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ORIGINAL RESEARCH

A study on clinical profile of neonates with septic shock admitted at a tertiary care hospital

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ABSTRACT

The incidence of sepsis is higher in very low birth weight infants, ranging from 1.9% to 21% depending on age of onset of sepsis. Reported fatality rates range from 10% to 18% depending on birth weight and age at onset of sepsis. Mortality rate of 10% to 40%, account for to 7% of all deaths among neonates annually (1, 4). In neonates, it is generally accepted that septic shock is also associated with high mortality and morbidity, but very few data on its epidemiology are available in the literature.

This was hospital based prospective observational study undertaken in term neonates who survived septic shock at the time of discharge and at 3 months of age. A total of 51 term neonates who met the inclusion and exclusion criteria were studied, of these 51% were males and 49% were females, mean weight of the subjects was 2.4 kg, among the neonates who had moderate neurological impairment at 3 months 7 were less than 2.5 kg and 8 were more than 2.5kg, 71% were inborn and 29% were outborn. Among the antenatal risk factors, 2 neonates with maternal anemia, 4 neonates with maternal PIH, 1neoante with maternal fever, 1 neoante with maternal chorioamnionitis had moderate neurological impairment at 3 months of age.

Key words: Clinical profile, neonates, septic shock

INTRODUCTION

Neonatal sepsis is a clinical syndrome in an infant 28 days of life or younger, manifested by systemic signs of infection and isolation of a bacterial pathogen from the bloodstream. A consensus definition for neonatal sepsis is lacking (1).

According NNPD (Neonatal perinatal data) the incidence of sepsis is 30 per 1000 live births [1].

A number of bacterial and nonbacterial agents may infect newborns in the intrapartum or postpartum period. Any microorganism inhabiting the genitourinary or lower gastrointestinal tract may cause intrapartum and postpartum infection. The most common bacteria are group B streptococcus (GBS) in west, Escherichia coli, and Klebsiella spp. Salmonella spp. are common causes of gram-negative sepsis in developing countries [2].

The incidence of meningitis is 0.3-3 per 1,000 live births in newborn infants and is higher in preterm infants. The most common bacterial causes of late onset sepsis are GBS, E. coli, and L. monocytogenes. *S. pneumoniae*, other streptococci, non typable *H. influenzae*, both coagulase-positive and coagulase-negative staphylococci, Klebsiella, Enterobacter, Pseudomonas, Treponema pallidum, and Mycobacterium tuberculosis infection involving the central nervous system (CNS) may also result in meningitis [3].

Early-onset sepsis is defined as the onset of symptoms before 72 hours of age, The incidence of culture-positive sepsis was 62%, of these Nearly two-thirds of cases occurred at or before 72 h of life (2). The fetus or neonate is not exposed to pathogenic bacteria until the membranes rupture and the infant passes through the birth canal and/or enters the extrauterine environment. Birth canal is colonized with aerobic and anaerobic organisms that may result in ascending amniotic infection and/or colonization of the neonate during birth [4].

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Late-onset sepsis is generally defined as the onset of symptoms at ≥72 hours upto 30 days of life Late onset sepsis the majority two thirds of causative organisms are gram negative organisms like klebsiella, ecoli, enterobacter, citrobacter, salmonella, pseudomonas sp., serratia, gram positive organisms like staphylococci, streptococci, coagulase negative staphylococci, coagulase positive staphylococci contribute to rest [5, 6].

METHODOLOGY

TYPE OF STUDY

PROSPECTIVE OBSERVATIONAL STUDY

INCLUSION CRITERIA

1) Neonates with positive sepsis screen with positive blood culture and have signs of shock.

EXCLUSION CRITERIA

1) Neonates with major congenital malformations.
2) Neonates who have died.
3) Neonates with Negative blood culture.
4) Neonates who have lost followup.

SAMPLE SIZE: Based on the previous studies the proportion of adverse outcome in neonates with septic shock was 52%, so to estimate the true proportion with 95% confidence and 5% error we require minimum of 50 neonates with septic shock.

n = z2 p(1-p) /d2
z = 95% confidence
1.96
p = Proportion of adverse outcome 0.52 (52%)
d = 0.15 (15%).

METHOD OF COLLECTION OF DATA

Neonates with total leukocyte count less than 5000 cells/mm3 or more than 20000 mm3, absolute neutrophil count of less than 1800/mm3, immature to total neutrophil count (I/T ratio of more than 0.2), positive CRP, and micro ESR 15 mm or more in the first hour, presence of any two among these is taken as sepsis screen positive, neonates with positive sepsis screen taken as probable sepsis, neonate with probable sepsis and having hypotension, were included in study and later excluded if blood culture was negative, and among the neonates who developed shock 2d echo was done to rule presence of any congenital heart disease, neonates with congenital heart disease were excluded.

Blood culture was taken for all the neonates with probable sepsis using aseptic precautions wiping the Venepuncture site using sterilium betadine sterilium, and 1 ml of blood was taken in sterile syringe and culture was sent in BACT/ALERT culture broths.

RESULTS

Table 1: Baseline patient characteristics

Patient characteristics	HINE		*P*-value
	41-60 n (%)	>60 n (%)	
Male	7 (26.9)	19 (73.1)	0.691
Female	8 (32.0)	17 (68.0)	
<2.5 kg	7 (35.0)	13 (65.0)	0.482
>2.5 kg	8 (25.8)	23 (74.2)	
Inborn	10 (27.8)	26 (72.2)	0.692
Outborn	5 (33.3)	10 (66.7)	
Anaemia	2 (7.60)	8 (92.40)	0.466
PIH	4 (36.4)	7 (63.6)	0.568
GDM	-	1 (100.0)	0.514
Hypothyroidism	-	2 (100.0)	0.352
Fever During Pregnancy	1 (100.0)	-	0.118
Chorio-Amnionitis	1 (100.0)	-	0.118
Vaginal	11 (31.4)	24 (68.6)	0.640
LSCS	4 (25.0)	12 (75.0)	
PV Leak	1 (100.0)	-	0.118
	14 (28.0)	36 (72.0)	
Fetal Distress	1 (100.0)	-	0.118
	14 (28.0)	36 (72.0)	
Resuscitation	-	1 (100.0)	0.514
	15 (30.0)	35 (70.0)	

In our study female: male ratio was 1:1.04, mean gestational age of subjects was 38.5 weeks, mean weight was 2.58kg.

Table 2: Distribution of Study Subjects according to the Organism Isolated (N=51)

Organism Isolated	No.	Percent
Klebsiella	19	37.3

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E Coli	17	33.3
Citrobacter	2	3.9
Staph Aureus	9	17.7
Streptococci	2	3.9
CONS	1	2.0
Candida	1	2.0

Table 3: Association between Organism Isolated and HINE (N=51)

Organism Isolated	No.	HINE 41-60	HINE >60	P Value
Klebsiella	19	8 (42.1)	11 (57.9)	0.125
E Coli	17	2 (11.8)	15 (88.2)	0.150
Citrobacter	2		2 (100.0)	0.351
Staph Aureus	9	5 (55.6)	4 (44.4)	0.057
Streptococci	2		2 (100.0)	0.351
CONS	1		1 (100.0)	0.514
Candida	1		1 (100.0)	0.514

In our study organisms isolated were 74.5% were gram negative, 23.5% were gram positive, 1.9% were fungal, abnormal HINE at 3 months was seen in 10 subjects with gram negative sepsis had moderate neurological impairment, 5 subjects with gram positive sepsis were having moderate neurodevelopmental impairment.

Table 4: Distribution of Study Subjects according to the Indications for Admission (N=51)

Indication	No.	Percent
Respiratory Distress	20	39.2
Refusal to Feed	13	25.5
Convulsion	3	5.9
Abdomen Distension	3	5.9
Abscess over Back	1	2.0
PROM	1	2.0
IDM	1	2.0
Lethargy	4	7.8
LBW	2	3.9
Neonatal Jaundice	2	3.9
Pustules	1	2.0

Table 5: Association between Indication for Admission and HINE (N=51)

Indication	HNNE		P Value
	41-60 n (%)	>60 n (%)	
Respiratory Distress	2 (20.0)	8 (80.0)	0.466
	13 (31.7)	28 (68.3)	
Refusal of Feed	4 (30.8)	9 (69.2)	0.901
	11 (28.9)	27 (71.1)	
Convulsion	**3 (100.0)**	**-**	**0.006***
	12 (25.0)	36 (75.0)	
Abdomen Distension	1 (33.3)	2 (66.7)	0.877
	14 (36.8)	34 (63.2)	
Abscess over Back	-	1 (100.0)	0.514
	15 (30.0)	35 (70.0)	
PROM	1 (100.0)	-	0.117
	14 (28.0)	36 (72.0)	
SIDM	-	1 (100.0)	0.514
	15 (30.0)	35 (70.0)	
Lethargy	1 (25.0)	3 (75.0)	0.840
	14 (29.8)	33 (70.2)	
LBWI(less than1.8kg)	-	2 (100.0)	0.351
	15 (30.6)	34 (69.4)	
Neonatal Jaundice	1 (50)	1(50)	0.250

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	13 (26.5)	36 (73.5)	
Pustules	-	1 (100.0)	0.514
	15 (30.0)	35 (70.0)	

Indicatios for admission in decresig frequency were Respiratory Distress (20), Refusal to Feed (13), Convulsion (3), Abdomen Distension (3), Abscess over Back (1), PROM (1), IDM (1), Lethargy (4), LBW (2), Neonatal Jaundice (2), Pustules (1), among these indications neonatal convulsion was associated with moderate neurological impairment at 3 months and it was statistically significant.

Table 6: Distribution of Study Subjects according to the Clinical Features and Complications (N=51)

Parameter	No.	Percent
Hypothermia	16	31.4
Reduced Urinary Output	26	51.0
Hypotension	51	100.0
Delayed Capillary Time	51	100.0
Impaired Peripheral Perfusion	51	100.0
Petechial Rash	1	2.0
Sclerma	2	3.9
Convulsions	3	3.9
Tachypnea	51	100.0
Feeding Intolerance	4	7.8
Increased O2 Requirement	18	35.3
Requirement of Ventilation	12	23.5
Poor Sucking	16	31.4
Abdomen Distension	6	11.8
Irritability	17	33.3
Lethargy	17	33.3
Hypotonia	10	19.6

DISCUSSION

Sepsis is an important cause of morbidity and mortality among newborn infants. According NNPD (Neonatal perinatal data) the incidence of sepsis is 30 per 1000 live births, accounts for 3 to 30% of infant and child deaths annually. Reported fatality rates range from 10% to 18% depending on birth weight and age at onset of sepsis (2-4). Mortality rate of 10% to 40%, account for to 7% of all deaths among neonates annually (1, 4). In neonates, it is generally accepted that septic shock is also associated with high mortality and morbidity, but very few data on its epidemiology are available in the literature [7, 8].

In our study organisms isolated were 74.5% were gram negative, 23% were gram positive and 2.5% were fungal and the incidence of EOS was 34(66%) and LOS was 17(34%), of these 9 (58%) cases had moderate neurological impairment, comparable to a study conducted by Swati Mahich *et al.* the commonest organisms isolated were Gram-negative (46.5%), Gram-positive (27.6%) organisms, and fungal (25.9%). EOS accounts for 69% cases and LOS for 31% [9].

In our study organisms isolated were 38(74.5%) were gram negative, among these 38 infants with gram negative sepsis 10 (66%) infants had moderate impairment at 3 months. In a study conducted by Kermorvant-Duchemin *et al.* Gram-negative organisms were responsible for 53% of fatal septic shock and 54% of adverse outcome. Logistic regression analysis showed that Gramnegative infection is one of the most important independent predictors of 28-day mortality and adverse outcome in neonatal septic shock. These data are in agreement with the known severity of Gramnegative sepsis [10].

CONCLUSION

- A total of 51 term neonates who met the inclusion and exclusion criteria were studied, of these 51% were males and 49% were females, mean weight of the subjects was 2.4 kg, among the neonates who had moderate neurological impairment at 3 months 7 were less than 2.5 kg and 8 were more than 2.5kg, 71% were inborn and 29% were outborn.
- Among the antenatal rsik factors, 2 neonates with maternal anemia, 4 neonates with maternal PIH, 1neoante with maternal fever, 1 neoante with maternal chorioamnionitis had moderate neurological impairment at 3 months of age.
- Indicatios for admission in decresig frequency were Respiratory Distress (20).
- Refusal to Feed (13), Convulsion (3), Abdomen Distension (3), Abscess over Back (1).

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