

A CLINICAL, BACTERIOLOGICAL AND LABORATORIES PROFILE OF NEONATAL SEPTICAEMIA IN A TERTIARY CARE CENTRE OF EASTERN NEPAL

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ABSTRACT

BACKGROUND

The most common neonatal morbidity and mortality in underdeveloped countries is neonatal sepsis. The vague clinical sign and symptoms need high degree of suspicion for the early diagnosis and treatment, while the continuously changing patterns of causative microbial flora and their sensitivity pattern cause problem in effective management of these cases.

MATERIALS AND METHODS

This retrospective descriptive study was conducted by studying the case reports of 325 newborns, which were (both inborn and outborn) admitted to BPKIHS Paediatric Ward, Nursery, NICU via Emergency over a period of one year from January 2012 to December 2012 with features suggestive of sepsis.

RESULTS

The total number of patients enrolled in this study was 325. Among them, 213 (65.5%) were male and 112 (34.5%) were female child. Male-to-female ratio was almost 2: 1. Early onset sepsis was found in 56.6% newborns, while 43.4% had late onset sepsis. Most of the newborns were presented with the complaints of fever (46.8%) followed by refusal of feed (39.7%) and respiratory distress. Blood culture from 13.2% newborns showed growth of pathologic organism.

CONCLUSION

Male sex has more tendency to develop neonatal sepsis than female. The risk of developing sepsis in male child is almost twice that of female child, which was statistically significant. The various risk factors are leaking, low birth weight, size corresponding to gestational age and prematurity. Fever, not sucking well, resp. distress, jaundice, lethargy, vomiting and seizure were the main chief complaints. Blood culture positivity rate was 13.2% with predominance of gram-positive organisms.

KEYWORDS

Bacteraemia, Causative Microbial Flora, Neonatal Sepsis.

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BACKGROUND

Neonatal sepsis is defined as a clinical syndrome of bacteraemia with systemic signs and symptoms of infection in the first 4 weeks of life. When pathogenic bacteria gain access into the blood stream, they may cause overwhelming infection without much localisation (septicaemia) or may get predominantly localised to the lung (pneumonia) or the meninges (meningitis).

Neonatal sepsis is the single most important cause of neonatal deaths in the community, accounting for over half of them. If diagnosed early and treated aggressively with antibiotics and good supportive care, it is possible to save most cases of neonatal sepsis. The incidence of neonatal sepsis varies from 1 - 8/ 1000 live births in developed countries to 10 - 50/ 1000 live births in developing countries

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and incidence in premature baby is 1/ 250 premature live births. Meningitis occurs in one-third of sepsis cases. Most cases of neonatal sepsis in the community are caused by Group B streptococcus; E. coli and Listeria in developed countries while Staphylococcus aureus, E. coli and Klebsiella causes majority of infection in developing countries. In hospitals, Klebsiella pneumoniae is also a common organism.

This study was done to study the various clinical presentations, laboratory profiles of neonatal sepsis as well as the risk factors causing neonatal sepsis. This study also assessed the organisms responsible for neonatal sepsis with its outcome.

MATERIALS AND METHODS

This was a retrospective descriptive study conducted by studying the case reports of 325 newborns, which was (both inborn and outborn) admitted to BPKIHS Paediatric Ward, Nursery, NICU via Emergency over a period of one year from January 2012 to December 2012 with features suggestive of sepsis.

Information was recorded on a prepared proforma from the case reports. The information relating to maternal factors included period of gestation, h/o leaking, duration of leaking, place and type of delivery. The information relating to the newborn included age, sex and weight of the baby, presenting

complaints, complete physical examination, blood culture and sensitivity test and outcome of the disease.

From the collected data the common presenting complaints, age at onset, common risk factors (both maternal and neonatal), physical findings, culture and sensitivity patterns, antibiotics use and the outcome were studied. The cases were divided into early onset sepsis (EOS) and late onset sepsis (LOS) on the basis of time of clinical presentation. Those presented within first 72 hours of life were diagnosed as EOS and after 72 hours of life as LOS.

Sepsis was suspected in the following conditions

At Birth

All newborns (i) born to mothers with maternal fever or prolonged rupture of membrane (> 18 hours) or foul smelling or meconium stained liquor and/ or (ii) having severe prematurity or birth asphyxia necessitating active resuscitation.

After Birth

All neonates with lethargy, refusal to feeds, abdominal distension, respiratory distress, temperature instability (hypothermia/ fever), pathological jaundice, seizures, vomiting and autonomic dysfunction.

The data entry was done on Microsoft Excel 2007 and correlation between different variables was found out using SPSS 10.1. The demographic characters of Neonates and Maternal is shown in tables. The comparison and association is done with Chi-square test.

RESULTS

The total number of patients enrolled in this study was 325. Among them, 213 (65.5%) were male and 112 (34.5%) were female child. Male-to-female ratio was almost 2: 1. This study also shows that neonatal sepsis is more common in children of age less than 7 days (69.5%) than in children of more than 7 days (30.5%). The mean age of children was 6.4 days.

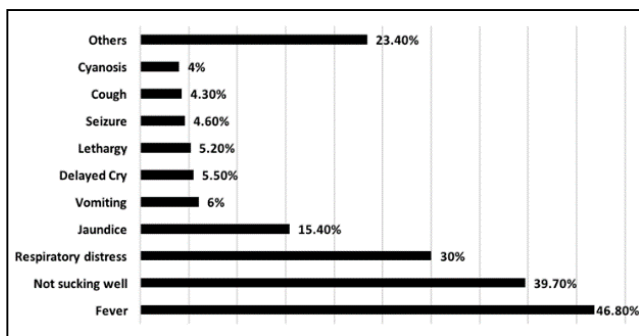


Figure 1. Presenting Complaints of Neonatal Sepsis

Variables	Distribution	Number	Percentage
Sex	Male	213	65.54
	Female	112	34.46
Age	Early onset (≤ 72 hours)	184	56.62
	Late onset (> 72 hours)	141	43.38
Place of Delivery	Inborn	140	43.08
	Outborn	185	56.92
Period of Gestation	< 34 weeks	18	5.54
	34 - 37 weeks	38	11.69

	> 37 weeks	269	82.77
Leaking per vaginum	Yes	116	35.69
	No	209	64.31
Mode of delivery	Normal Vaginal	255	78.46
	Assisted	6	1.85
	LSCS	64	19.69
Neonatal size	SGA	55	16.92
	AGA	263	80.92
	LGA	7	2.15
Birth weight	ELBW	1	0.31
	VLBW	19	5.85
	LBW	113	34.77
	NBW	192	59.08
Heart rate	< 120	8	2.46
	120 to 160	288	88.62
	> 160	29	8.92
Respiratory rate	< 60	223	68.62
	60 to 80	96	29.54
	> 80	6	1.85
PCV	< 40%	104	32.00
	40 - 65%	219	67.38
	> 65%	2	0.62
TLC	< 5000	5	1.54
	5000 to 15000	139	42.77
	> 15000	151	46.46
Bilirubin	<15 mg/dL	215	66.15
	≥ 15 mg/dL	105	32.31
Blood glucose	< 60 mg/dL	70	21.54
	≥ 60 mg/dL	255	78.46
Blood culture	Positive	43	13.23
	Sterile	282	86.77
Outcome	Improved	263	80.92
	LAMA	38	11.69
	Death	24	7.38

Table 1. Demographic Characteristics of Neonates

Variables	Blood Culture		P-value (Chi-Square Test)	
	Sterile	Positive		
Leaking	No	184 (88.0%)	25 (12%)	0.36
	Yes	98 (84.5%)	18 (15.5%)	
Duration of leaking (hrs.)	<6	12 (12.24%)	1 (5.55%)	0.049
	6 - 12	22 (22.44%)	2 (11.11%)	
	12 - 18	11 (11.2%)	1 (5.55%)	
	18 - 24	22 (22.44%)	4 (22.22%)	
	> 24	31 (31.63%)	10 (55.55%)	
Period of gestation	<37 Weeks	32(82.05%)	7 (17.94%)	0.859
	≥37 Weeks	250 (87.41%)	36 (12.58%)	0.859
Size of baby	SGA	42 (76.36%)	13 (23.63%)	0.025
	AGA	234 (88.97%)	29 (11.02%)	0.025
Size of baby	LGA	6 (85.71%)	1 (14.28%)	
	Pre-lacteal feed	No	263 (86.79%)	40 (13.20%)
Pre-lacteal feed	Yes	19 (86.36%)	3 (13.63%)	1.00
Outcome	LAMA	35 (10.77%)	3 (0.92%)	0.153
Outcome	Improved	224 (68.92%)	39 (12.00%)	0.153
	Death	23 (7.08%)	1 (0.31%)	

Table 2. Association of Blood Culture with Different Variables

Organism	Staph. aureus (n=24)	Enterobacter (n=6)	Enterococcus (n=6)	Acinetobacter (n=4)	Pseudomonas (n=3)	E. coli (n=1)	Morganella (n=1)
Amikacin	19 (79.16%)	3 (50%)	0	3 (75%)	3 (100%)	1 (100%)	1 (100%)
Amoxyclav	4 (16.67%)	0	0	0	0	0	0
Azithromycin	1 (4.16%)	0	0	0	0	0	0
Cephalexin	5 (20.83%)	2 (33.33%)	1 (16.67%)	2 (50.00%)	0	0	0
Cefotaxime	2 (8.33%)	0	0	0	0	0	1 (100%)
Ceftriaxone	2 (8.33%)	1 (16.67%)	0	1 (25.00%)	2 (66.67%)	0	1 (100%)
Ceftazidime	3 (12.50%)	1 (16.67%)	0	1 (25.00%)	1 (33.33%)	1 (100%)	1 (100%)
Chloramphenicol	0	0	0	0	0	1 (100%)	0
Ciprofloxacin	14 (58.33%)	2 (33.33%)	3 (50.00%)	2 (50.00%)	3 (100.00%)	1 (100%)	0
Cotrimoxazole	1 (4.16%)	1 (16.67%)	0	1 (25.00%)	0	0	0
Gentamycin	14 (58.33%)	0	0	0	3 (100.00%)	0	0
Penicillin	2 (8.33%)	0	0	0	2 (66.67%)	0	0
Nitrofurantoin	0	0	1 (16.67%)	0	0	0	0
Ofloxacin	7 (29.16%)	3 (50.00%)	3 (50.00%)	3 (75.00%)	0	1 (100%)	0
Vancomycin	13 (54.16%)	2 (33.33%)	5 (83.33%)	2 (50.00%)	0	0	0

Table 3. Drug Sensitivity Pattern of different Isolated Bacteria

DISCUSSION

Neonatal septicaemia encompasses systemic infections of newborn including septicaemia, meningitis, pneumonia, UTI and osteomyelitis of newborn. The incidence of neonatal sepsis varies 1 - 10 per 1000 live births.

Our study showed that the male: female ratio of 1.9: 1, which means male had more chances of going into sepsis in comparable to females. This was comparable to the study done by Shaw CK et al, who showed male: female ratio of 1.86: 1.¹ Among the newborns presented with features of sepsis, 53% were outborn.

In this study among early onset sepsis and late onset sepsis, early onset sepsis was more common. Early onset sepsis was found in 56.6% newborns, while 43.4% had late onset sepsis which is in contrast to the study done by Shrestha P et al where there was preponderance of late onset sepsis (66.9%).² Most of the newborns delivered preterm are prone to sepsis. In this study also, 17.2% of the newborns were delivered preterm, which contrasts the Gerd Faxelius et al,³ which showed 53% of the newborn delivered preterm. The value also contrasts the study done by Budhathoki S in BPKIHS, Dharan, Nepal⁴ where 48% of the neonates were delivered preterm.

History of leaking was present in mothers of 36% neonates. The value is nearly comparable with the 46% obtained by Budhathoki S in BPKIHS, Dharan, Nepal.⁴ Among them 68.1%, i.e. 24.30% of total had leaking for more than 12 hours. The value is about half the value of 48%, observed by Gerd Faxelius et al.³ The mode of delivery is normal vaginal delivery in 78.5% neonates, while 21.5% were delivered through LSCS and/or instrumental delivery. This is comparable with Budhathoki S⁴ (23% LSCS). Similar results were found by Gerd Faxelius et al,³ which showed 26% LSCS delivery. Slightly higher value was obtained by Ayman Koutbuoy,⁵ who observed 38.67% newborns delivered via LSCS delivery.

Most of the newborns were presented with the complaints of fever (46.8%) followed by refusal of feed (39.7%) and respiratory distress. This contrasts Shrestha P et al, where refusal of feed (42.74%) was the commonest problem followed by fever (41.7%).² L. Ronfani et al observed most newborn coming with difficult breathing (32%)

followed by diarrhoea (26%), fever, cough and vomiting (19%) and jaundice (16%).⁶

Blood culture from 13.2% newborns showed growth of pathologic organism in contrast to 54.64% observed by Shaw CK et al.¹ But the value is nearly comparable with the 22% observed by Budhathoki S.⁴ However, 55.2% positive cultures were obtained by AK Ako-Nai et al⁷ and 76% by Anil Kumar Pawa et al.⁸ Prior empirical therapies, referral of cases from outside with prior antibiotic therapy are likely causes for the low culture positivity rate in our institute. Our study shows 66.7% Gram-positive culture (Staphylococcus 53.3% and Enterococcus 13.4%) and 33.3% Gram-negative culture, Enterobacter being the commonest one. The result is comparable with the Budhathoki S,⁴ where S. aureus was the commonest pathogen followed by Klebsiella (18.32%). Similar results were observed by Shrestha P et al.² However, the result contrasts with Ayman Koutbuoy et al⁵ who found GBS as the commonest pathogen followed by E. coli and Staph. epidermidis. Anita Sharma et al⁹ found Klebsiella as the commonest organism followed by Staphylococcus.

Study shows most of the isolated organisms are sensitive to amikacin followed by Ciprofloxacin, Gentamycin and Vancomycin. This is in comparable with JN Mishra et al,¹⁰ where most of the organisms were sensitive to Gentamycin. Shrestha P et al² also found that most of the organisms sensitive to aminoglycosides (Amikacin and Gentamycin) and third-generation cephalosporins. In our study 79.16% of Staphylococcus isolates are sensitive to amikacin, 58.33% are sensitive to ciprofloxacin and gentamycin and 54% are sensitive to vancomycin, while 100% were resistant to penicillin. This is comparable with Shaw CK et al¹ where Staphylococcus isolates were 92% sensitive to amikacin, 100% sensitive to Vancomycin and imipenem-cilastatin, while 100% were resistant to Penicillin.

Positive blood culture was found in 15.5% of cases, who had h/o leaking and 12% of them without h/o leaking. Among the culture positive cases, 83.32% had leaking for more than 12 hours. This is greater than the value observed by Gerd Faxelius et al,³ who found 48% cases with positive blood culture with h/o prolonged rupture of membrane (>12hrs.) before delivery. The study found positive culture in 17.94% preterm newborns, while culture was positive in only

12.58% term newborns. The result contrasts Budhathoki S⁴ who found 20% preterm and 25% term neonates were culture positive. Gerd Faxelius et al³ showed 55% of the infants with early onset septicaemia (culture positive) were preterm.

Out of 325 newborns 263 (80.9%) improved after proper treatment, while 62 (19.1%) did not. Among 43 culture positive cases 39 (90.69%) improved, while 9.30% did not. This contrasts with JN Mishra et al,¹⁰ where mortality in culture positive cases was 61.7%

The limitation of this study is that, since the study was retrospective all the required information could not be found with absence of most of relevant antenatal history of mother.

CONCLUSION

Male sex has more tendencies to develop neonatal sepsis than female. The risk of developing sepsis in male child is almost twice that of female child, which was statistically significant. The various risk factors are leaking, low birth weight, size corresponding to gestational age or prematurity. Fever, not sucking well, resp. distress, jaundice, lethargy, vomiting and seizure were the main chief complaints. Blood culture positivity rate was 13.2% with predominance of gram-positive organisms. Staphylococcus aureus was the most common isolated pathogen (53.2%) followed by Enterobacter and Enterococcus. Seventy-nine percent of Staphylococcus was sensitive to Amikacin, 58.33% sensitive to Ciprofloxacin and Gentamycin and 54% sensitive to Vancomycin.

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