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Original Research Article

Clinical profile of sepsis and choice of antimicrobials in babies admitted to special newborn care unit Kalaburagi

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ABSTRACT

Background: Sepsis is one of the common clinical conditions seen in neonates. Sepsis being major cause of neonatal morbidity and mortality in neonates, early recognition and treatment with antibiotics remains a mainstay of NICU protocols for neonatologists.
Methods: It is a hospital based retrospective study conducted from July 2019 to February 2020 in GIMS, Kalaburagi. Neonates with suspicion of clinical sepsis were investigated for complete blood count (CBC), C-reactive protein (CRP) and blood culture (BC). Antibiotics were started based on CBC and CRP reports, or on high index of clinical suspicion. Based on common organisms isolated in previous 3 months statistics, antibiotics were decided. On confirmation by blood culture, antibiotics were changed as per blood culture report.
Results: Out of 100 neonates, CRP was positive in 80 (70%) neonates, BC showed growth among 24 (24%) neonates. Although neonates had clinical sepsis, CRP was negative in 20 (10%), 76 (76%) did not show any kind of growth on BC. Mortality was seen in 04 (5%) neonates with only CRP positive, 02 (08%) neonates with only BC growth, 02 (10%) neonates with both CRP positive and BC growth, 02 (03%) neonates with CRP positive but no growth on BC. Clinical features were from subtle to severe.
Conclusions: Although CRP and blood culture confirmation remains one of the main diagnostic parameter in sepsis, as mortality is seen among neonates with negative blood parameters, high index of clinical suspicion is essential to treat sepsis at an early stage.

Keywords: CRP, BC, Sepsis, Neonates, CBC

INTRODUCTION

Sepsis is one of the common causes of morbidity and mortality in neonates admitted to SNCU (special newborn care unit).[1]It includes various non-specific presentations such as fever, respiratory distress, lethargy, irritability, convulsions, bulging fontanels, refusal to feed, jaundice, bleeding, abdominal distension and temperature dysregulation. It includes systemic infections such as pneumonia, septicemia and meningitis.[2] It is classified as early onset sepsis (occurring within 72 hours of life) and late onset sepsis (occurring after 72 hours of life).[3]

Source of early onset sepsis is usually maternal genital tract. For late onset sepsis, source is from the health care providers and the nursing environment.[4] Sepsis commonly occurs due to poor hygiene and lack of infection control measures. Mortality can be prevented by early recognition of sepsis, rational antibiotics and good supportive care.

Aims and objectives

The aim and objectives were to know the clinical profile of sepsis in neonates admitted to NICU and to reduce the morbidity and mortality of neonates by early start and choice of antimicrobial treatment in sepsis based on previous statistics.

METHODS

Study design was of hospital based retrospective study. The study was carried out from July 2019 to February 2020. Study conducted at NICU, Gulbarga institute of medical sciences hospital Kalaburagi.

Inclusion criteria

All neonates with clinical suspicion of sepsis were included in the study.

Exclusion criteria

Neonates with congenital anomalies, neonates with suspected IEM and neonates with congenital heart disease were excluded from the study.

All clinically suspected sepsis neonates were investigated for complete blood count (CBC), C-reactive protein (CRP) and blood culture. Empirical antibiotics were started based on screen reports of CBC, CRP or high index of suspicion of clinical sepsis. Antibiotics were selected based on most common organism isolated in previous 3 months statistics. Antibiotics were grouped into first line, second line and third line based on previous statistics. Double antibiotic regimen covering gram positive organism and gram-negative organism was chosen. First line antibiotics were injection amoxycillin with potassium clavulanate and injection amikacin. Second line drugs were injection meropenem and injection netilmycin as most of previous month statistics showed *Klebsiella pneumonia* growth on blood culture which were sensitive to injection meropenem. Third line drugs were decided on specific present blood culture reports or drugs such as injection colistin, injection tigecycline were administered if either blood culture proved their sensitivity or if there was no clinical improvement on second line of drugs.

Sample size

Sample size was 100. It is calculated based on statistics of blood culture positivity (20%) and apnea incidence (30%) among low CRP neonates in previous studies, formula $4PQ/L^2$ is used.

Statistical analysis

Statistical analysis done using SPSS software. Ethical approval taken.

RESULTS

Out of 100 clinically suspected neonates, there were 60 male neonates and 40 female neonates (Table 1).

CRP was positive in 80 (70%) neonates, blood culture showed growth among 24 (24%) neonates. Although neonates had clinical sepsis, CRP was negative in 20 neonates (10%), 76 (76%) neonates did not show any kind of growth on blood culture (Table 2).

CRP Positive with positive blood culture growth was seen among 20 neonates (20%) and no growth on blood culture was seen among 60 neonates (60%), CRP negative with positive blood culture growth was seen among 04 neonates (04%) and no growth on blood culture was seen among 16 neonates (16%) (Table 3).

Tables 1: Demographic details.

Gender	Numbers
Male neonates	60
Female neonates	40

Table 2: CRP and blood culture results, (n=100).

Parameters	Clinical suspect sepsis (%)
CRP positive	80 (80)
CRP negative	20 (20)
Blood culture growth present	24 (24)
Blood culture-no growth	76 (76)

Table 3: Relation between CRP and blood culture.

Parameters	Clinical suspect sepsis (%)
CRP positive with positive blood culture growth	20 (20)
CRP positive with no growth on blood culture	60 (60)
CRP negative with positive blood culture growth	4 (4)
CRP negative with no growth on blood culture	16 (16)

Table 4: Clinical features relation with CRP (CRP>6 is positive).

Clinical features	CRP -ve, n=20 (%)	CRP + ve, n=80 (%)
Fever (Temp. above 30^0 C)	5 (25)	35 (43)
Apnea / bradycardia	6 (30)	28 (35)
Abdominal distension	1 (5)	8 (10)
Tachycardia	6 (30)	40 (50)
Hyper / hypoglycemia	3 (15)	25 (31)
Septic shock	2 (25)	25 (31)

Clinical features were from subtle to severe. Fever was seen in 5 neonates (25%) with CRP negative report and in 35 neonates (43%) with CRP positive report. Apnea was observed in 6 neonates (30%) with CRP negative report and in 28 neonates (35%) with CRP positive report. Abdominal distension was observed in 1 neonate (5%) with CRP negative report and in 8 neonates (10%) with CRP positive report. Tachycardia was seen in 6 neonates (30%) with CRP negative and in 28 neonates (35%) with CRP positive. Hyper/ hypo-glycaemia was seen in 3 neonates (15%) with CRP negative and in 25 neonates (31%) with CRP positive. Septic shock was seen in 2 neonates (25%) with CRP negative and in 25 neonates (31%) with CRP positive (Table 4).

Mortality was observed in 04 (5%) neonates with only CRP positive reports, 02 (08%) neonates with only blood culture growth positive, 02 (10%) neonates with both CRP and blood culture growth positive, 02 (03%) neonates with CRP positive but no growth on blood culture (Table 5).

Table 5: Outcome of neonates with sepsis.

Parameters	Survival outcome (%)	Mortality outcome (%)
Neonates with CRP positive	76 (95), n=80	4 (5)
Neonates with positive growth on blood culture	22 (91), n=24	2 (8)
Neonates with CRP positive and positive growth on blood culture	18 (90), n=20	2 (10)
Neonates with CRP positive and no growth on blood culture	58 (97), n=60	2 (3)
Neonates with CRP negative and positive growth on blood culture	4 (100), n=4	0
Neonates with CRP negative and no growth on blood culture	16 (100), n=16	0

DISCUSSION

Neonatal sepsis is cause of substantial morbidity and mortality. Clinical manifestations range from subclinical infection to severe systemic disease. Males (60%) were reported to be more likely than females (40%) in our study. Faridi et al reported 66.7% males and 33.3% females in their study.[7]

In our study, subtle clinical features like fever, apnea, tachycardia in clinically suspected CRP negative neonates was 25%, 30%, 30% respectively. Whereas Lai et al in their study showed neonates with low CRP had 40%, 60%, 22% respectively.[8] However from these values, it is observed that there is evidence of clinical features even if CRP was low/ negative. Hence this must be taken as a high index of clinical suspicion to initiate early treatment.

Our study showed 80% CRP positive neonates and 24% blood culture positive neonates. Monga et al showed that 47% neonates were blood culture positive and 70 % were CRP positive.[9]

In our study out of 24 blood culture positive samples, 20 (83%) were CRP positive which was similar to study done by Abhay et al, Goswami y et al and Hisamuddin et al which showed out of 53 blood culture positive samples, 46 (86.7%) were positive for CRP.[10-12]

Survival outcome of neonates in our study was above 90% in all groups irrespective of CRP and blood culture positivity, this can be attributed to the benefit of early start of antimicrobials based on high index of clinical suspicion.

This study helps us to understand the distribution of sepsis in NICU, hence instead of waiting for blood culture report which would take 7 days, if clinical signs are evident with positive CRP, based on common organisms isolated in previous statistics of same NICU, decision on antimicrobials can be made wisely without any hinderance and delay in treatment.

Many of overcrowded NICU's could follow the same strategy which could benefit the survival of neonates in terms of sepsis.

Limitations

This study has been limited to only CBC, CRP as screening lab parameters of sepsis. Follow up outcome of the sepsis treated babies is also the limitation.

CONCLUSION

Although CRP and blood culture confirmation remains one of the main diagnostic parameters in sepsis, as mortality is seen among neonates with negative blood parameters, high index of clinical suspicion is essential to treat sepsis at an early stage.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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