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Original Research Article

To evaluate the significance of platelet counts, platelet indices (PDW &MPV) and RDW as an early diagnostic and prognostic marker of neonatal sepsis.

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Abstract:

Background & Method: The aim of the study is to evaluate the significance of platelet counts, platelet indices (PDW &MPV) and RDW as an early diagnostic and prognostic marker of neonatal sepsis. Neonate admitted in SNCU, Nursery and postnatal wards were included in the study after a written informed consent. This study was conducted at dept of Paediatrics MGM Medical College, Indore for a period of one year. It is a well-equipped SNCU with mechanical ventilators, 24-hour laboratory facilities, portable bedside Xray machines, electronic monitors and a bedside USG machine.

Result: In this study, we found that confirmed sepsis maximum occur during < 7 day of life. P- value <0.05 is statistically significant., and there is no association between Gender, birth weight, mode of delivery, gestational period and sepsis. The p-value is >0.05 which is statistically, not significant. The area under the ROC curve (AUROC) for Mean MPV predicting sepsis was 0.48, thus demonstrating fail to diagnostic performance. It was statistically not significant (p = >0.05) The area under the ROC curve (AUROC) for Mean PDW predicting sepsis was 0.56, thus demonstrating fail to diagnostic performance. It was statistically not significant (p = >0.05). The area under the ROC curve (AUROC) for Mean RDW predicting sepsis was 0.68, thus demonstrating POOR to diagnostic performance. It was statistically significant (p = <0.05).

Conclusion: Symptoms of sepsis to evaluate the significance of platelet indices (PDW &MPV) and RDW as a early diagnostic and prognostic marker of neonatal sepsis. Further, we also compared platelet indices & RDW with the existing sepsis screen in prediction and prognostication of neonatal sepsis. While Mean MPV and Mean PDW failed to have a predictable diagnostic potential (the area under the ROC curve (AUROC) for Mean MPV and Mean PDW predicting sepsis being 0.48 and 0.56 respectively), Mean RDW and Mean Platelet count showed poor yet a predictable potential to diagnose neonatal sepsis with values of 0.68 and 0.60 respectively.

Keywords: platelet, PDW, MPV, RDW, prognostic, neonatal & sepsis.

Study Designed: Prospective observational study.

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1. Introduction

Neonatal sepsis (NS) is one of the major causes of morbidity and mortality among both term and preterm infants especially in the developing countries worldwide contributing around 38% of all deaths in neonates.[1] While some reports from developed countries demonstrated that the incidence of neonatal sepsis varies from
1 to 5 cases per 1000 live births, some other population-based studies from developing countries have reported clinical sepsis rates ranging from 49 to 170 per 1000 livebirths.[2]
Situation is even more worsened in low-income underdeveloped countries. Some anecdotal population-based studies have reported clinical sepsis rates ranging from 49 to 170/1000 live births in rural India. The younger the gestational age, the lower is the birth weight, resulting in higher morbidity and mortality from sepsis. Incidence is not changed much over the past decade, and the fatality due to sepsis is between 30% and 65%.[3]
As per the National Neonatal Perinatal Database 2002-2003, the incidence of neonatal sepsis is 30 per 1000 live births.[4] Further, the incidence is found to be 11.5- 24/1000 livebirths in India.[5]
Neonatal sepsis is a clinical syndrome of bacteraemia characterized by systemic signs and symptoms in first month of life and has wide variations of clinical presentations. These presentations may be nonspecific and do not necessarily reflect the severity of the course or the possible outcome of the disease. It is a very serious
condition and if not diagnosed and treated quickly, can lead to shock, multiple organ dysfunction, permanent disability or death.[6]
Neonatal sepsis (NS) is a disease process, which represents the consequences of systemic response to bacteria entering the blood stream during the first 28 days of life. It is a clinical syndrome characterized by signs and symptoms of infection in neonatal period of life. It covers various systemic infections of new-born such as septicaemia, meningitis, pneumonia, arthritis, osteomyelitis and urinary tract infections. It is estimated that 20% of neonates develop sepsis and approximately 1% deaths are related to sepsis.[7]
NS are classified, according to the absence or the presence of the positive blood culture, in Clinical Sepsis and Proven Sepsis. Concerning the time of symptoms onset, they are defined as Early-Onset Sepsis (EOS) and Late-Onset Sepsis (LOS). When the blood culture is negative, but the neonate presents clinical and inflammation signs and biomarker increase, the sepsis is defined as Clinical Sepsis.[8] Group B Streptococcus, Escherichia coli, coagulase-negative Staphylococcus, Staphylococcus aureus, Klebsiella, Pseudomonas and Enterobacter are the most common cause of neonatal sepsis.

2. Material & Method

The present study was carried out at SNCU, Nursery and postnatal wards of Department of Pediatrics in MGM Medical College Indore. After taking written informed consent from parents, all neonate admitted in Special new born care unit (SNCU), nursery and postnatal wards were included in the study.
Neonate admitted in SNCU, Nursery and postnatal wards were included in the study after a written informed consent. This study was conducted at dept of Paediatrics MGM Medical College, Indore for a period of one year. It is a well-equipped SNCU with mechanical ventilators, 24-hour laboratory facilities, portable bedside Xray machines, electronic monitors and a bedside USG machine. This study was approved by the ethical committee of MGM Medical College, Indore.

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On admission, basic patient details such as age, gender, address, Complete antenatal history and date of admission were entered in a prepared proforma. complete neonatal examinations were done and note down detailed antenatal history with mother risk factors in prepared proforma. Blood samples (CBC with sepsis screen, CRP and blood culture) were collected and analysed at the time of presentation followed after taking informed consent from parents. All babies enrolled were investigated for blood culture, sepsis screen [C-reactive protein (CRP), total leukocyte count (TLC), absolute neutrophil count (ANC), immature to total neutrophil (IT) ratio], and platelet indices (platelet count, MPV, PDW). For this, approximately 2 mL of venous blood was drawn from each neonate through peripheral veins.

INCLUSION CRITERIA

1. Nursery, Postnatal ward and
2. SNCU whose sepsis screen will be sent.
3. (POST NATAL WARD -Presence of predisposing factors i.e., maternal fever or foul-smelling liquors or prolonged rupture of membranes (> 18hours).

EXCLUSION CRITERIA

1. New-born's coming from outside who have all ready received antibiotics
2. New-born's whose mother as on heparin.
3. Mother with systemic lupus erythematous, ITP and other autoimmune disease
4. Rh incompatibility and haemolytic disease of Newborn.

3. Results

Table 1: Distribution of study participants according to age

PND (Days)	< 7 days	297	70.5%
	7-14 days	101	24.0%
	>18 days	23	5.5%
	Total	421	100.0%

Table 2: Distribution of study participants according to birth weight, gestational ageand mode of delivery.

Birth Weight (kg)	low birth weight	351	83.4%
	normal	70	16.6%
Term/Preterm	PRETERM	219	52.0%
	TERM	202	48.0%

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Mode of Delivery	LSCS	96	22.8%
	NVD	325	77.2%

Table 3: Association of basic parameters with sepsis

		confirm sepsis		no sepsis		probable sepsis		
		Count	%	Count	%	Count	%	p-value
PND (Days)	< 7 days	68	70.10%	132	64.40%	97	81.50%	0.003
	>18 days	2	2.10%	18	8.80%	3	2.50%	significant
	7-14 days	27	27.80%	55	26.80%	19	16.00%	
Sex	female	42	43.30%	78	38.00%	38	31.90%	0.22
	male	55	56.70%	127	62.00%	81	68.10%	Not significant
h Weight(kg)	low birth weight	81	83.50%	166	81.00%	104	87.40%	0.32
	normal	16	16.50%	39	19.00%	15	12.60%	Not significant
Term/ Preterm	PRETERM	53	54.60%	100	48.80%	66	55.50%	0.42
	TERM	44	45.40%	105	51.20%	53	44.50%	Not significant
Mode of Delivery	LSCS	21	21.60%	43	21.00%	32	26.90%	0.45
	NVD	76	78.40%	162	79.00%	87	73.10%	Not significant

In this study, we found that confirmed sepsis maximum occur during < 7 day of life. **P- value <0.05 is statistically significant**., and there is no association between Gender, birth weight, mode of delivery, gestational period and sepsis. The p-value is >0.05 which isstatistically, not significant.

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Table 4: ROC Curve Analysis Showing Diagnostic Performance of MPV, RDW and PDW in Predicting Outcome: sepsis

Test Result Variable(s)	Area under curve	Std. Error	Asymptotic Sig.[b]
MPV	0.486	0.035	.697 Not significant
RDW	0.683	0.034	0.000 significant
PDW	0.564	0.037	.075 Not significant

The area under the ROC curve (AUROC) for Mean MPV predicting sepsis was 0.48, thus demonstrating fail to diagnostic performance. It was statistically not significant (p = >0.05) The area under the ROC curve (AUROC) for Mean PDW predicting sepsis was 0.56, thus demonstrating fail to diagnostic performance. It was statistically not significant (p = >0.05). The area under the ROC curve (AUROC) for Mean RDW predicting sepsis was 0.68, thus demonstrating POOR to diagnostic performance. It was statistically significant (p = <0.05).

4. Discussion

In the developing world, neonatal septicemia remains the major cause of mortality and morbidity in spite of recent advances in technology and therapeutics. As neonates are fragile and can rapidly deteriorate, so the treatment should be initiated in a neonate suspected to have sepsis without any delay[9].

Diagnosis of neonatal sepsis remains one of the challenges that pediatrics are facing because clinical findings are nonspecific, overlapping, and vague. Though many advanced diagnostic and treatment modalities have been on research and currently use, neonatal sepsis continues to be a major burden[10].

The present Prospective Observational study titled "Evaluation of platelet count, platelet indices (MPV and PDW) and RDW as diagnostic and prognostic indicators in neonatal sepsis" was conducted in the Department of Pediatrics, MGM Medical College and MY Hospital, Indore (MP) and a tertiary care Centre at CNBC Indore on 421 neonates who were admitted in the Pediatric ward and ICU with symptoms of sepsis during the study period and qualified the inclusion criteria.

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Identification of a specific and sensitive marker will not only help in identifying septic babies but it will further guide in early diagnosis and prognosis of neonatal sepsis thus predicting the outcome in neonates admitted with neonatal sepsis syndrome. This may help the clinicians to determine which of those neonates need closer monitoring. Timely intervention can be planned and Neonatal sepsis related morbidity and mortality can be reduced[11].

Out of 421 subjects, majority of neonates i.e., 297 who developed sepsis were of age less than 7 days followed by neonates of 7-14 days age group i.e., 101 neonates. Minimum neonatal sepsis developed in neonates who were aged more than 18 days. A higher male preponderance was seen i.e., 263 as compared to 158 females. Male to female ratio was 1.66:1.

Clinical symptoms of sepsis were present in 99.5 % of patients i.e., 415 neonates. However, CRP was positive in 169 patients i.e., 40.1%, and blood culture was positive in 97 patients i.e., 23% of patients.in blood culture- positive patients most common organism found was klebsiella.

Past history of the study participants revealed that 351 neonates i.e., 83.4 % were low birth weight while 70 had normal weight at time of birth. Also, 219 neonates i.e., 52 % were preterm while 202 i.e., 48% were term babies. 325 babies i.e., 77.2% were Normal Vaginal Delivery while remaining 96 i.e., 22.8 % were delivered by LSCS. Final outcome of study participants showed that 270 patients i.e., 64.1% were discharged while 137 i.e., 32.5% died and 2 patients i.e., 3.3% left against medical advice (LAMA). 97 i.e., 23% were diagnosed with confirmed sepsis while 119 i.e., 28.3 % had probable sepsis and 205 i.e.,48.7% had no sepsis.

5. Conclusion

Symptoms of sepsis to evaluate the significance of platelet indices (PDW &MPV) and RDW as a early diagnostic and prognostic marker of neonatal sepsis. Further, we also compared platelet indices & RDW with the existing sepsis screen in prediction and prognostication of neonatal sepsis. While Mean MPV and Mean PDW failed to have a predictable diagnostic potential (the area under the ROC curve (AUROC) for Mean MPV and Mean PDW predicting sepsis being 0.48 and 0.56 respectively), Mean RDW and Mean Platelet count showed poor yet a predictable potential to diagnose neonatal sepsis with values of 0.68 and 0.60 respectively.

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