ROLE OF GASTRIC ASPIRATE POLYMORPHS IN DIAGNOSIS OF EARLY ONSET NEONATAL SEPSIS

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ABSTRACT

INTRODUCTION

Neonatal sepsis is one of the major causes of morbidity and mortality in the newborn. Early diagnosis of neonatal septicemia is the cornerstone for the successful management and favorable outcome. It is a challenge because of non-specific symptoms and signs of neonatal sepsis. Gastric aspirate cytology has been used for the diagnosis of neonatal infection. The presence of more than five polymorphs per high power field correlate with neonatal infection. The objective of the study was to study correlation between positive gastric aspirate and development of early onset neonatal sepsis.

MATERIAL AND METHODS

This is a prospective-hospital based cross-sectional study conducted at Neonatal Intensive Care Unit (NICU) of Department of Pediatrics, Manipal Teaching Hospital, Pokhara, Nepal from November 2017 to May 2019. A total of 96 cases who were admitted in NICU suspected with early onset neonatal sepsis (EONS) were included in the study. Under all aseptic conditions, nasogastric tube was inserted and gastric fluid was collected and sent to the pathology department. All slides were stained with Leishman's stain and then examined for the presence of neutrophils under light microscope.

RESULTS

Out of 96 neonates, 24 were blood culture positive and 72 were culture negative. Gastric aspirate examination was positive in 61 patients and negative in 35 patients. Gastric aspirate was more positive in term and normal birth weight babies. Among 61 gastric aspirate positive cases, 21 were blood culture positive and 40 were culture negative (p=0.005). Among other acute phase reactants, gastric aspirate had highest sensitivity (87.5%).

CONCLUSION

The present study concludes that gastric aspirate polymorphs are good screening tool in the early detection of early onset neonatal sepsis in a resource limited settings.

KEYWORDS

Blood culture, Early onset neonatal sepsis (EONS), Gastric aspirate (GA) polymorphs

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INTRODUCTION

Sepsis, an important cause of morbidity and mortality among newborn infants, is responsible for about 30-50% of the total neonatal deaths in developing countries.[1] It is estimated that 20% of all neonates develop sepsis and approximately 1% die of sepsis related causes.[2] However, the incidence varies with the geographical area, the socio-economic status and various practices in the perinatal period.[3] The incidence is even higher in developing countries like Nepal, where the facilities for newborn care is limited.

Sepsis is defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.[4] Neonatal sepsis is diagnosed when generalized systemic features of sepsis are associated with growth of bacteria from one or more sites.[5] Sepsis related morbidity and mortality is largely preventable with rational antimicrobial therapy and aggressive supportive care.

To diagnose septicaemia, various investigations are performed such as complete blood count, C-reactive protein (CRP), gastric aspirate for polymorphs, blood culture, immature to total neutrophil (I:T) ratio, urine culture, lumbar puncture, micro erythrocyte sedimentation rate (ESR) and high vaginal swab. Blood culture is the gold standard for diagnosis of septicaemia and should be performed in all cases of suspected sepsis prior to starting antibiotics. A positive blood culture is the best guide to antimicrobial therapy.[6]

Examination of gastric aspirate has been used in the newborn for diagnosis of neonatal infection. The presence of more than five polymorphs per high power field is correlated with increased risk of neonatal infection. Gastric fluid sample represent amniotic fluid protected from vaginal contamination. Gastric aspirate polymorphs have been assumed to represent intra amniotic fetal response to inflammation.[7]

This test is simple, easy, quick, cheap and can be performed in a short period of time. This may be of great importance in our country due to higher infection rate and limited resources. Early diagnosis of neonatal sepsis helps to decrease morbidity and mortality as well as decrease the financial burden of the hospital stay.

MATERIAL AND METHODS

This is a prospective hospital-based cross-sectional study conducted at Neonatal Intensive Care Unit (NICU) of Department of Pediatrics, Manipal Teaching Hospital, Pokhara, Nepal from November 2017 to May 2019. A total of 96 cases who were admitted in NICU suspected with EONS were included in the study. Babies with congenital anomalies, chromosomal abnormalities, babies who had already received antibiotics and mothers not willing to give consent were excluded from the study. Written consent was obtained from parents of neonates and the study was approved by institutional ethical committee (Ethical clearance certificate dated 11.12.2017).

Neonates suspected of having sepsis were admitted in NICU, Department of Pediatrics, Manipal Teaching Hospital (MTH). Under all aseptic conditions, nasogastric tube was inserted and gastric fluid was collected and sent to the pathology department. A slide was made from gastric aspirate material by putting a small drop of gastric fluid roughly measuring 1.0 cm from one end of the slide. Then with the help of another slide this drop was spread over the slide and allowed to be air dried. This was done without any use of fixative. All slides were stained with Leishman's stain and then examined for the presence of neutrophils under microscope. Under the light microscope, total number of polymorphs per high power field were counted. We considered positive gastric aspirate when more than 5 polymorphs were seen per high power field. The data collected was entered and analysed by using Standard Computer Program Software (SPSS) version 25.0. Discrete variables were expressed as percentages. Chi-square test was applied wherever necessary to find out association between variables. A *p* value of ≤0.05 was taken to be statistically significant.

RESULTS

A total of 96 cases admitted in NICU of MTH during the study period suspected with early onset neonatal sepsis were enrolled in the study. Among them, 42 (43.8%) were term and 54 (56.3%) were preterm. Among 96 cases 24 (25%) cases were blood culture positive and 75% were culture negative. Those cases were confirmed cases of sepsis. In this study, 9 (21.4%) cases were culture positive among 42 term babies and 15 (27.8%) cases culture positive among 54 preterm babies. This shows the rate of culture positive cases is higher in preterm babies. Among 96 cases, 61 (63.5%) cases were gastric aspirate polymorphs positive and 36.5% cases were negative. Gastric aspirate polymorphs were positive in 28 (66.7%) term babies (among 42 term) and 33 (61.1%) cases were positive in preterm babies (among 54 preterm). It shows gastric aspirate for polymorphs were more positive in term babies. However, *p* value for this test was 0.575 which was statistically insignificant.

Among 96 cases (Table 1), 34.4% of positive GA polymorphs were also found to be blood culture positive. It could also be seen that GA polymorphs have a sensitivity of 87.5%, and a positive predictive value of 34.4% with blood culture. The *p* value for this test was 0.005 which was statistically significant.

Table 1. Comparison of Gastric aspirate polymorphs with blood culture in EONS

Gastric aspirate polymorphs (n)	Blood culture	
	Positive	Negative
Positive (61) (≥5/hpf)	21 (True positive)	40 (False positive)
Negative (35) (<5/hpf)	3 (False negative)	32 (True negative)
Total = 96	24	72

p value = 0.005

GA polymorphs (Table 2) have 87.5% sensitivity with blood culture which was highest among other acute phase reactant (CRP, I:T ratio, platelet count, TLC, ANC). It also has specificity of 44.44%, positive predictive value (PPV) of 34.4%, and negative predictive value (NPV) of 91.4%.

Table 2. Relation of gastric aspirate polymorphs, CRP, I:T ratio, TLC, ANC, platelet count with blood culture

	Blood Culture					
	Positive (%)	Negative (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
GA polymorphs	34.4	65.6	87.5	44.44	34.4	91.4
CRP	36.6	63.4	45.8	73.6	36.6	80.3
I:T ratio	42.8	57.2	37.5	83.3	42.8	80
Platelet count	19.35	80.65	25	65.2	19.35	72.3
TLC	100	0	4.16	100	100	75
ANC	100	0	4.16	100	100	75

DISCUSSION

Neonatal septicemia is a leading cause of mortality and morbidity in neonates. An early diagnosis not only helps in early institution of antibiotic therapy to reduce mortality but also helps in avoiding the unnecessary treatment of non-infected neonates. Although the blood culture is the gold standard in diagnosis, it takes time and has low yield.[8] Gastric aspirate cytology is simple and can be done without specially trained staff even in rural hospital settings in very short period of time (few minutes). This is of great importance in a developing country like ours with a high infection rate and limited resources.

In this present study, blood culture positivity was found to be 25%. Our study was comparable with Thomas et al (26.7%) which showed similar finding, however other authors reported finding higher than ours.[9] Chekkali et al, Guha et al and Rao et al reported the rate of blood culture positivity found to be 44%, 40% and 40% respectively.[10-12] In the present study, positivity of GA polymorphs was 63.5% in suspected EONS which is similar to studies conducted by Jeoung et al (75%)[13] and Chekkali et al (78%).[10] This shows that in newborn, if gastric aspirate examination is positive than neonate will have increases chances of early onset septicemia.

In this study, gastric aspirate polymorphs show 87.5% sensitivity and 44.44% specificity with the culture proven sepsis. This result is similar to Chekkali et al[10] who found sensitivity and specificity of 72.72% and 17.85% respectively. In this study, 21 (34.4%) cases were blood culture positive among 61 gastric aspirate polymorphs positive cases and 3 (8.6%) cases were blood culture positive among 35 gastric aspirate polymorphs negative cases and 32 (91.4%) were culture negative among gastric aspirate negative cases. *p* value for this test was 0.005 which is statistically significant. Similar result was noticed in the study done by Kumar et al with a *p* value of 0.00001.[14] Hence, from this study, gastric aspirate polymorphs can be regarded as an early marker for the diagnosis of EONS.

CONCLUSION

After comparison with the blood culture positive sepsis and acute phase reactant, gastric aspirate polymorphs can be considered as an early marker in the diagnosis of EONS. Hence, gastric aspirate polymorphs can be taken as an early marker in the diagnosis of EONS as this test is simple, easy, quick and cheaper and can be performed in a short period of time in a basic laboratory settings.

CONFLICT OF INTEREST

None

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