosis of neonatal sepsis were found to be 84.9% and 33.7%, respectively. In a study by Arad et al., it was seen that sensitivity and specificity of anincrease in MPV in the diagnosis of neonatal sepsis were 54% and 46%, respectively. [14] PDW markedly increased in 86 cases when compared with controls (36%) ($P < 0.0004$). Guclu et al. showed that MPV and PDW were significantly different between sepsis patients and control group.[15] Patrick and Lazarchick reported that there is a significant association of bacteremia in those neonates with MPV >10.8 fL and/ or PDW >19.1%.[16] Few babies showed increased WBC count, Relative neutrophilia/ Lymphocytosis. Elevated WBC count and neutrophil counts are the main laboratory findings in diagnosis of sepsis. These factors are not significant in our study.

CONCLUSION

Platelet count and indices can be used as early diagnostic markers in neonatal sepsis.Neonates with sepsis have significantly increased MPV, PDW compared to healthy neonates.Platelet indices are inexpensive and easily available tests can be routinely performed for all neonates suspected to be in sepsis.

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