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Study on Microbiotia and Antibiotic Susceptibility pattern of Gram-Positive Cocci isolates in Neonatal Septicemia patients

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ABSTRACT

Introduction: Neonatal septicemia is a clinical condition characterized by systemic signs and symptoms due to bacteremia in the first month of life. It is one of the most common causes of neonatal mortality in the developing world. A widespread bacterial infection that is verified by a positive blood culture during the first four weeks of life is the hallmark of neonatal septicemia. The aim of this study is to determine prevalence, identification, sensitive and resistant patterns of the gram positive pathogens of Neonatal septicemia.
Materials And Methods: A cross sectional observational study was conducted in the Department of Microbiology. A total of 100 blood cultures of patients who satisfied the following inclusion and exclusion criteria were considered as a study population. All blood cultures were inoculated into blood culture bottles, loaded in automated method - BACT/ALERT 3D culture system (BioMerieux). Processing and identification of the colonies was done as per the standard guidelines. Antibiotic susceptibility testing of all isolates was done by Vitek2 compact system.
Results: The total number of microorganisms isolated in the blood cultures was as Staphylococcus aureus (9%), Coagulase Negative Staphylococci (27.9%), Enterococcus faecium (9%), Escherichia coli (4.6%), Klebsiella pneumoniae (4.6%), Klebsiella aerogenes (4.6%), Pseudomonas aeruginosa (9%), Acinetobacter baumanii (9%), Serratia marcescens (4.6%), Candida albicans (4.6%), Non albicans Candida (13.7%). Overall antibiotic sensitivity of gram positive cocci showed 100% resistant to cefoxitin and penicillin (MRSA and MRCONS isolates of Neonatal septicemia), 50-80% sensitivity to fluoroquinolones, broad spectrum antibiotics, linezolid, vancomycin and gentamicin, and 100% sensitive to teicoplanin, tigecycline
Conclusion: VRE is a dangerous resistance pattern sparing with last resort antibiotics such as fluoroquinolones, tigecycline and linezolid. Isolation of MRSA, MRCONS and VRE poses a greater challenge for clinicians to treat and also alarming sign of emerging antimicrobial resistance.

Keywords: Gram positive pathogens, Antimicrobial susceptibility testing, Neonatal sepsis.

INTRODUCTION

Neonatal sepsis (or septicemia) is a life-threatening bloodstream infection in infants younger than 28 days old. Neonatal septicemia is one of the most common causes of mortality and morbidity especially in middle and lower income countries including India and continues to be a significant issue for newborns in Neonatal Critical Care Units [1]. In India, it is one of the top four factors contributing to newborn mortality and morbidity.

The incidence of early-onset neonatal sepsis ranges from 1 to 5 per 1000 live births. This incidence has been shown to decrease with intrapartum antibiotic therapy [2,3]. The incidence of late-onset neonatal sepsis is reported to vary between

0.61% and 14.2% in hospitalized newborn babies [4]. Lawn et al presented epidemiological data, 99% of newborn deaths occurred in low- and middle-income countries and 1% in high-income countries [5].

Neonatal septicemia is a clinical condition characterized by systemic signs and symptoms due to bacteremia in the first month of life. Based on the time of presentation after birth, neonatal sepsis is categorized as early onset sepsis (EOS) that occurs at or before 72 hours of newborn life and late onset sepsis (LOS) which occurs after 72 hours of newborn life. EOS usually occurs due to the transmission of pathogens from the female genitourinary system to the newborn or fetus. LOS is generally caused by the transmission of pathogens from the environment after delivery [6-8]. The two bacterial infections most frequently linked to EOS are Escherichia coli and Group B Streptococcal (GBS). In addition, less frequent bacterial causes of EOS, including Gram Negative Enteric Bacilli and *Listeria monocytogenes*. *E.coli, Enterobacter species, Klebsiella species,* and *Pseudomonas species* are examples of Gram Negative Bacilli that are frequently linked to LOS [9]. *Group B Streptococcus, Escherichia coli, Coagulase Negative Staphylococcus, Staphylococcus aureus*, along with various other bacterial pathogens, are responsible for early-onset neonatal sepsis (EONS). The microorganisms frequently linked to late-onset sepsis encompass *Coagulase-Negative Staphylococci* (CONS) and *Klebsiella pneumoniae* [10].

A useful sepsis screen for clinically doubtful cases is a panel of tests (sepsis screen) that includes total leukocyte count (<5000/mm^3), absolute neutrophil count (<1800/mm^3), immature to total neutrophil ratio (greater than 20%), C Reactive Protein (greater than 1 mg/dl), and micro Erythrocyte Sedimentation Rate (15 mm or more in the first hour). If two of these values are positive, the sepsis screen is deemed positive [11,12].

A positive blood culture result is the gold standard for identifying bacteraemia in neonates with suspected sepsis. Conventional blood culture bottles as Brain heart Infusion broth and agar has several disadvantages in diagnosing pathogens. Automated systems like BacT/ALERT, BACTEC, VersaTREK has been introduced and there will be continuous monitoring of blood cultures, enhanced detection, faster time to detection, better recovery, good temperature stability [13]. A widespread bacterial infection that is verified by a positive blood culture during the first four weeks of life is the hallmark of neonatal septicemia.

AIM

The aim of this study is to determine prevalence, identification, sensitive and resistant patterns of the gram positive pathogens of Neonatal septicemia.

OBJECTIVES

1. To determine the Prevalence of Neonatal Septicaemia among suspected sepsis in neonates less than 28 days old, attending to a Tertiary Care Hospital.
2. To isolate and identify Microbiological Profile by using Bact/Alert and VITEK-2 semi-automated system.
3. To determine Antimicrobial susceptibility pattern by VITEK-2 COMPACT system.

MATERIALS AND METHODS

Study Design and Settings:

A cross sectional observational study was conducted in the Department of Microbiology, Government General Hospital & Government Medical College, Anantapuramu, Andhra Pradesh from March 2023 to August 2024. Approval was obtained from the Institutional Ethical Committee before the beginning of the research.

Study Population: A total of 100 blood cultures of patients who satisfied the following inclusion and exclusion criteria were considered as a study population.

Inclusion criteria:

- Neonates less than 28 days of life suspected to have sepsis.
- Neonates admitted under Pediatrics department with septicemia features.

Exclusion criteria:

- Age more than 28 days of life
- Age less than 28 days of life without symptoms of neonatal septicemia
- Patient already started on antibiotics.
- Neonates with multiple congenital malformations.
- Neonates with complex congenital heart diseases.

Sample Collection:

Before venepuncture, the septum of the bottles was disinfected by rubbing with an alcohol swab. Under aseptic precautions, one to 2 milliliters of peripheral blood were collected in BACT/ALERT PF plus blood culture bottle.

Sample processing:
Following inoculation into blood culture bottles, loaded in automated method - BACT/ALERT 3D culture system (BioMerieux). The bottle should be treated as soon as feasible for the following reasons after the automated blood culture bottle provides a positive signal: Direct gram stain, Subcultures was done on MacConkey and 5% Blood agar plates, Colony identification and Antimicrobial Susceptibility Testing are performed from subculture plates by VITEK 2 system. Blood culture bottles showing no growth on subculture after 7 days of incubation were reported as negative.

Antibiotic susceptibility testing:
The procedure for VITEK 2 system was as follows:

1. For testing one isolate, take 2 un-sensitized tubes and label it with ID (identification) and AST (antimicrobial susceptibility).
2. Take 3ml suspension solution of half normal saline from dispenser.
3. Prepare the inoculum suspension in the ID tube using sterile swab to transfer a sufficient number of morphologically similar single isolated colonies from pure culture and calibrate the turbidity of ID tube.
4. Transfer 145 µl (for GNB) and 280 µl(for GPC and YST) from ID tube to AST tube.
5. Place ID card in ID tube and AST card in AST tube in cassette.
6. Fill in blank cassette worksheet with required information for data entry.
7. Age of suspension must not exceed 30 minutes before inoculating card and loading the cassette.
8. Place the cassette into the chamber and run the cycle
9. After completion of the fill cycle, remove cassette from the filler Station and close the fill door. The load door unlocks.
10. Open the load door, place the cassette into station and close it.
11. After processing of test cards unload the cassette as a blinking, blue indicator LED at the load/unload station indicates that an empty cassette is at the station.
12. Remove the cassette from the instrument.

Interpretation: Antimicrobial susceptibility will be done as per Clinical and Laboratory Standard Institute M100, 34 th Edition for bacterial isolation 65 .
In case of fungal isolation, antifungal susceptibility will be done as per Clinical and Laboratory Standard Institute, M27 68.

Definitions [14]:

- Suspected sepsis: Regardless of whether there is a clinical symptom or not, the presence of sepsis risk factors in the baby or findings suggesting sepsis in follow-up.
- Clinical sepsis: Clinical and laboratory findings are present, but the failure to show the causative microorganism.
- Proven sepsis: Clinical and laboratory findings are present, and demonstration of the pathogenic microorganism in cultures taken from the sterile field.

Statistical Analysis:
After receiving report of blood cultures, all the data along with the patient details were entered into structured predesigned proforma. Later, the results were transferred into spread excel sheet to evaluate and tabulate the results.

RESULTS
In this observational study, 100 blood samples taken from clinically suspected sepsis in the neonates < 28 days from March 2023 to August 2024 in the Department of Microbiology, GMC, Anantapuramu. Out of 100 samples, 22 (22%) samples were shown positive blood culture and 78 (78%) samples were found to be negative.

In the present study, based on the age distribution of the cases, out of 22 positive blood culture cases, Early Onset Neonatal Sepsis contributes 14 (63.6%) cases and Late Onset Sepsis about 8(36.4%) cases.

In the present study, based on the Gender-wise distribution of samples, 59.1% was Females and 40.9% were Males. The number of female cases was higher than males.

In the present study, based on the weight of the neonatal cases, 68.2% cases were low birth weight and 31.8% cases were normal weight cases. High positivity rate was observed in the low birth weight cases than normal weight neonates, in this study.

In this study, based on the gestational age of the mother, preterm delivery cases contributed to 54% and term delivery cases contributed 46% sepsis in the neonates.

In the present study, based on the symptoms of the cases, 33% cases were presented with the respiratory distress, followed by refusal of feeds (26%), prematurity(23%), and seizures(15%). The other (3%) symptoms such as absent cry, lethargy, abdominal distention and jaundice were also present (Table 1).

Table 1. Distribution of various risk factors responsible for neonatal sepsis

Parameters	Positive cases (n=22)	Percentage
Age		
<3 days (EOS)	14	63.6%
>3-28 days (LOS)	8	36.4%
Gender		
Female	13	59.1%
Male	9	40.9%
Birth Weight		
Low Birth weight	15	68.2%
Normal weight	7	31.8%
Gestational age		
Pre term delivery	12	54.5%
Term delivery	10	45.4%
Clinical features		
Respiratory distress	33	33%
Refusal of feeds	26	26%
Prematurity	23	23%
Seizures	15	15%
Others	3	3%

In the present study, based on the isolation of micro-organisms, 10 (45.4%) Gram Positive Organisms, 8 (36.4%) Gram Negative bacteria, 4 (18.2%) Candida species were isolated from blood culture.

In this study, the total number of microorganisms isolated in the blood cultures was as *Staphylococcus aureus* (9%), *Coagulase Negative Staphylococci* (27.9%), *Enterococcus faecium* (9%), *Escherichia coli* (4.6%), *Klebsiella pneumoniae* (4.6%), *Klebsiella aerogenes* (4.6%), *Pseudomonas aeruginosa* (9%), *Acinetobacter baumanii* (9%), *Serratia marcescens* (4.6%), *Candida albicans* (4.6%), *Non albicans Candida* (13.7%) (Table 2).

Table 2. Isolation of different pathogens in blood cultures of neonatal septicemia

S.No	Organisms	Positive cases	Percentage
1	*Staphylococcus aureus*	2	9%
2	*Coagulase Negative Staphylococcus*	6	27.30%
3	*Enterococcus faecium*	2	9%
4	*Escherichia coli*	1	4.6%
5	*Klebsiella pneumoniae*	1	4.6%
6	*Klebsiella aerogenes*	1	4.6%
7	*Pseudomonas aeruginosa*	2	9%
8	*Acinetobacter baumanii*	2	9%
9	*Serratia marcescens*	1	4.6%
10	*Candida albicans*	1	4.6%
11	*Candida Non Albicans*	3	13.7%

In the present study, based on the isolation of micro-organisms, 10 (45.4%) Gram Positive Organisms, 8 (36.4%) Gram Negative bacteria, 4 (18.2%) Candida species were isolated from blood culture.

In this study, Antimicrobial Susceptibility Pattern for Gram Positive cocci was performed in VITEK 2 COMPACT System. Positive MRSA pattern Negative Inducible Clindamycin resistance was noticed in both the isolates. These MRSA isolates were sensitive to all higher antibiotics like vancomycin, fluoroquinolones, teicoplanin, linezolid, broad spectrum antibiotics and macrolides (Table 3).

Table 3. Antibiotic Sensitivity Pattern of Staphylococcus aureus

ANITIBIOTICS	BC-135		BC-196	
Cefoxitin Screen	Positive		Positive	
Benzylpenicillin	≥0.5	R	≥0.5	R
Oxacillin	≥4	R	≥4	R

Gentamycin	≤0.5	S	≥16	R
Ciprofloxacin	≤0.5	S	≥8	R
Levofloxacin	≤0.12	S	≥8	R
Inducible Clindamycin Resistance	NEGATIVE		NEGATIVE	
Erythromycin	≤0.25	S	≥8	R
Clindamycin	≤0.12	S	0.25	S
Linezolid	1	S	2	S
Daptomycin	0.25	S	1	S
Teicoplanin	2	S	2	S
Vancomycin	1	S	1	S
Tetracycline	≤1	S	≤1	S
Tigecycline	≤0.12	S	0.25	S
Trimethoprim/ Sulfamethoxazole	≤10	S	20	S

All the 6 CONS isolates of Neonatal septicemia showed Methicillin resistant and negative for inducible clindamycin resistance. One isolates showed resistance to higher drugs like linezolid and teicoplanin. Erythromycin and Clindamycin showed altered susceptibility pattern (Table 4).

Table 4. Antibiotic Sensitivity Pattern of *Coagulase Negative Staphylococcus*

ANITIBIOTICS	BC-121	BC-186	BC-156	BC-174	BC-192	BC-210
Cefoxitin Screen	+	+	+	+	+	+
Benzyl Penicillin	≥0.5 (R)	≥0.5 (R)	≥0.5 (R)	≥0.5 (R)	≥0.5 (R)	≥0.5 (R)
Oxacillin	≥4 (R)	≥4 (R)	≥4 (R)	≥4 (R)	≥4 (R)	≥4 (R)
Gentamycin	≤0.5 (S)	4 (S)	≥16 (R)	≤0.5 (S)	≤0.5 (S)	≥16 (R)
Ciprofloxacin	≤0.5 (S)	≤0.5 (S)	1 (S)	2 (I)	≤0.5 (S)	2 (I)
Levofloxacin	≤0.12 (S)	≤0.12 (S)	≤0.25 (S)	≤0.5 (S)	≤0.25(S)	4 (R)
Inducible Clindamycin Resistance	N	N	N	N	N	N
Erythromycin	1 (I)	≤0.25 (I)	≥8 (R)	≥8 (R)	≤0.25(S)	≥8 (R)
Clindamycin	≥4 (R)	≥4 (R)	≥4 (R)	≤0.12(S)	≤0.12(S)	0.25 (S)
Linezolid	≥8 (R)	1 (S)	1 (S)	1 (S)	1 (S)	1 (S)
Daptomycin	0.25 (S)	0.25 (S)	0.5 (S)	0.25 (S)	0.5 (S)	0.25 (S)
Teicoplanin	≥32 (R)	4 (S)	4 (S)	8 (S)	2 (S)	4 (S)
Vancomycin	2 (S)	2 (S)	2 (S)	1 (S)	1 (S)	1 (S)
Tetracycline	2 (S)	≤1 (S)	≤1 (S)	≤1 (S)	≤1 (S)	≤1 (S)
Tigecycline	0.25 (S)	≤0.12 (S)	≤0.12(S)	≤0.12(S)	≤0.12(S)	≤0.12 (S)
Trimethoprim/ Sulfamethoxazole	≤10 (S)	20 (S)	80 (R)	20 (S)	≤10 (S)	≤10 (S)

Both isolates were vancomycin resistant Enterococcus faecium which showed sensitivity towards fluoroquinolones, erythromycin, linezolid and tigecycline (Table 5).

Table 5. Antibiotic Sensitivity Pattern of Enterococcus faecium

Antibiotics	**BC-123**		**BC-152**	
Benzyl Penicillin	≥64	R	≥64	R
High Level Gentamycin	S	S	R	R
Ciprofloxacin	≤0.5	S	≥8	R
Levofloxacin	≤0.12	S	≥8	R
Erythromycin	≤0.25	S	≥8	R
Linezolid	1	S	2	S
Teicoplanin	4	S	≥32	R
Vancomycin	≥32	R	≥32	R
Tetracycline	≤1	S	≥16	R
Tigecycline	≤0.12	S	≤0.12	S

Overall antibiotic sensitivity of gram positive cocci showed 100% resistant to cefoxitin and penicillin (MRSA and MRCONS isolates of Neonatal septicemia), 50-80% sensitivity to fluoroquinolones, broad spectrum antibiotics, linezolid, vancomycin and gentamicin, and 100% sensitive to teicoplanin, tigecycline (Table 6).

Table 6. Gram Positive organism's sensitivity percentage against tested antibiotics

Antibiotics	*Staphylococcus aureus*	*Staphylococcus epidermidis*	*Enterococcus faecium*
Cefoxitin	0%	0%	-
Oxacillin	0%	0%	-
Benzyl Penicillin	0%	0%	0%
Gentamicin	66.7%	66.7%	-
Levofloxacin	50%	83.3%	50%
Linezolid	100%	0%	100%
Teicoplanin	100%	66.7%	50%
Tigecycline	100%	100%	100%
Vancomycin	100%	100%	0%
Daptomycin	100%	100%	-
Tetracycline	100%	100%	50%
Trimethoprim/ Sulfamethoxazole	100%	83.3%	-

DISCUSSION

Among 100 blood samples received at Microbiology department, 22 (22%) samples were shown positive blood culture and 78 (78%) samples were found to be negative. In similar to our study Kumar DV et al [15] and Reddy KV et al [16] observed the prevalence as 26.6% and 24.27% respectively. Surjeet SS et al [17] noted 40.4% of prevalence rate of neonatal sepsis, which is higher than this study.

In the present study, based on the age distribution of the cases, out of 22 positive blood culture cases, Early Onset Neonatal Sepsis contributes 14 (63.6%) cases and Late Onset Sepsis about 8(36.4%) cases. Other studies were also noted similar findings, presented in Table 1.

Table 1. Prevalence of neonatal sepsis in various studies

Place	EOS %	LOS%	Reference
Western India	66.7%	33.3%	Muley et al [8]
West Bengal	61%	39%	Das M etal [18]
Gujarat	64%	36%	Gamit et al [19]
Sudan	64.4%	35.6%	Abdelaziz M et al [20]
Andhra Pradesh	54.9%	45.1%	Kurma et al [21]
Andhra Pradesh	63.6%	36%	Present study

In the present study, based on the weight of the neonatal cases, 68.2% cases were low birth weight and 31.8% cases were normal weight cases. High positivity rate was observed in the low birth weight cases than normal weight neonates, in this study. Low birth weight babies often develop infections due to underdeveloped immune system in term of cellular and humoral and indirect transfer of pathogens from objects and hospital staff or at home to neonates when there is a breach in infection control practices [22].

In this study, based on the gestational age of the mother, preterm delivery cases contributed to 54% and term delivery cases contributed 46% sepsis in the neonates. Majority of the study showed similar type of results. A study conducted by Mohakud et al from Capital Hospital and Kalinga Institute of Medical Science, Bhubaneswar, Odisha shown neonates delivered before 37 weeks of gestational age had 55.5% and after 37 weeks of gestational age had 44.5% septicaemia [25]. In preterm infants the immune system is compromised by less phagocytosis, less chemotaxis, and reduced opsonic activity of the serum [22].

In the present study, based on the symptoms of the cases, 33% cases were presented with the respiratory distress, followed by refusal of feeds (26%), prematurity (23%), and seizures (15%). The other (3%) symptoms such as absent cry, lethargy, abdominal distention and jaundice were also present. According to similar study by Das M et al, 26.8% of the infants had respiratory distress when they first arrived, along with additional signs like hypoglycemia, convulsions, jaundice, and inadequate crying [18].

In this study, the total number of microorganisms isolated in the blood cultures was as *Staphylococcus aureus* (9%), *Coagulase Negative Staphylococci* (27.9%), *Enterococcus faecium* (9%), *Escherichia coli* (4.6%), *Klebsiella pneumoniae* (4.6%), *Klebsiella aerogenes* (4.6%), *Pseudomonas aeruginosa* (9%), *Acinetobacter baumanii* (9%), *Serratia marcescens* (4.6%), *Candida albicans* (4.6%), *Non albicans Candida* (13.7%).

Surjeet SS et al [17] observed *Klebsiella pneumoniae* was the most frequently isolated pathogen (15 cases, 45.5%), followed by *Coagulase Negative Staphylococcus* (7 cases, 21.2%). Other isolated organisms included *Escherichia coli* (4 cases, 12.1%), *Pseudomonas aeruginosa* (3 cases, 9.1%), *Enterococcus* (2 cases, 6.1%), *Acinetobacter baumannii* (1 case, 3.0%), and *Staphylococcus aureus* (1 case, 3.0%). A similar study by Parajuli R et al from Paropakar Maternity and Women's hospital, Thapathali, Kathmandu, Nepal, were shown that the most commonly isolated were Gram Positive Cocci, which was about 82.6% and the most commonly isolated species was Staphylococcus epidermidis [23]. A similar study conducted by Gamit et al [19] shown that most common organism causing neonatal septicaemia was Gram Positive Cocci which accounts, in which the most common species was *Staphylococcus epidermidis*, which was about 61.33%. Kumar S et al [24] documented among gram-positive organisms, Coagulase-negative staphylococci (CONS) and *Staphylococcus aureus* were most commonly isolated from a blood sample in similar to the present study.

Staphylococcus aureus and *Coagulase Negative Staphylococci* showed positive MRSA & MRCONS pattern Negative Inducible Clindamycin resistance. These isolates were sensitive to all higher antibiotics like vancomycin, fluoroquinolones, teicoplanin, linezolid, broad spectrum antibiotics and macrolides. Kumar S et al [24] CONS was resistant to penicillin and meropenem in the beta-lactam group and resistant to cefotaxime and gentamycin. They were sensitive to ampicillin and tazobactam (beta-lactam) and cefepime and ciprofloxacin (non-beta-lactam). *Staphylococcus aureus* was resistant to only penicillin and sensitive to most of the antibiotics of both beta- and non-beta-lactam classes. Mohakud NK et al [25] and Marwah P et al [26] conducted in India showed good sensitivity to aminoglycoside and vancomycin and low resistance to cephalosporins. According to a related study conducted by Nazir A et al [27] in the Department of Microbiology at Government Medical College Srinagar, 84% of isolates had methicillin resistance. A similar study by Abdelaziz M et al shown that most of the isolates were MRSA(95%), 91.7% sensitive to Vancomycin and 60% sensitive to Gentamicin [20]. Both isolates were vancomycin resistant Enterococcus faecium which showed sensitivity towards fluoroquinolones, erythromycin, linezolid and tigecycline. A similar study was done by Shailaja VV et al shown that there was a rise in the detection of *Enterococcus faecium* in the blood of newborns with sepsis who were admitted to intensive care units. Almost 50% cases were isolated *Enterococcus faecium* [28].

During the delivery passage, *Enterococci* are among the first bacteria to enter the newborn's digestive tract, either orally through breast milk consumption or from the mother's vaginal and gastrointestinal flora. Sepsis caused by Vancomycin

Resistant Enterococci (VRE) is becoming a serious issue in the intensive care unit. The illness may be contracted from the carrier mother or as a nosocomial hospital cross-infection. Furthermore, it is quite concerning when plasmids containing resistance genes are transferred to Staphylococcus aureus. The treatment for VRE is quite difficult [29].

A study done by Gupta S et al shown that two of the five isolates of *Acinetobacter* was resistant to Carbapenem. Every Non Fermenter isolate was susceptible to Colistin. While all three Pseudomonas were susceptible to Carbapenem, two were multidrug resistant and showed resistance to Aminoglycosides, Ceftazidime, and Piperacillin-Tazobactam [30]

CONCLUSION

Our research indicates that premature and preterm babies are more likely to develop neonatal sepsis. Infant mortality and morbidity associated with bacterial newborn septicemia are caused by a variety of Gram Positive, Gram Negative and *Candida*. *Coagulase Negative Staphylococci* was predominantly isolated from Neonatal sepsis patients. Staphylococcal isolates were sensitive to all higher antibiotics like vancomycin, fluoroquinolones, teicoplanin, linezolid, broad spectrum antibiotics and macrolides. Vancomycin resistant Enterococci were also isolated which highlights the importance of transfer of pathogen during intrapartum phase. VRE is a dangerous resistance pattern sparing with last resort antibiotics such as fluoroquinolones, tigecycline and linezolid. Isolation of MRSA, MRCONS and VRE poses a greater challenge for clinicians to treat and also alarming sign of emerging antimicrobial resistance.

The screening of maternal and intrapartum risk factors and analysis of sepsis score will help to identify the condition at the earliest and implementation of sepsis prevention strategies. The implementation and periodic review of the hospital's Antibiotic Policy, regular monitoring and assessment of Antibiotic Susceptibility, an effective Infection Control Program, and the encouragement of responsible antibiotic use will all help to reduce the rates of nosocomial infections and the emergence of bacterial resistance.

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