

## Bacteriological Profile of Sepsis in Newborn



### Medical sciences

**KEYWORDS :** Antibiotic sensitivity, Bacterial isolates, Neonatal sepsis.

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### ABSTRACT

Neonatal sepsis is life threatening emergency and demand urgent attention. This study was carried out to determine the bacteriological profile and antibiotic sensitivity pattern of neonatal sepsis. Samples were collected from 100 newborns admitted in NICU, Blood samples from all neonates were cultured using brain heart infusion (BHI) broth and their antibiotic sensitivity patterns were studied. The most frequently isolated organism from neonatal sepsis were coagulase negative Staphylococci, followed by Staphylococcus aureus Klebsiella species Pseudomonas species, E. coli, Proteus species and Salmonella Typhi. Multi-drug resistance organisms were isolated from septicemia in neonates. Therefore great caution is required in selection of antibiotic therapy.

### Introduction:

Neonatal sepsis is dangerous and life-threatening clinical disease that requires urgent diagnosis and treatment(1). The incidence of neonatal sepsis is 1-4 per 1000 live births in developed countries. Preterm and low birth weight infants especially very low birth weight (VLBW)

have a 3- to 10-fold higher incidence of infection than full term newborns. Prematurity, VLBW, exposure to invasive procedures, receiving parenteral nutrition with lipid emulsions, alterations in the skin and/or mucous membrane barriers, frequent use of broad-spectrum antibiotics and prolonged hospital stay are the most common risk factors for nosocomial sepsis in newborns(2). The causative agents of neonatal sepsis change from time to time and from region to region(3). The most common causes of neonatal sepsis are group B streptococci (GBS), Escherichia coli (E. coli) and Listeria monocytogenes in developed countries and gram negative bacteria and coagulase negative staphylococci (CONS) in developing countries(4). These organisms have developed increased drug resistance over the last two decades(5,6), and management of patients is becoming a major problem. This study was conducted to determine the bacteriological profiles and antibiotic sensitivity patterns of isolates from blood cultures of neonates.

### MATERIAL AND METHODS:

This study was conducted in the Microbiology Department of M.P Shah Medical college, Jamnagar, Gujarat. Total 100 blood samples were collected. Blood cultures were performed routinely on all neonates with suspected sepsis. Whenever possible blood was collected before antibiotics has been started, under proper aseptic conditions, 1ml of blood was inoculated in 10 ml of Brain heart infusion broth. This was further incubated for 24 hours at 35-37°C. Subcultures were done on Chocolate agar, Blood Agar and MacConkey's agar after 24 hours, 48 hours, 72 hours, 5th day and final on 7th day as per standard protocol. If there was no bacterial growth after 7 days of incubation, the culture was reported to be negative.

If growth was present, organisms were identified on the basis of colony morphology and standard biochemical tests.

Antibiotic sensitivity testing was performed by Kirby-Bauer disc diffusion method as per CLSI recommendations.

### RESULTS:

Out of 100 neonates 59 were males & 41 were female and male:female is 1.43:1.

Blood cultures were positive in 76 neonates. Out of which 42(55.26%) were gram positive and 34(44.73%) gram negative. The commonest organism from neonatal sepsis were coagulase negative Staphylococci 22(28.94%), followed by Staphylococcus aureus 20(26.31%) Klebsiella species 13(17.10%), Pseudomonas species 11(14.17%), E. coli 5(6.57%), Proteus species 3(3.94%) and Salmonella Typhi 2(2.63%)(Table 1).

**Table-1- Isolated microorganisms.**

	Organisms	Numbers	%
Gram positive	Coagulase Negative Staphylococci	22	28.94
	Staphylococcus aureus	20	26.31
Gram negative	Klebsiella	13	17.10
	Pseudomonas	11	14.47
	E.Coli	05	6.57
	Proteus	03	3.94
	S.typhi	02	2.63
Total		76	

Early onset of sepsis(EOS) were found in 50(65.78%) and late onset of sepsis(LOS) in 26(34.21%). CONS, Staphylococcus aureus, and Klebsiella were found in EOS, while Pseudomonas and E.coli were found in LOS(Table-2 ). Out of 76 neonates 49(64.47%) were low birth weight and 27(35.52%) newborns were with > 2.5 Kg.

**Table-2- Types of micro-organisms & onset of septicaemia.**

Organisms	EOS	LOS
Coagulase Negative Staphylococci	17	05
Staphylococcus aureus	14	06
Klebsiella	08	05
Pseudomonas	05	06
E.Coli	02	03
Proteus	02	01
S.typhi	02	00
Total	50	26

In more than 50% cases, the gram positive strains showed high degree of resistance to commonly used antibiotics like Penicillin, Clindamycin, Erythromycin, Roxithromycin. Low resistance were against levofloxacin, ciprofloxacin, Linezolid, Oxacillin, Rifampicin, Teichoplanin and vancomycin.

Among gram negative organisms there was high sensitivity to higher generation cephalosporins and  $\beta$ -lactamase inhibitor combinations and carbapenems. High degree of resistance were found against broad spectrum cephalosporins.

### Discussion:

We found that early onset sepsis (77.5%) was more common than late onset disease and (22.5%), which is compatible with the reports from the other developing countries (7,8). Early onset neonatal sepsis in general is more common because of various high risk perinatal factors for sepsis operate during this period. On the contrary, Kuruvilla KA et al have reported a lower rate of EOS (24%) than LOS (76%)(9). This could be due to the

fact that they defined EOS as <48 hours and LOS as >48 hours.

In our study Male female ratio is 1.43:1, Male neonates were reported to be affected more with sepsis as compared to females in some studies(10,11). Higher susceptibility to sepsis has been shown in male sex and its reason is unknown but it may be related to sex –dependent factors.

LBW is a significant risk factor for development of neonatal sepsis. present study Showed that 64% of low birth weight newborns were affected in comparison of 35% of new born with >2.5kg of birth weight. This is in concordance with other studies where low birth was found to be important risk factor for sepsis(12,13). LBW babies are mostly also premature and are predisposed to sepsis due to multiple reasons like immune incompetence at various levels of defence, more subjected to invasive interventions etc.

In present study out of gram positive organisms were more common(55.25%)as compared to gram negative(44.73%). CONS was the most common pathogen(28.94%), similar to study of Gheibi et al(14) and Torkman et al(15). During the last two decades, coagulase-negative staphylococci have emerged as the leading cause of bloodstream infections and septicemia in neonatal intensive care units(16,17). *CONS* rarely causes infections in healthy tissue (18) but has a pronounced ability to proliferate on surfaces of indwelling medical devices after surgical insertion (19), where it forms biofilms and it is an important virulence determinant during catheter-associated infection.

The causative organisms in neonatal sepsis vary from place to place and the frequency of the causative organisms is different in different hospitals and even in the same hospital at different time(20,21). Some studies such as Movahedian et al(22) Awoniyi et al(23) gram negative bacteria were more common than gram-positive. The probable reasons being, newborns most probably acquire these Gram-negative rods from the vaginal and fecal flora of the mother and the environment where the

delivery occurs(24).

A large number of gram negative and gram positive bacteria, were resistant to one or more type of antibiotics which was similar to other studies(25,26). Study showed very high degree of resistance of gram negative organism to commonly used antibiotics, predominantly to broad spectrum cephalosporins. These findings were compatible with other studies (6,27). Multi-drug resistance of microorganisms causing neonatal sepsis is a rapidly emerging, potentially a disastrous problem. The situation is worse in developing countries because of lack of legislation, over the counter sale of antibiotics, poor sanitary conditions, lack of surveillance of the standards of maternity homes and the practices of traditional birth attendants who deliver almost 80% of all births(28).

#### Conclusion:

CONS is the most common gram-positive bacterium and *Klebsiella* is the most common gram-negative bacterium causing neonatal sepsis. Gram positive and gram-negative bacteria are highly resistant against commonly used antibiotics. Higher generation cephalosporins and  $\beta$ -lactamase inhibitor combinations, carbapenems were effective against Gram-negative bugs. In Gram-positive organisms Resistance to macrolides is also increasing. Linezolid and vancomycin were sensitive.

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