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SCREENING CORD BLOOD IS A BETTER DIAGNOSING METHOD FOR EARLY ONSET NEONATAL SEPTICEMIA

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Abstract

Back ground- Infections are the single largest cause of neonatal deaths globally. Early predictors of early-onset neonatal sepsis is always under debate. In the present era we have to outweigh the risks of hospital infections against other obstretic complications in pregnancy. out comes of pregnancy though comes out good ,neonatal infections and morbidity are still continuing. With this background ,this study aimed at taking cord blood which can predict neonatal infection.
Materials & Methods- 70 new borns irrespective of birth weight were included in the study. The cord blood samples were obtained with aseptic precautions and was put on culture. Also cord blood was analysed in sysmex cellcounter for complete blood count.CRP was done with latex agglutination test.
Results- 30 neonates showed growth among which Staphylococcus aureus 25.8%,Streptococci species in 19.35%. The values of CRP were 6.7% positive in sepsis developed group and 2.5% positive in non-sepsis group. Low WBC count, low neutrophil count, low RBC count, elevated MCV values, low platelet count were observed in neonates with sepsis when compared to neonates without sepsis.
Conclusion- Cord blood is a definetely a very useful screening method for predicting early onset neonatal septicemia. A standardised protocol should be adopted for screening cord blood ,so that a better treatment modalities can be adopted by paediatricians .

Introduction

Neonatal sepsis is a leading cause of mortality in developing countries. It accounts for up to 30-50% of neonatal deaths where in, it is estimated that 99% of neonatal deaths occur in developing countries. [1]Based on onset of infection, neonatal sepsis can be categorized as early onset sepsis and late onset sepsis. Early onset of sepsis generally occurs within the first 72 hours of life . Early onset bacterial sepsis (EOS) remains a major cause for neonatal morbidity and mortality.[2] The case fatality rate in early onset neonatal sepsis ranges from 16.7% to 19.4% .[3] Majority of early onset of infection is reasoned by maternal genital tract and late onset is mainly due to nosocomial infections . Apart from the obstetric risk factors, prematurity and low birth weights are associated with increased bacterial infection rates .[4]Various other maternal, fetal and environmental factors also contribute towards sepsis in the newborns. Some of the maternal factors are premature rupture of membrane, maternal fever within 2 weeks prior to delivery, meconium stained amniotic fluid (MSAF), foul smelling liquor and instrumental delivery. [5]Though we are aware of many clinical causes that can be the risk factor for neonatal septicemia, we still hardly bother to screen for infection in neonates unless they present with gross symptoms.

It is extremely important to make an early diagnosis of neonatal sepsis for the prompt institution of anti-microbial therapy, which improves the outcomes.[6] Clinicians are frustrated by the limitations in the diagnosis of neonatal sepsis .The newborn especially the premature are prone to serious infections because most of the time the signs of these infections may be absent or subtle and hard to detect. Thus, fatal septicemia may occur with little warning. Hence, the timely diagnosis of sepsis in neonates is critical as the illness can be rapidly progressive and in some instances fatal.[7]

Cord blood is the earliest hematologic sample from the new borns, which could guide the clinicians to carry out effective therapeutic strategy as soon as possible. Besides, a painless and non- invasive manipulation, avoids iatrogenic stress source to vulnerable newborns, which could cause deterioration and possible anemia.[8]
It has been recognized a gradual change in spectrum of organisms responsible for neonatal sepsis. Surveillance is needed to identify the common pathogens of the disease as well as the antibiotic susceptibility profile of the pathogens in a particular area. Constant surveillance is important to guide empirical antibiotic therapy and changes in trends.[2] Till now there is no routine test for screening neonatal sepsis at an early stage. This study was taken up to evaluate different tests which can be adopted to screen neonatal cord blood for infection.

Materials and methods

The present prospective cross sectional study was conducted at the department of Microbiology , Mysore Medical College & Research Institute and its attached hospitals during 2013.
70 new borns irrespective of birth weight were included in the study .Pregnant women with known history of hypertension, diabetes or proteinuria were excluded.

The cord blood samples were obtained with aseptic precautions and was sent to Microbiology and Pathology laboratories . For blood culture , cord blood was collected in sterile brain heart infusion broth and subcultured according to standard methods.The isolates were identified using standard biochemical reactions .[9]
The total leukocyte counts were counted in cell counter (Sysmex K21). Differential counts were performed on Leishman stained blood smears by counting at least 200 cells. Erythrocyte sedimentation rate (ESR) was carried out by westergreen method .

C-reactive protein (CRP) was done using using latex agglutination test kit . Appropriate statistical methods are adopted for comparison.

Results

Based on the laboratory reports , 70 neonates were classified into sepsis developed group (30 neonates,42.85%) which showed growth & non-sepsis group (40 neonates,57.14%) which showed no growth on culture of cord blood samples. **Table1** showing different bacteria isolated from various cord blood samples.

Table 1 : Different bacteria isolated from cord blood samples.

Name of the organism	**Number**	**Percentage**
Staphylococcus aureus	8	25.8%
Streptococcus spp.	6	19.35%
NFGNB	5	16.12%
Escherichia coli	3	9.67%
Enterococcus spp.	3	9.67%
Enterobacter spp.	3	9.67%
Acinetobacter spp.	2	6.45%
	30	100%

NFGNB-Non fermenting Gram negative bacilli

Table 2 : WBC count statistics of cord blood samples.

	GROUP	No	Mean	Std. Deviation	Std. Error Mean	t-value	Df	p-value
WBC Values ($x10^3/mm^3$)	**Sepsis**	**30**	**11.9567**	**5.39468**	**.98493**	**2.249**	**68**	**.028**
	non-sepsis	**40**	**14.4350**	**3.82794**	**.60525**			

- The mean value in sepsis developed group is 11.9567x103and non-sepsis was 14.4350x103.The independent T-test revealed a significant difference between sepsis and non-sepsis group with t value 2.249 and p-value .028

Table 3 : Association between WBC count and development of neonatal sepsis

			GROUP		Total
			sepsis	non-sepsis	
WBC	**Normal**	**Count**	**12**	**29**	**41**
		% of GROUP	**40.0%**	**72.5%**	**58.6%**
	abnormal	**Count**	**18**	**11**	**29**
		% of GROUP	**60.0%**	**27.5%**	**41.4%**
Total		**Count**	**30**	**40**	**70**
		% of GROUP	**100.0%**	**100.0%**	**100.0%**

- The value of chi square is 4.679 which are significant at 0.031 levels which indicate that there is association between WBC count test result and of neonatal sepsis. The value of kappa coefficient is 0.562 which shows agreement with attributes. Hence WBC count test can be considered as test for prediction of neonatal sepsis

Table 4 : Comparison of RBC values of cord blood samples.

Group Statistics								
	GROUP	**No**	**Mean**	**Std. Deviation**	**Std. Error Mean**	**t-value**	**df**	**p-value**
RBC values ($x10^6/mm^3$)	**sepsis**	**30**	**4.2603**	**.83375**	**.15222**	**2.414**	**68**	0.018
	non-sepsis	**40**	**4.6110**	**.33748**	**.05336**			

- The mean value in sepsis developed group was $4.2603x10^6$and non-sepsis was $4.6110x10^6$.The independent T-test revealed a significant difference between sepsis and non-sepsis group with t value 2.414 and p-value .018.

Table 5: Comparison of MCV values of cord blood samples

Group Statistics								
	GROUP	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**	**t-value**	**df**	**p-value**
MCV (in fl)	**sepsis**	**30**	**117.3100**	**7.70877**	**1.40742**	**2.661**	**68**	**.010**
	non-sepsis	**40**	**113.0975**	**5.54198**	**.87626**			

- The mean value in sepsis developed group was 117.3100 and non-sepsis group was 113.0975.The independent T-test revealed a significant difference between sepsis and non-sepsis group with t value 2.661 and p-value .010.

Table 6 : Comparison of neutrophils values of cord blood samples

Group Statistics								
	GROUP	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**	**t-value**	**df**	**p-value**
NEUTROPHIL VALUES((x10^3/mm^3)	**sepsis**	**30**	**4.9967**	**2.29850**	**.41965**	**3.169**	**68**	**0.002**
	non-sepsis	**40**	**6.9900**	**2.80976**	**.44426**			

- The mean value in sepsis developed group was 4.9967x$10^3$and non-sepsis was 6.9900x10^3.The independent T-test revealed a significant difference between sepsis and non-sepsis group with t value 3.169 and p-value 0.002

Table 7 : CRP values of cord blood samples

			GROUP		**Total**
			sepsis	**non-sepsis**	
CRP	**-ve**	**Count**	**28**	**39**	**67**
		% of GROUP	**93.3%**	**97.5%**	**95.7%**
	+ve	**Count**	**2**	**1**	**3**
		% of GROUP	**6.7%**	**2.5%**	**4.3%**
Total		**Count**	**30**	**40**	**70**
		% of GROUP	**100.0%**	**100.0%**	**100.0%**

- The values of CRP were 6.7% positive in sepsis developed group and 2.5% positive in non-sepsis group and hence values of CRP were not significantly positive in sepsis developing group than non-sepsis group
- The mean value of MCH in sepsis developed group was 35.3667 and non-sepsis was 35.1667.The independent T-test revealed a non-significant difference between sepsis and non-sepsis group with t value 0.196 and p-value 0.845 .

- The mean value of MCHC in sepsis developed group was 30.28 and non-sepsis was 31.13. The independent T-test revealed a non-significant difference between sepsis and non-sepsis group with t value 0.985 and p-value 0.328 .
- Platelet count's mean value in sepsis developed group was $17.35x10^4$ and non-sepsis was $22.0825x10^4$ .The independent T-test revealed a non-significant difference in platelet counts between sepsis and non-sepsis group with t-value 2.351 and p-value .022 .
- The mean value of ESR in sepsis developed group was 5.3333 and non-sepsis group 3.5750.The independent T-test revealed a non-significant difference between sepsis and non-sepsis group with t value 1.795 and p-value 0.077 .

Discussion

Neonatal septicemia remains in the forefront among highly morbid conditions among new borns. Various tests have been described to look for neonatal septicemia. Early diagnosis of neonatal septicemia provides an effective guideline in decision making regarding judicious use of antibiotics.

In our study of 70 neonates, 30 of them have shown culture positive ,with *Staphylococcus aureus* (25.8%) as the common organism. Other organisms grown were streptococcus spp 19.35%, non fermenting gram negative bacilli 16.17%. These organisms are known causes of other systemic infections like meningitis. *Staphylococcus aureus* is a very well known hospital pathogen with multidrug resistance .We have a very strong antenatal care system working for the welfare of pregnant women. The obstretic complications are higher ranked when compared to the hospital acquired infections which can be contracted in pregnancy. The profile of organisms in our study depicts hospital pathogens where in the source can be presumed to be the hospital during regular check ups.
In neonatology, tests that use hematological indices remain in widespread use, despite the continuing concerns about their reliability in diagnosing neonatal sepsis.[6] Low WBC count, low neutrophil count, low RBC count, elevated MCV values, low platelet count were observed in neonates with sepsis when compared to neonates without sepsis. Factors responsible for low WBC count, low neutrophil count, low RBC count, elevated MCV values, low platelet count in sepsis developed group are immaturity of the immune system, which include decreased phagocyte activity of white cells, decreased production of cytokines and weak cellular and humoral immunity.

ESR values and CRP though are said to be predictors of infection ,they are not significantly showing difference in sepsis developed group. This is because CRP level increases in within 6-10 hours in neonates after exposure to infection and peaks at 2-3 day followed by a decrease with favourable evolution. This might be the cause for getting CRP value positive in only 6.7% of cases in sepsis developed group

Though there are lots of confusions , the present trend which is being applied for infants who are suspected to have neonatal sepsis may lead to unnecessary and increased antibiotic consumption, a higher incidence of the side effects due to their use, increased resistance to the antibiotics, a longer hospitalization, the separation of the infants from their mothers and increased health costs. Therefore, using fast diagnostic methods including laboratory markers could be beneficial for the diagnosis of neonatal sepsis .[10] They would benefit from reliable tests in diagnosing sepsis early in its course.[6]
A practical septic screen for the diagnosis of sepsis has been described and some suggestions for antibiotic use have been included in the protocol.[11] The knowledge of the sensitivity and the resistance pattern of the microorganisms would help in choosing the empirical therapy.

Conclusion

The findings of the present study confirms that the cord blood culturing with total WBC count test are more reliable in the early diagnosis of neonatal sepsis. The cord blood can replaces the neonatal blood & use of it can avoid the complication of neonatal blood sampling procedure. Thus routine screening by using cord blood will help in reducing neonatal mortality and morbidity.

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