Original Research Paper

Volume - 14 | Issue - 08 | August - 2024 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Paediatrics

CORRELATION BETWEEN GASTRIC ASPIRATE POLYMORPHS AND NEONATAL SEPSIS.: A CROSS-SECTIONAL STUDY

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ABSTRACT **Background:** Neonatal septicaemia remains a significant cause of morbidity and mortality in newborn infants. Neonatal sepsis is difficult for diagnosing clinically because the symptoms and signs are not always readily apparent. Recently, microscopic appearances of fluid from gastric aspirate (GA) have been used as evidence of bacterial sepsis acquired in utero. Therefore, the present study was conducted to study the correlation between gastric aspirate polymorphs and neonatal sepsis. **Material and Methods:** The present study was observational cross-sectional study carried out at Department of Paediatrics of tertiary care centre during July 2023 to June 2024. A total of 102 neonates who had the clinical symptoms and signs of suspected neonatal sepsis admitted in hospital was included in the study population. Each patient was subjected to a detailed physical examination and history. Blood samples were taken at admission and subjected to TLC and CRP. Simultaneously, the blood sample for sensitivity and blood culture was taken. Simple, sterilized tubes containing the gastric aspiration were sent for cytology. The statistical software namely SPSS 22.0 used for the analysis of the data. **Results:** A total of 102 neonates were screened for neonatal sepsis among which majority of the patients were males 54 (52.94%). Among them 43 (42.16%) were term and 59 (57.84%) were preterm. The majority of neonates positive for CRP (70.58%) followed by GA polymorphs (65.68%), blood culture (54.91%) and TLC. (25.49%) GA polymorphs was found to be highly sensitive parameter. (96.43%) **Conclusion:** Gastric aspirate polymorphs as a screening tool for neonatal sepsis with good sensitivity and specificity serves as good tool for neonatal screening

KEYWORDS : Gastric aspirate polymorphs, Correlation, Sepsis

INTRODUCTION:

A severe bacterial infection during the first month of life can have pathophysiological implications that lead to a clinical illness known as neonatal sepsis. Due to delayed diagnosis, sepsis affects a significant percentage of newborns worldwide.[1,2] Neonatal septicaemia remains a significant cause of morbidity and mortality in newborn infants. In India, the incidence of neonatal sepsis ranges from 11.0 to 24.5/1000 live births.[3] Bacterial infections often present a diagnostic challenge in the resource-poor setting of most developing countries.

Mortality in early onset neonatal sepsis condition is much higher than in late onset sepsis. [4] In contrast to bacteraemia (bacteria in blood), septicaemia usually consists of bacteriemia plus a constellation of signs and symptoms caused by microorganisms or their toxic products in circulation. There may be progression of bacteriemia to septicaemia depending on clinical manifestations. Neonatal sepsis is a challenging clinical diagnosis to make as both signs and symptoms are not always apparent. There is no laboratory test with 100% sensitivity and specificity.[5,6]

Moreover, in many cases blood culture fails to detect the offending organism/bacteria. [1] So, the search for a reliable test continues, especially one that is useful in culture-negative cases. As the gold standard, isolating the pathogenic bacteria from blood provides the conclusive diagnosis. [2]

Recently, microscopic appearances of fluid from gastric aspirate (GA) have been used as evidence of bacterial sepsis acquired in utero. Blanc detected evidence of inflammation from a smear of the foetal surface of the placenta and presence of leucocytes in the GA of the foetus. [7] Bernirschke introduced the technique umbilical wall inflammation with infection through microscopic analysis on quickly frozen pieces of the cord. [8] Oliver proposed a link between the likelihood of the newborn becoming infected later on and the existence of polymorph nuclear cells in the GA.

[9] Thus, demonstration of bacteria and inflammatory cells in the GA on the first day of life (within an hour of life) may reflect maternal amnionitis. Therefore, it has been believed that gastric polymorphs indicate an intra-amniotic inflammatory response in fetuses. Examination of gastric contents is a rapid and reliable method of early diagnosis of neonatal sepsis, provided the aspiration is done within an hour of birth.[10]

Therefore, the aim of the present study was conducted to study the correlation between gastric aspirate polymorphs and neonatal sepsis.

Objectives:

1. To correlate the GA polymorphs with blood culture in early onset neonatal sepsis.
2. To compare GA polymorphs, TLC and CRP with blood culture in early onset neonatal sepsis.

Methodology:

Study Design: The present study was observational cross-sectional study.

Study Setting: The study was carried out at neonatal intensive care unit attached to Department of Paediatrics of tertiary care centre during July 2023 to June 2024.

Ethical Approval: The study was conducted after obtaining clearance from the Ethical Committee of the institute.

Sample Size: A total of 102 babies who had the clinical symptoms and signs of suspected neonatal sepsis/high risk factors for developing the sepsis during study period and fulfilling inclusion and exclusion criteria were included.

Inclusion Criteria:

- Neonates with age <3 days of life
- Neonates inborn or outborn with suspected sepsis and with high risk factors (antenatal, natal, postnatal).
- Willing to participate in the study.

Exclusion Criteria:

- Neonates with age >3 days of life
- Neonates having septic shock or rapidly deteriorating clinical condition
- Neonates weighing <1500 grams
- Neonates with history of severe perinatal asphyxia
- Neonates with any congenital malformations/chromosomal anomalies/congenital metabolic defects
- Neonates with family history of any immunodeficiency syndrome

Operational Definitions:

High risk factors: The high-risk factors included preterm neonates, with history of foetal distress, maternal history of leaking P/V (more than 18 hours), maternal fever, history of any maternal infection such as chorioamnionitis, urinary tract infections, difficult labors, or repeated obstetric operations.

Sepsis Screening Positive:
When Significant values for screening tests were taken as TLC of >25,000/ <5000 and CRP positive (>10 mg/L) and GA polymorphs >5 /HPF. Two or more positive tests indicate a sepsis screen positive.

Study Procedure:
A thorough history and physical examination were performed on every patient. At admission, a blood sample was obtained and tested for TLC and CRP. Simultaneously, the blood sample for sensitivity and blood culture was taken. Simple, sterilized tubes containing the gastric aspiration were sent for cytology. Within 12 hours of the neonate's birth, GA was drawn out via infant feeding tube and stored in a simple vial.

One drop of GA was mixed with one drop of methylene blue on a slide and covered with a cover slip. Slide was seen under microscope for polymorphs/HPF. Significant values for screening tests were taken as TLC of >25,000/ <5,000; GA polymorph >5/HPF and CRP >10mg/L. Two or more positive tests indicated a sepsis screen positive. Following sample collection, the neonates were started on empirical IV antibiotics. Blood culture was used as gold standard and the decision to continue antibiotics was taken depending upon the blood culture report. The statistical analysis was done using SPSS 22.0.

RESULTS:
A total of 102 neonates were screened for neonatal sepsis among which majority of the patients were males 54 (52.94%) The neonates were admitted to the NICU with clinical symptoms and signs of tachypnea, refusal to feeds, lethargy, jaundice, abdominal distention, convulsions, cyanosis, fever, and oliguria. Among them 43 (42.16%) were term and 59 (57.84%) were preterm.

Table 1: Distribution according to Ga Polymorphs, TLC, CRP and Blood Culture in Neonatal Sepsis:

Parameters	Positive (%)	Negative (%)	Total (%)
TLC	26 (25.49)	76 (74.51)	102 (100)
CRP	72 (70.58)	30 (29.42)	102 (100)
GA polymorphs	67 (65.68)	35 (34.32)	102 (100)
Blood Culture	56 (54.91)	46 (45.09)	102 (100)

It was seen that the according to parameters of neonatal screening for sepsis majority of neonates positive for CRP (70.58%) followed by GA polymorphs (65.68%), blood culture (54.91%) and TLC. (25.49%)

Table 2: Comparison of TLC with blood culture in neonates:

TLC	Blood Culture		Total
	Positive	Negative	
>25000 (Positive)	20	06	26
≤25000 (Negative)	36	40	76
Total	56	46	102

The comparison with TLC and blood culture shows, among 102 neonates, 20 (19.61%) of positive TLC were also found to be blood culture positive with a sensitivity of 35.71%. (Table 2)

Table 3: Comparison of CRP with blood culture in neonates:

CRP	Blood Culture		Total
	Positive	Negative	
> 10mg/L (Positive)	42	30	72
≤10 mg/ L (Negative)	14	16	30
Total	56	46	102

The comparison with CRP and blood culture shows, among 102 neonates, 42 (41.17%) of positive CRP were also found to be blood culture positive with a sensitivity of 75%. (Table 3)

Table 4: Comparison of CRP with blood culture in neonates:

GA polymorphs	Blood Culture		Total
	Positive	Negative	
>5/HPF (Positive)	54	13	67
≤5/HPF (Negative)	02	33	35
Total	56	46	102

The comparison with GA polymorphs and blood culture shows, among 102 neonates, 54 (52.94%) of positive GA polymorphs were also found to be blood culture positive with a sensitivity of 96.43%. (Table 4)

Table 5: Showing relation of Gastric aspirate polymorphs, CRP, TLC with blood culture:

Parameters	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
TLC	35.71	86.96	76.92	52.63	58.82
CRP	75.00	34.78	58.33	53.33	56.86
GA polymorphs	96.43	71.74	80.60	94.29	85.29

The relation of GA polymorphs, CRP, TLC with blood culture shows TLC was found to be least sensitive parameter in neonatal sepsis screening (35.71%). GA polymorphs was found to be highly sensitive parameter. (96.43%) Both CRP and GA polymorphs showed positive correlation with blood culture.

DISCUSSION:
Neonatal sepsis is a significant contributing factor to neonatal mortality. An early diagnosis not only helps in early institution of antibiotic therapy to reduce mortality due to neonatal sepsis but also helps in avoiding the unnecessary treatment of non-infected neonates. Although the blood culture is gold standard in diagnosis, it takes time and often complicated and has low yield. [11]

In the present study, a total of 102 neonates were screened for neonatal sepsis among which majority of the patients were males 54 (52.94%) The neonates were admitted to the NICU with tachypnea, resistance to feeding, lethargy, jaundice, abdominal distention, convulsions, cyanosis, fever, and oliguria as clinical symptoms and indicators. Among them 43 (42.16%) were term and 59 (57.84%) were preterm. Similar complaints were noted in the neonates in the study by Shah et al [12] like refusal to feed, lethargy, respiratory distress and temperature changes.

It was observed that majority of neonates positive for CRP (70.58%) followed by GA polymorphs (65.68%), blood culture (54.91%) and TLC. (25.49%) GA polymorphs was found to be highly sensitive parameter. (96.43%) while TLC was found to be least sensitive parameter in neonatal sepsis screening (35.71%).

In the present study, blood culture was positive among 54.91%. Similar findings were observed in a study done by Shah et al, [12] Tayal M et al [13] and Khatua SP et al [14] who revealed 59-82% blood culture positivity in neonatal sepsis.

In a study Garland and Bowman [15] assessed the usefulness of C-reactive protein (CRP) showed predicting the diagnosis of neonatal sepsis compared with routinely available markers of infection, the sensitivity for CRP was 67.0%, and the negative predictive value (NPV) was 86.0%. This finding was similar to present study. In a cross-sectional study conducted on 50 neonates by Morad et al., [16] CRP showed a sensitivity (89.5%), a specificity (66.7%), a PPV (92.5%), a NPV (60.0%), and a significant accuracy 86.0%. This was more than present study. Of the rapid diagnostic tests, CRP was found to be most useful when taken singly. Its elevation and returning to normal levels once the infection is controlled occurs in a matter of a few hours.

Studies done by Blanc WA. et al [8] and Vasan UN et al [17] have shown presence of polymorphs in GA to represent a foetal intra-amniotic inflammatory response. GA cytology is simple and can be done without specially trained staff even in rural hospital settings. This is of great importance in a developing country like ours with a high infection rate and limited resources. [11]

In the study done by Dinesh Chaudhary et al [18] gastric aspirate polymorphs show 87.5% sensitivity and 44.44% specificity with the culture proven sepsis. This result is similar to Chekkali et al [2] who found sensitivity and specificity of 72.72% and 17.85% respectively.
GA cytology is a good screening tool for neonatal sepsis added to a detailed perinatal history and clinical examination but does not completely substitute the present-day available screening parameters. The results of this study showed that early onset newborn sepsis can be diagnosed with the use of biochemical assays such as CRP and GA polymorphs.

CONCLUSION:
The present study concludes that GA cytology as a screening tool for neonatal sepsis with good sensitivity and specificity serves as good tool for neonatal screening added to a detailed antenatal history and clinical examination of the neonate.

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