

## Original Article

## Bacteriological profiles of septicaemia in neonates at tertiary care hospital, Gujarat, India

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### ABSTRACT

**Background:** Neonatal septicaemia describes any systemic bacterial infection in neonates documented by positive blood culture. It is an important cause of morbidity and mortality among neonates. Neonatal sepsis may be classified according to the time of onset of the disease, < 72 hours as early-onset neonatal sepsis (EONS) and >72 hours as late-onset neonatal sepsis (LONS). EONS are caused by organisms prevalent in the maternal genital tract and LONS are caused by environmental factors.

**Objectives:** To identify the prevalence of septicaemia in neonates along with age and gender wise distribution, common associated factors and clinical signs/symptoms.

**Material and Methods:** Venous blood was collected aseptically and inoculated in blood culture bottle. Further isolation and identification was done by Standard Microbiological Guidelines. ESBL was detected according to CLSI guidelines.

**Results:** In present study out of 116 clinically suspected neonatal septicaemia cases, 89 (76.72%) were males and 27 (23.28%) were females. In present study out of 116 cases of neonatal septicaemia, 65 (56.03%) were early onset neonatal septicaemia and 51 (43.97%) were late onset septicaemia. Out of 89 male patients studied, in 31 (34.83%) cases pathogen were isolated. Out of 27 (23.28%) female patients studied, in 10 (37.04%) cases pathogens were isolated. In present study most common was Klebsiella spp. 39.02 %.

**Conclusion:** Prevalence of septicaemia is 35.34% in neonates in present study. Prevalence was higher in males. And most common associated factor was preterm.

**Key words:** Neonatal septicaemia, Causative bacterial pathogens, Predisposing factors

### INTRODUCTION

Neonatal septicaemia describes any systemic bacterial infection in neonates documented by positive blood culture. It is an important cause of morbidity and mortality among neonates generally [1]. Neonatal sepsis may be classified according to the time of onset of the disease, as early-onset neonatal sepsis (EONS) and late-onset neonatal sepsis (LONS) [2]. Early onset sepsis (EOS) (less than 72 hours) infections are caused by organisms prevalent in the maternal genital tract or in the delivery area. The predisposing factors include low birth weight (LBW), prolonged rupture of membrane; foul smelling liquor, multiple per vaginal examinations, maternal fever, difficult or prolonged labour and aspiration of meconium. EOS manifested frequently as pneumonia and less commonly as meningitis. Late onset sepsis (LOS) (greater than 72 hours) infections are caused by the organisms thriving in the external environments of

the home or the hospital. The infection is often transmitted through the hands of the care providers. The presentation is that of, pneumonia or meningitis. The predisposing factors include LBW, lack of breastfeeding, poor cord care, superficial infections (pyoderma, umbilical sepsis), aspiration of feeds and disruption of skin integrity with needle pricks and use of intravenous fluids [3].

### MATERIAL AND METHODS

**Study duration & sample size:** The study was conducted from July 2010 to August 2012 in the Department of Microbiology, at C. U. Shah Medical College and Hospital, Surendranagar, Gujarat. Total 116 clinically suspected patients of sepsis from Neonatal intensive care unit were selected for the study. A detailed history was taken and Performa was filled for each patient documenting age, sex, socioeconomic status, address, duration of illness

along with type of delivery, artificial intervention, birth weight and any resuscitative procedures done.

**Ethical Consideration:** The study was approved by Institutional Ethics Committee (Human Research).

**Inclusion Criteria:** Neonatal patients having respiratory distress, poor feeding, fever, hypothermia, signs of gastrointestinal or central nervous system involvement were included in this study [4].

**Exclusion Criteria:** Neonatal patient with congenital malformations and known chromosomal disorders were excluded from study.

#### Testing method:

2 ml blood was collected from peripheral vein with aseptic precaution. It was immediately inoculated into blood culture bottles and processed as per conventional blood culture methods. Any growths of bacteria on media were identified by colony morphology, gram stain and standard biochemical tests [4].

Cefoxitin disk diffusion method was performed for all *S. aureus* isolates to identify methicillin resistance as per Clinical and Laboratory Standards Institute (CLSI) guidelines. For ESBL detection screening and phenotypic confirmation tests were performed for all *E. coli*, *Klebsiella* spp. and *Proteus* spp. as per CLSI guidelines [5].

## RESULTS

**Table 1: Distribution of total cases**

Variable	No (%), N= 116
<b>Sex</b>	
Male	89 (76.72%)
Female	27 (23.28%)
Total	116 (100%)
<b>Type of septicaemia</b>	
EONS	65 (56.03%)
LONS	51 (43.97%)
Total	116 (100%)
<b>Type of isolates</b>	
Gram positive	19 (16.37%)
Gram negative	22 (18.97%)
No isolates	75 (64.66%)
Total	116 (100%)

Table-1 shows the distribution of cases in different ways. In present study out of 116 clinically suspected neonatal septicaemia cases, 89 (76.72%) were males and 27 (23.28%) were

females while 65 (56.03%) were Early Onset Neonatal Septicaemia (EONS) and 51 (43.97%) were Late Onset Neonatal Septicaemia (EONS). In present study 19 (16.37%) were gram positive and 22 (18.97%) were gram negative isolates while in 75 (64.66%) cases no isolates has been identified.

**Table 2: Associated factors & clinical signs/symptoms in neonatal septicaemia**

Associated Factors	No. ( %), (N=116 )
Preterm	45 (38.79%)
Low birth weight	22 (18.96%)
Meconium aspiration	15 (12.93%)
PROM (Premature Rupture of Membrane )	1 (0.86%)
Perinatal asphyxia	1 (0.86%)
Prolonged catheterisation	1 (0.86%)
<b>Clinical Signs/Symptoms</b>	
Pneumonia	8 (6.89%)
Fever With Jaundice	8 (6.89%)
Fever of unknown origins	4 (3.44%)
Poor feed	3 (2.58%)
Respiratory distress	3 (2.58%)
Fever with Neutrophilia	3 (2.58%)
Fever with Neutropenia	2 (1.73%)
Altered sensorium	0 (0%)

Table-2 shows distribution of associated factors and clinical sign – symptoms in neonatal septicaemia. Among 116 cases most common associated factor was preterm birth (38.79 %) and most common sign and symptoms was pneumonia (6.89%) and fever with jaundice (6.89 %).

**Table 3: Bacteria isolated in neonatal septicaemia**

Organisms	No (%), (N=41)
<i>S. aureus</i>	12 (29.26%)
<i>S. epidermidis</i>	3 (7.31%)
<i>S. saprophyticus</i>	1 (2.43%)
Enterococci spp.	3 (7.31%)
<i>E. coli</i>	5 (12.19%)
<i>Klebsiella</i> Spp.	16 (39.02%)
<i>Pseudomonas</i> Spp.	1 (2.43%)
Total	41 (100%)

Table-3 shows distribution of various bacteria which were isolated in this study. Among 116 cases, 41 showed bacterial growth. Most common bacteria were *Klebsiella* spp. followed by *S. aureus*.

**Table 4: ESBL isolates in present study & other study**

<b>Mane AK et al<sup>(14)</sup></b>	Nagpur/India	2010	50.00 % E. coli & 58.30 % Klebsiella spp.
<b>Present study*</b>	Surendranagar/India	2012	0 (0%) E.coli & 6 (37.50 %) Klebsiella spp.

Table-4 shows comparison of ESBL isolates with other studies. In present study, Out of 5 E. coli isolates in neonates, 0 (0%) showed ESBL production while out of 16 Klebsiella spp. 6 (37.5%) isolates showed ESBL production.

## DISCUSSION

It was observed in present study that males (76.72%) were more than females (23.28%) as shown in Table-1. Aletayeb S et al [4], Celicia C et al [6], Rabia S et al [7] and Ahmad A et al [8] have reported higher number of male's neonatal septicaemia than female's neonatal septicaemia, which correlates with present study. Male predominance may be due to Gender biased care for male babies in our society [12]. African American race and male sex are unexplained additional risk factor for neonatal sepsis [15].

In present study EONS & LONS were 56.03% and 43.97% respectively. Other authors like Jain AK et al [9] have found EONS (68.86 %) and LONS (31.14 %) and Aletayeb et al [4] have found EONS (64.70 %) and LONS (35.30 %). Newborn infants show deficit in phagocytic migration to the site of infection also there is sub optimal activation of complement and Defence mechanism against viral pathogen may be deficit in newborn [15].

In present study 19 (16.37%) were gram positive and 22 (18.97%) were gram negative isolates while in 75 (64.66%) cases no isolates has been identified (Table-1). Study by Jain AK et al [9] has reported gram negative 76.66 % and gram positive 23.34 %. Study by Aletayeb S et al [4] has reported gram negative 92.8 % and gram positive 7.2 %.

The results of studies in relation to microbial isolates by different authors are variable as prevalence of bacterial isolate varies from place to place. It also depends on hygiene of mother, mode of delivery and different geographical area. Negative cultures can be attributed to non-bacterial growth, presence of viral agents, fastidious organism, and anaerobic etiology, ratio of volume of amount of blood collected and liquid broth and prior antibiotic therapy [10, 12 & 13]. And studies with which we have compared data have not considered

cases with no bacterial growth. So their percentage is higher as compare to our study.

In present study among neonates most common associated factor is preterm birth (38.79%). Study by Tsering et al [11] has reported 31 % preterm cases and Aletayeb S et al [4] have reported 76.5 % preterm cases.

In present study among neonates Jaundice (6.89 %) is most common clinical sign. While study by Jain NK et al [9] have reported 30 % cases with jaundice. And Ahmed et al [12] have reported 40 % cases with jaundice.

In present study Klebsiella spp. (39.02%) was the most common isolate as shown in table 3, study by Aletayeb S et al [4] have isolated Klebsiella spp. (46.40%) as most common isolate. While other authors like Celicia C et al [6] have isolated pseudomonas spp. (43.20 %) as most common isolate. Rahman S et al [16] 36.60 % and Rizvi F et al [17] (16%) have reported E. coli as most common isolate. Tsering et al [11] have isolated S. aureus (41.18 %) as most common isolate. Predominance of either gram positive or gram negative bacterial isolate is influenced by hygiene of mother, mode of delivery and different geographical area [10,12,13].

In present study, Out of 5 E. coli isolates in neonates 0 (0%) showed ESBL production. Out of 16 Klebsiella spp. 6 (37.5%) isolates showed ESBL production. While study of Mane AK et al [14] reported higher percentage of ESBL production with 50% in E. coli & 58.30 % in Klebsiella spp. as shown in Table-4.

## CONCLUSION

Prevalence of septicaemia is 35.34% in neonates (0 - 28days) in present study. Prevalence of septicaemia is higher in males compared to females. Among neonates, incidence of early onset septicaemia is 56.03% and late onset septicaemia is 43.97 %.Most common associated factor was preterm birth 38.39 % in neonates. Most common clinical symptom was fever with jaundice (6.89 %).Common bacterial species isolated were Klebsiella spp. 39.02% in neonates. Prevalence of ESBL Producer was 37.5% (Klebsiella spp.) in neonates.

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