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Study of Etiology, Risk Factors, Clinical Features and Outcome in Blood Culture Proven Late Onset Septicemia

Medical Science

KEYWORDS : late onset septicemia, blood culture, preterm

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ABSTRACT

Objectives: *To find out incidence, etiology, risk factors, clinical profile and outcome in blood culture proven late onset septicemia patients.*

Study Design: *Retrospective observational study*

Setting: *NICU of a tertiary care centre Ahmedabad*

Subjects: *Out born patients of blood culture proven late onset septicemia*

Study Period: *1st April 2015 to 30th September 2015*

Results: Total 84 patients included in study. Preterm neonates are more affected. Meningitis is the commonest mode of clinical presentation. Gram negative Klebsiella pneumoniae is the most common organism isolated. 59.5 % were discharged, 8.3 % had taken DAMA and 32.14 % were expired. Bacteremia without focus due to multi-organ failure was the commonest cause of death. Mortality was highest amongst sepsis with gram negative organisms.

Conclusion:

Neonatal septicemia is important cause of neonatal mortality; hence all the efforts should be targeted towards controlling infection in the ailing neonate.

Introduction:

Neonatal sepsis is a clinical syndrome of bacterial infection characterized by signs and symptoms of systemic involvement during the first month of life.[1,2] Sepsis occurring in the first 3 days of life is called as early onset sepsis (EOS) and one occurring after 3rd day of life till 1 month is late onset sepsis (LOS).[2,3]

Pathogens responsible for EOS are mostly from vertical transmission while late onset neonatal sepsis is caused by horizontal transmission. The microorganisms change from one to other region and with the passage of time.[4,5]

Neonatal sepsis is an important and common cause of morbidity and mortality in full term as well as preterm neonates.[6] Sepsis is the commonest cause of neonatal mortality; responsible for about 30-50% of the total neonatal deaths in developing countries.[7]

The current study was conducted in order to know the incidence, pattern of etiological bacterial pathogens, risk factors, clinical profile, and outcome in blood culture proven late onset septicemia patients in our tertiary level hospital.

Methodology:

This retrospective study was carried with informed consent among out born neonates admitted in our NICU with clinical presentation of late onset septicemia whose blood culture was positive, during the period of 6 months from 1st April 2015 from 30th September 2015.

Results and Discussion:

Total no of NICU admission during my study period was **1647**, out of which total no of out born neonates were 984. There were total 728 cases of septicemia which included early and late onset sepsis and clinical and blood culture proven sepsis. **84** neonates fulfilled the inclusion criteria and were included in my study. Thus the incidence of blood culture proven late onset septicemia in out born neonates is 5 % of total NICU admission. The incidence of neonatal sepsis according to the data from National Neonatal Perinatal Database (NNPD 2002-03) is 30 per 1000 live births while in developed countries it is 1 to 10 per 1000 live births.[7]

Table 1: Comparative Studies Showing the Distribution of Culture Positivity in Sepsis

Author	Year	Total culture positive	Early onset sepsis	Late onset sepsis
Present study	2015	-	-	84 (11.5%)
NNPD 2002 [7]	2002	1248	67%	33%
NNPD 2000 [7]	2000	793	69.8%	30.2%

In present study, blood culture positive cases of late onset septicemia in out born newborn were 11.5 %. The variations in the results in NNPD 2002 and 2000 may be due to large no. of patients were studied in NNPD 2000 and 2002 while in present study no. of patients were less as compare to them.[7]

Among gender distribution as such there is no sex preference for sepsis, but in present study 48 (57.2%) were male while 36 (42.8%) were female. The M: F ratio is 1.3:1.

Septicemia was seen more commonly in low birth weight 63 (75%) and preterm 52 (61.9%) neonates and are important risk factors for septicemia. The incidence of septicemia is inversely proportional to birthweight and gestational age of the neonates. Late onset septicemia presented with meningitis mostly has history of prelacteal feed or mismanaged feeding. Many patients have more than one risk factor.[8]

Table 2: Gestational age

Gestational age	No of neonates (n=84)	Percentage (%)	Chudgar et al [14]	Shah CP et al [15]
Preterm (<37weeks)	52	61.9 %	52.6 %	51.4 %
Term	32	38.1 %	47.4 %	48.6 %

Thus preterm neonates were found to be more affected with sepsis. The results of present study were comparable to other studies.

Preterm neonates are more susceptible to infections due to lack of inherent defensive mechanism, both humeral and cellular defense mechanism and due to low lysozyme level and low birth weight.[10,11,12]

In addition, there is lack of resistance. Bacteriostatic and bactericidal activity of blood serum is less vigorous then mature babies. Their white blood corpuscles phagocytize bacteria less efficiently than do those of matured infants. They have been deprived of some maternal antibodies that would normally cross placenta in last trimester. The preterm babies also does not manufacture antibody in response to injection of antigen to the same degree as does the matured infants.[10,11,12]

Table 3: Clinical Features- Symptoms

Symptoms	Present study (n=84)	Chudgar HH et al [14]	Shah CP et al [15]
Refusal to feed	65 (77.38%)	84%	80%
Lethargy	57 (67.85%)	42%	40%
Fever	50 (59.52%)	44%	30%
Excessive crying	40 (47.62%)	21%	25%
Convulsion	38 (45.24%)	28%	30%
Abdominal distension	35 (41.66%)	18%	20%
Vomiting	33 (39.28%)	26%	21%
Diarrhea	28 (33.33%)	13%	10%
Jaundice	22 (26.19%)	25.4%	40%

In the present study refusal to feed and lethargy were the most common complaints given by mother. Results were similar and comparable with other studies. Change in the feeding pattern, refusal to feed, inattention and lethargy during feeding are the earliest and most common indicator of sepsis.[9]

Table 4: Clinical features- Signs

Signs	**Present study (n=84)**	**Chudgar HH et al [14]**	**Shah CP et al [15]**
Increased respiratory rate	55 (65.47%)	34%	60%
Tachycardia	51 (60.71%)	58%	57%
Hypothermia	30 (35.72%)	13%	36%
Sclerema	29 (34.52%)	23%	36%
Apnoea	24 (28.57%)	21%	20%
Petechiae	22 (26.19%)	19%	6%
Cyanosis	20 (23.81%)	15%	11%
Mottling	18 (21.42%)	16%	14%
Bulging AF	11 (13.09%)	11%	9%
Pallor	8 (9.52%)	5%	7%

In present study commonly observed signs were increased respiratory rate and tachycardia which is comparable to other studies. The early clinical features of sepsis are often subtle and nonspecific and require a high index of suspicion for early diagnosis supported by laboratory investigations.[9]

Table 5: Clinical diagnosis among late onset septicemia

Clinical Diagnosis	**No of term neonates (n=32)**	**No of preterm neonates (n=52)**	**Total no of neonates (n=84)**
Bacteremia without focus	8 (25 %)	10 (19.2%)	18 (21.42%)
Pneumonia	4 (12.5%)	8 (15.4%)	12 (14.28%)
Meningitis	11 (34.4%)	17 (32.7%)	28 (33.33%)
Umbilical Sepsis	4 (12.5%)	3 (5.8%)	7 (8.33%)
NEC	3 (9.4%)	13 (25%)	16 (19 %)
Septic Arthritis	2 (6.3%)	1 (1.9%)	3 (3.57%)

Meningitis was the commonest mode of clinical presentation. Sepsis especially meningitis, pneumonia and NEC was seen predominantly in preterm neonates.

Table 6: Prevalence of Bacterial Isolate in Blood Culture Positive Late onset Septicemia

Bacterial isolates	Present study (n=84)	NNPD 2000 [7]	Shah CP et al [15]
Gram positive isolates	30 (35.71%)	42%	48%
Staphylococcus aureus	8 (9.5 %)	17.5%	20%
Coagulase negative staphylococcus	22 (26.2%)	18%	21%
Gram negative isolates	54 (64.28%)	58%	52%
Klebsiella pneumoniae	30 (35.7%)	31.2%	20%
Pseudomonas aeruginosa	4 (4.76 %)	8%	8%
Escherichia coli	10 (11.9%)	6.8%	40%
Enterobacter	1 (1.2 %)	4.9%	-
Acinetobacter	1 (1.2 %)	4.9%	-
Fungal isolates	8 (9.52%)	-	-
Candida spp.	8 (9.52%)	-	-

In the present study Gram negative isolates were most common amongst which Klebsiella pneumoniae is the most common organism isolated, which is comparable with the studies conducted by NNPD 2000 and Shah CP et al.

Among Gram positive isolates Coagulase negative staphylococcus was commonly found. In the present study, 9.5 % of bacteria were Staphylococcus aureus as compared to 17.5% isolates in NNPD 2000.[7] There is always a changing pattern of bacterial isolates from time to time and at different places with changing resistance pattern.[5] The neonatal unit should design the antibiotic policy according to prevalence of bacterial isolates in there NICU.[13]

Table 7: Outcome of Late onset Septicemia

Outcome	No of Term neonates (n=32)	No of Preterm neonates (n=52)	Total no of neonates (n=84)	Percentage (%)
Discharge	21	29	50	59.5 %
DAMA	2	5	7	8.3 %
Expiry	9	18	27	32.14 %
Total	32	52	84	100 %

Mortality was seen more in preterm neonates.

Table 8: Correlation of Clinical Diagnosis with Mortality in Late Onset Sepsis

Clinical Diagnosis	Cases	Mortality
Bacteremia without focus	18	8 (44.5 %)
Pneumonia	12	4 (33.3 %)
Meningitis	28	8 (28.6 %)
Umbilical Sepsis	7	-
NEC	16	7 (43.7 %)
Septic Arthritis	3	-

Bacteremia without focus due to multi-organ failure was the commonest cause of death with 44.5% risk of mortality.

Table 9: Correlation of Bacterial Isolate with Mortality in Late Onset Sepsis

Bacterial isolates	Cases	Mortality
Gram positive isolates	30	8 (26.7%)
Staphylococcus aureus	8	2 (25 %)
Coagulase negative staphylococcus	22	6 (27.3 %)
Gram negative isolates	54	19 (35.2 %)
Klebsiella pneumoniae	30	14 (46.7 %)
Pseudomonas aeruginosa	4	1 (25 %)
Escherichia coli	10	3 (30 %)
Entero bacter	1	0
Acinetobacter	1	0
Fungal isolates	8	1 (12.5 %)
Candida spp.	8	1 (12.5 %)

Mortality was highest amongst sepsis with gram negative organ-

ism and Klebsiella and E.coli being commonest organism causing mortality.

Conclusion:

Neonatal septicemia is no doubt an important cause of neonatal mortality regardless of the onset of sepsis and hence all the efforts should be targeted towards controlling infection in the ailing neonate. Prematurity and low birth weight is important risk factors making a neonate susceptible to sepsis.

Meningitis and then bacteremia without focus were the commonest mode of clinical presentation in late onset sepsis. The symptoms and signs of septicemia are not always pointing towards particular system involvement and are non-specific; hence a careful observation of the neonate can give clue towards early diagnosis. Acting before the disease spreads is most crucial for increasing survival rate.

In blood culture proven late onset sepsis, Gram negative isolates were most common amongst which Klebsiella pneumoniae is the most common organism isolated. However, Staphylococcus aureus was also found to be isolated so we should not neglect gram positive organisms like Staphylococcus aureus and the neonatal unit should design the antibiotic policy according to prevalence of bacterial isolates in there NICU.

Mortality was highest amongst sepsis with gram-negative organisms and Klebsiella and Pseudomonas aeruginosa being commonest organism causing sepsis.

Bacteremia with multiple organ dysfunctions was the commonest cause of death. High index of clinical suspicion with early institution of empirical therapy in suspected cases and a good supportive care and aseptic precautions can help in decreasing sepsis to improve neonatal outcome.

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