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Original Article

Clinical and Bacteriological Profile of Neonatal Sepsis

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Abstract:

Background: Despite recent advances in neonatal care, considerable progress in hygiene, introduction of new antimicrobial agents and measures for early diagnosis and treatment, neonatal sepsis still remains one of the most important causes of mortality and morbidity. **Objective:** The objective of the study was undertaken to determine the most common sign-symptoms of neonatal sepsis and the pattern of bacterial isolates responsible for these infections. **Methods:** This cross-sectional descriptive study was conducted from January 2017 to December 2018 at Special Care Newborn Unit (SCANU) of Rangpur Medical College Hospital. After parental permission and ethical clearance, a total of 70 eligible neonates who had clinical pictures of sepsis were included into the study. Demographic, clinical and other relevant data were obtained as well as these neonates were investigated for bacterial etiologic agents. **Results:** Among 70 neonates, mean age of participants was 7.8±6.8 days, of which most neonates (47.1%) were in the age group of 7-28 days. Mean birth weight was 2643.57±380.87 grams where 68.57% was male and the rest 31.43% was female with a male to female ratio of 2.18:1. Out of 70 neonates, 24(34.29%) were delivered by LUCS and 46(65.71%) newborn were born by vaginal delivery in which 38(54%) were delivered at hospital and 32(46%) at home. Most frequent presentation were reluctant to feed 66(94.28%) and lethargy 63(90.00%). Of the total 70 neonates studied, 19 (27.14%) were blood culture positive and Escherichia coli 7(36.84%) was the most common causative organism for neonatal sepsis followed by Pseudomonas 4(21.05%), Staphylococcus aureus 3(15.78%), Klebsiella 3(15.78%)andAcinitobacter 2(10.52%). **Conclusion:** The most frequent clinical presentation was reluctant to feed and E.Coli remained the principal organism causing neonatal sepsis.

Key words: Neonatal sepsis, Bacteriological profile, Special Care Newborn Unit (SCANU)

Introduction:

Neonatal sepsis is the most common cause of neonatal mortality and is responsible for 30-50% of total neonatal deaths each year in developing countries[1]. As per National Neonatal Perinatal Database (NNDP) 2005 and 2002-2003, sepsis is the primary cause of mortality in 18.6% of intramural neonates where Klebsiella pneumoniae is the commonest bacterial pathogen (32.5%), the next common being Staphylococcus aureus (13.6%). In extramural admissions, neonatal sepsis is 12 times more common and responsible for 38.0% deaths[2,3].

The current neonatal mortality rate in our country is 28 per 1000 live births which is high in comparison with the neonatal mortality profile in developed world[4]. Although infant mortality in Bangladesh has reduced substantially during the last decade, the rate of neonatal mortality is still high. In Bangladesh, the major causes of neonatal deaths are preterm birth complications (29.7%), perinatal asphyxia (22.9%) and sepsis (19.9%)[5,6]. Sepsis still remains significant cause of neonatal morbidity and mortality in our country[7].

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As newborn infants are less capable of responding to infection due to certain immunologic deficiencies, they go through higher risk of infection[8]. Moreover, diagnosis of neonatal septicemia may be difficult as the early signs and symptoms of sepsis may be subtle and timely diagnosis of neonatal septicaemia is critical because the illness in neonates can progress more rapidly than adult[9,10]. Group B streptococcus (GBS) is the most common cause of neonatal sepsis in developed countries contrary to preponderance of gram negative organism in tropical and developing countries[11]. It has been observed that gram negative organisms are leading pathogens in Bangladesh[12].

Despite the availability of effective antibiotics, early diagnosis of neonatal septicaemia represents a major challenge because of the non-specific nature of signs and symptoms as well as non-availability of standard microbial culture[13]. The definitive diagnosis of septicaemia is established by positive blood culture. This gold standard diagnostic tool requires a minimum of 48-72 hours[14]. There are several methods for rapid detection of microorganism in blood culture of newborn infants using automated blood culture system, DNA probe and flurometric detection system.

Methods:

This cross-sectional observational study was conducted at Special Care Newborn Unit (SCANU) of Pediatrics, Rangpur Medical College Hospital, Rangpur from January 2017 to December 2018. A total of 70 neonates aged 0-28 days of both sex with suspected clinical diagnosis of neonatal sepsis were investigated with aim to detect bacterial pathogens responsible for these infections on the presence of two or more clinical signs. Neonates were suspected having sepsis if they presented with two or more of the following signs or symptoms: reluctant to feed, fever (temperature >38° C), hypothermia (temperature <36°C), poor or excessive cry, convulsion, abdominal distention, lethargy, jaundice, cyanosis, apnea or grunting etc. Risk factors in the mother included maternal febrile illness within two weeks prior to delivery, foul smelling or meconium stained liquor, prolonged rupture of membranes (PROM) of≥18 hours, single unclean or >3 sterile vaginal examination/s duringlabour and prolonged labour. On the other hand neonates with birth injury, preterm (<32 weeks) babies, very low birth weight (<1500gm) babies and babies getting antibiotic therapy were excluded from the study. With all aseptic precaution 2 ml of blood was collected immediate after admission prior to giving antibiotics. The specimens were transported immediately to microbiological laboratory and incubated for one week in 37° C and were daily checked for evidence of bacterial growth. For positive broth cultures, subcultures were made on solid media (Blood agar and McConkey agar) and were incubated in 37° C for 24 to 48 hours. The grown bacteria were identified by colony morphology, gram stain and biochemical tests. Findings of the physical examinations and laboratory investigations were recorded. Collected data were entered into Microsoft Excel software and analysis was done using SPSS (Statistical Package for Social Sciences) software version 23.0.

Results:

Among 70 neonates, mean age of participants was 7.8±6.8 days, of which most neonates (47.1%) were in the age group of 7-28 days (Table I).

Table I: Distribution of clinically suspected neonates for sepsis by age (n=70)

Age in Group	Frequency (n)	Percentage (%)
0-72 hours	16	22.85%
3-7 days	21	30.00%
7-28 days	33	47.15%
Total	**70**	**100.00**

(Mean 7.84, SD±6.88)

Birth weight of 39(55.71%) neonates were <2500 grams and 31(41%) were ≥ 2500 grams. Mean birth weight was 2643.57±380.87 grams (Table II).

Table II: Distribution of clinically suspected neonates for sepsis by weight (n=70)

Weight	Frequency (n)	Percentage (%)
Low Birth Weight (<2500 gram)	39	55.71%
Normal Birth Weight (≥2500 gram)	31	44.29%
Total	**70**	**100.00**

(Mean 2643.57, SD: ±380.87)

Among the babies 68.57% was male and the rest 31.43% was female with a male to female ratio of 2.18:1 (Figure 1).

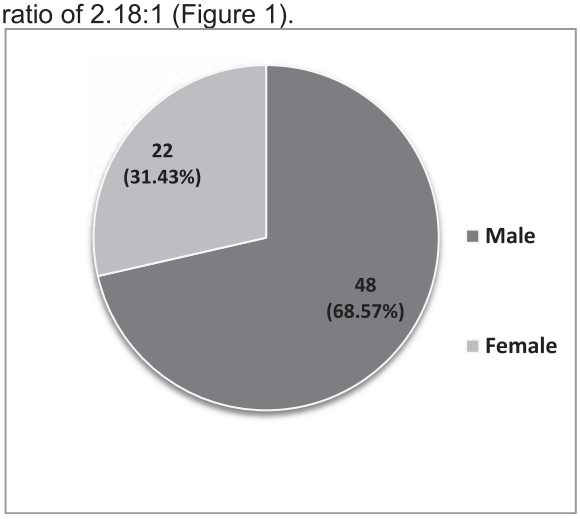


Figure 1 Demonstrates that male neonates outnumbered female.

Out of 70 neonates, 24(34.29%) were delivered by LUCS and 46(65.71%) newborn were born by vaginal delivery in which 38(54%) were delivered at hospital and 32(46%) at home (Figure 2).

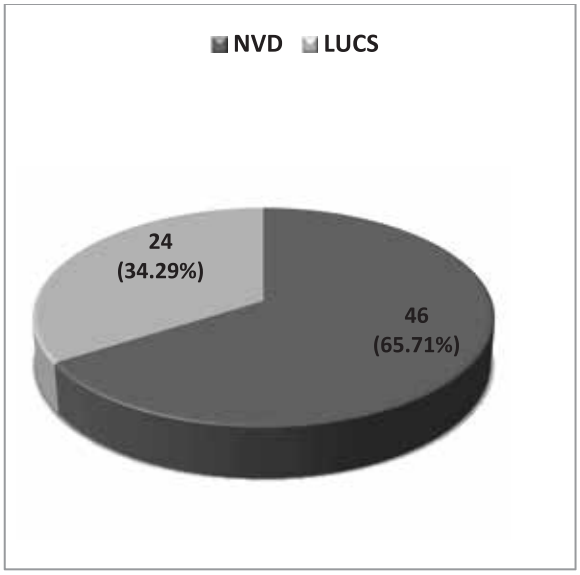


Figure 2 Shows most 46 (65.71%) of the clinically suspected neonates for sepsis were delivered by normal vaginal delivery.

Most frequent presentation were reluctant to feed 66(94.28%) and lethargy 63(90.00%) (Figure 3).

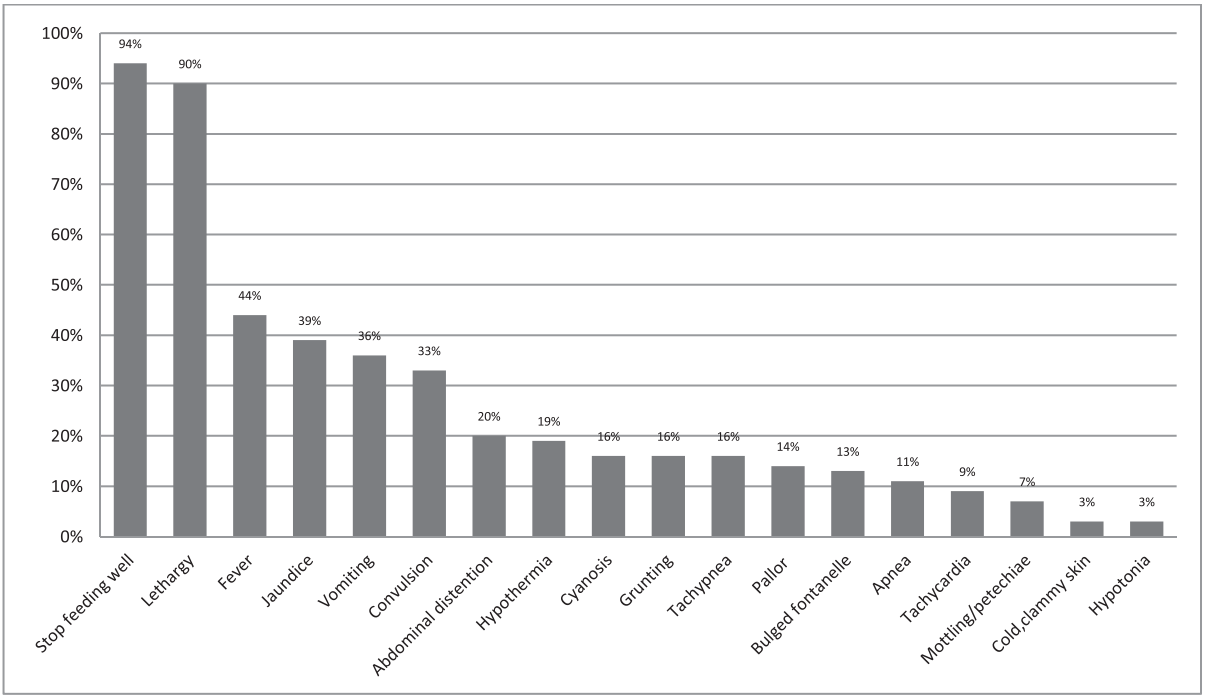


Figure 3: Illustrates that among plethora of clinical manifestations the most frequently occurring presentation was reluctant to feed (94.28%) followed by lethargy (90.00%).

Of the total 70 neonates studied, 19(27.14%) were blood culture positive and Escherichia coli 7(36.84%) was the most common causative organism for neonatal sepsis followed by Pseudomonas 4(21.05%), Staphylococcus aureus 3(15.78%), Klebsiella 3(15.78%) and Acinitobacter 2(10.52%) (Figure 4).

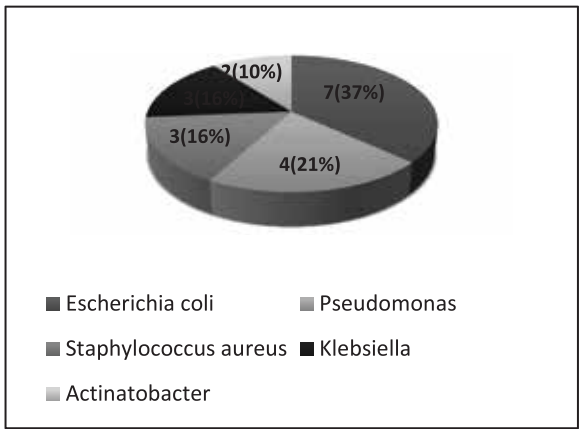


Figure 4: Demonstrates that among 19 culture positive cases E.coli(10.00%) was the most common organism of neonatal sepsis followed *by* Pseudomonas 4(5.72%).

Discussion:

Sepsis is defined as a systemic inflammatory response syndrome (SIRS) associated with infection diagnosed either on microbiologic cultures or strong clinical evidence of an infection[15].

In this study, among 70 neonates, 48(68.57%) were male and the rest 22(31.43%) were female with a male to female ratio of 2.18:1. Male were more susceptible to neonatal sepsis than female. This is similar with the studies conducted by other authors, in Dharan, Nepal where out of 103 clinically suspected septicaemic newborn 78(75.73%) were male and 25(24.27%) were females. Buch et al. (2011) showed in their study the male to female ratio was 1.8:1[16]. In another study conducted in Udaipur, India male to female ratio was 2.57:1. In the present study, male predominance may be explained by the male dominant neonatal admission statistics of this hospital (Rangpur Medical College Annual Report 2012-2013)[17]. Moreover the health seeking behavior of our common people attaches great importance to male child as compared to females one. The predominance of male is attributed to the factors regulating the synthesis of a globulin are situated on the X chromosome leading male gender less immunologically protected than the females[15].

In the present study birth weight of 39(55.71%) neonates were <2500 grams and 31(41%) were ≥ 2500 grams. Mean birth weight was 2643.57 grams. Gestational ages of 41(58.57%) neonates were <37 weeks and 29(41.43%) neonates were ≥37 weeks. Mean gestational age was 36.83 weeks. Vulnerability of Preterm and Low birth weight babies to infection is explained by low level of IgG and lower defense mechanism12.Culture proven septicemia was more common among 42(65.63%) of low birth neonates[18].

In another study conducted in the department of Paediatrics, Kasturba medical College, Manipal, Karnataka, India done by Bhat et al. (2010), out of 1291 neonates 212(16.4%) had positive blood culture. The mean weight was 2465.8±715.8g. Of the total gestational age of 140 (66.03%) neonates were >37 weeks and 72(33.9%) were preterm[19].

A study conducted in NICU of Yenepoya Medical College Hospital, Karnataka, India, where mean birth weight observed was 2.9±0.8 kg and mean gestational age was 35.8±3.6 weeks[20]. In another study, conducted in Padmashree Dr. D. Y. Patil Medical College and Research Centre, out of 120 neonates, 97(80.8%) neonates were low birth weight, 88.3% neonates were preterm[16].

Out of 70 suspected newborn 24(34.29%) were delivered by LUCS and 46(65.71%) newborn were born by vaginal delivery. 38(54%) were delivered at hospital and 32(46%) at home.

In the present study, most frequent presentation were reluctant to feed 66(94.28%) and lethargy 63(90.00%) which is consistent with the study done by Waliullah et al. 2009[21].

A study conducted in SCABU under department of Paediatrics and Neonatology, BIRDEM, Dhaka, Bangladesh by Raha et al. revealed reluctant to feed (90.6%), lethargy (73.4%) and fever (46.9%) were common presentations[18].

In this study, out of 70 suspected cases of neonatal sepsis, blood culture of 19(27.14%) neonates showed growth of single organism and 51(72.86%) had no growth in their blood culture.

Escherichia coli 7(36.84%) was the most common causative organism for neonatal sepsis followed by *Pseudomonas* 4(21.05%), *Staphylococcus aureus* 3(15.78%), *Klebsiella* 3(15.78%) and *Acinitobacter* 2(10.52%). This study results are consistent with other studies. Ahmed et al. 2002 found that out of 86 clinically suspected septicaemic cases 35% cases were culture positive and 65% culture negative with predominant organisms being gram negative[11]. Among them *Escherichia coli was* the commonest isolated organism (30%) followed by *Klebsiella pneumonia(23%) and Staphylococcus aureus* (17%). A prospective study done at ICU, BSMMU, Bangladesh by Khair et al. (2010) found that out of 100 neonates only 12(12%) had culture proven sepsis[12]. In their study *Escherichia coli* was the most common organism followed by *Klebsiella pneumoniae, Acinitobacter spp and Enterobacter spp*. Another study done at department of Paediatrics, College of Medicine and JNM Hospital, West Bengal, India by Pal & Samanta (2013) revealed among 238 clinically suspected cases of neonatal sepsis, blood culture was positive in 90(37.8%) cases[22]. A study conducted in the Special Care Baby Unit (SCABU) in BIRDEM, Dhaka, Bangladesh done by Begum et al. (2012), Gram negative bacteria were the most common organism isolated accounting 98% of total isolated bacteria[23]. *Klebsiella spp* (52.3%) was the most common organism followed by *Enterobacter* (20.0%), Acinatobacter (10.8%), *Pseudomonas* (6.2%), Serratia (6.2%) and *Cytobacter* (3.1%). The variation of blood culture positivity may be explained by selection criteria of the studied population, volume sample and sampling site.

Conclusion:

It was concluded that reluctant to feed followed by lethargy were the main clinical features among the plethora of presentations in neonates with suspected clinical sepsis. Moreover, majority of the cultures isolated gram negative bacilli, most commonly E.Coli and Pseudomonas.

Recommendation:

As this is a hospital-based design of study, it is recommended for additional community-based studies of local patterns and antibiotic sensitivity of pathogens of neonatal sepsis in order to formulate a standard policy of rational antibiotic use. There also is a need for community-based case-control studies with larger sample size to identify the risk factors and preventive measures for neonatal sepsis.

Limitations of the study:

This study was conducted in a single tertiary care hospital. Therefore, the findings may not reflect the exact scenario of other health facilities that provide care to sick newborn admitted with similar illness. The present study was conducted among 70 patients which was not a large sample size to elicit a definite conclusion. Studies conducted in Bangladesh on the present problem are scant in number. Therefore, it was difficult to compare the findings of present study with the research findings of other authors.

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