

Bacteriological Profile and Antimicrobial Susceptibility Pattern of Isolates Obtained from Neonatal Sepsis PatientsAgrawal Ruchi¹, Sharma Seema², Shah Mitesh³, Misra Vaibhav⁴¹Demonstrator, Department of Microbiology, Bundelkhand Medical College, Sagar, M.P. India²Senior Resident, Department of Obstetrics & Gynaecology, M.L.B. Medical College & Hospital, Jhansi, U.P. India³Assistant Professor, Department of Pathology, Bundelkhand Medical College, Sagar, M.P. India⁴Professor, Department of Microbiology, Gajra Raja Medical College, Gwalior, M.P. India

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Conflict of interest: Nil

Abstract:

Introduction: Sepsis is a dysregulated systemic inflammatory as well as immune response that lead to organ damage in response to microbial invasion. Infection is the leading cause of neonatal deaths in India. For appropriate management of neonatal sepsis evaluation of causative agents should be done from time to time. Present study was undertaken to determine the bacteriological profile and antibiotic sensitivity patterns of causative bacteria of neonatal sepsis.

Aims and Objectives: To isolate and identify the bacteria causing neonatal sepsis with their antibiotic susceptibility pattern.

Method: Prospective study conducted in department of Microbiology, Gajra Raja Medical College, Gwalior. Blood samples were collected from suspected case of septicemic neonates in blood culture bottles, subcultures were done. Growth was identified and antimicrobial susceptibility testing was performed for all isolates.

Result: Gram negative bacteria are more frequently isolated than gram positive bacteria from blood culture of suspected neonatal sepsis with *Klebsiella* spp. being most common followed by coagulase negative staphylococci. Gram negative isolates were sensitive for meropenam, levofloxacin and piperacillin + tazobactam while Gram positive isolates were mostly sensitive towards linezolid and Vancomycin.

Conclusion: Gram positive and Gram negative bacteria both can cause neonatal sepsis. Bacteria causing neonatal sepsis shows multidrug resistance.

Keywords: Sepsis, Neonate, Bacteria, Antibiotics.

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Introduction

Bacterial sepsis occurs where response of body for an infection lead to injury to its own tissues and organs. This life threatening condition caused by bacterial invasion and can damage functional integrity [1]. Now its definition is evolving and is heterogenous in primary and secondary criteria both [2]. In response to microbial invasion there occurs a dysregulated systemic inflammatory as well as immune response that lead to organ damage is now considered as sepsis [3].

Isolation of microbes and clinical features are still important components to diagnose sepsis [2]. India accounts for more than 25% of global neonatal death. In 2013 highest neonatal death (0.75 million) occurred in India.

An analysis of child mortality in 2013 found complications of preterm birth and infections as the leading cause of neonatal deaths in India [4]. On the basis of age of onset neonatal sepsis is

classified into early onset (from birth to 7 days of life) and late onset (from 7 days to 28 days of life) sepsis. Early onset sepsis mostly occurs due to antepartum and intrapartum acquisition of infection while late onset sepsis occurs due to community acquired and nosocomial infections. [5] Early onset sepsis is a big threat for preterm infants. Group B streptococcus (GBS) is the commonest agent of early onset neonatal sepsis and mortality is most commonly caused by *Escherichia coli* [6].

In India *Klebsiella*, *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas* spp and Coagulase negative *Staphylococcus* are the common causative agents of neonatal sepsis [7]. Though the agent varies with respect to time and place [8]. Thus for appropriate management of neonatal sepsis evaluation of causative agents should be done from time to time. [7] Present study was undertaken to determine the bacteriological

profile and antibiotic sensitivity patterns of aerobic isolates from blood cultures of neonates in a tertiary care hospital in Gwalior, (M.P.).

Objectives:

- To isolate and identify the bacteria causing neonatal sepsis.
- To determine the antimicrobial susceptibility pattern of the isolated bacteria.

Materials and Methods:

Study design – Prospective

- Total 304 blood samples were collected over 09 months period from 2016 to 2017 in Microbiology department of Gajra Raja Medical College, Gwalior.
- Blood samples were collected from suspected case of septicemic neonates in blood culture bottles (BHI broth).
- Subcultures were done on Blood agar and MacConkey agar at the earliest visual detection of

turbidity or blindly on days 1, 2, and 5 if the bottles did not show turbidity.

- Blood culture broth that showed no microbial growth after 5 days was reported as culture negative.
- Any growth was identified by colony characteristics, Gram staining and standard biochemical tests.
- Antimicrobial susceptibility testing was performed for all isolates by Kirby–Bauer disc diffusion method as per Clinical Laboratory Standards Institute (CLSI) guidelines.

Result:

Of the 304 samples studied, growth was observed in 130 (42.76%) samples.

- Sepsis by Gram negative bacteria is encountered in 79 cases (60.76%) and by Gram positive bacteria in 51 cases (39.2 %).

Table 1: Bacterial isolates from blood culture of neonates with sepsis

S. No.	Bacteria	Isolates (Percentage of total isolates)
1	Gram negative bacteria	Klebsiella spp.
2		Escherichia coli
3		Pseudomonas aeruginosa
4		Acinetobacter baumannii
5		Citrobacter koseri
6	Gram Positive bacteria	Coagulase negative Staphylococci
7		Staphylococcus aureus
8		Group B Streptococcus

Table 1 shows that among all isolates gram negative bacteria Klebsiella spp. is the commonest 52 (40% of total isolates) followed by E.coli, Pseudomonas, Acinetobacter and Citrobacter found in 16 (12.30%), 9 (6.9%), 1(0.76%) and 1(0.76%) case respectively. Among gram positive bacteria Coagulase negative staphylococci is the commonest 33 (25.38%) followed by Staphylococci 16 (12.30%) and Group B Streptococcus 2 (1.53%).

Table 2: Antimicrobial susceptibility pattern for Gram Negative isolates

Drug	Bacteria				
	Klebsiella spp (52)	Escherichia coli (16)	Pseudomonas aeruginosa (09)	Acinetobacter baumannii (01)	Citrobacter koseri (01)
Amikacin	52 %	50 %	66 %	0 %	100 %
Ampicillin + sulbactam	46 %	56%	11 %	100 %	0 %
Cefotaxime	62 %	56 %	11 %	0 %	100 %
Gentamicin	46 %	44 %	22 %	0 %	0 %
Cefoperazone + sulbactam	46 %	38 %	22 %	0%	100 %
Levofloxacin	82 %	78 %	77 %	100 %	100 %
Meropenem	91 %	81 %	66 %	100 %	100 %
Piperacillin + tazobactam	87 %	88 %	55 %	0 %	0 %

Table 2 shows most of Gram negative bacteria show sensitivity for meropenem followed by levofloxacin and piperacillin + tazobactam. Pseudomonas is resistant for Ampicillin+ sulbactam, Cefotaxime, Gentamicin and Cefoperazone + sulbactam; Klebsiella spp. and E coli also show about 50% sensitivity for these drugs. Amikacin show moderate sensitivity for most of Gram negative bacteria.

Table 3: Antimicrobial susceptibility pattern for Gram Positive isolates

Drug	Bacteria		
	Coagulase negative Staphylococcus (33)	Staphylococcus aureus (16)	Group B Streptococcus (02)
Ampicillin	30%	13 %	0 %
Amoxyclav	49%	38 %	50 %
Azithromycin	64 %	44 %	0 %
Levofloxacin	45 %	38 %	50 %

Cefoperazone + sulbactam	49 %	44 %	50 %
Cotrimoxazole	61 %	56 %	0 %
Linezolid	97 %	88 %	100 %
Vancomycin	94 %	88 %	50 %

Table 3 shows Linezolid and Vancomycin as the most sensitive drug for Gram positive bacteria causing neonatal sepsis.

Ampicillin, Amoxycylav, Levofloxacin and Cefoperazone + sulbactam antibiotics show resistance for these bacteria.

Cotrimoxazole and Azithromycin show moderate sensitivity for Coagulase negative staphylococcus and Staphylococcus aureus while Group B Streptococcus is resistant.

Discussion

In the study, blood culture positivity rate is 42.76%. Sepsis by Gram negative bacteria was encountered in 60.76% cases, Klebsiella spp and Escherichia coli were the predominant pathogens. Other isolated pathogens were Pseudomonas aeruginosa, Acinetobacter baumannii and Citrobacter koseri. A study done by Bhatt et al and Muley et al also shows predominance of Klebsiella spp. Sepsis by Gram positive bacteria found in 39.2% cases and coagulase negative Staphylococcus was the predominant pathogen. Other isolated pathogen was Staphylococcus aureus and Group B Streptococcus. This finding of neonatal sepsis predominantly by Gram negative bacteria is comparable with studies done by Jyothi et al, Ronni et al, whereas in studies done by S Thakur et al, Gram positive isolates were more in number in comparison to Gram negative isolates.

In our study Gram Negative isolates were most sensitive to Meropenem followed by Levofloxacin and Piperacillin + Tazobactam. Resistance was observed to be against antibiotics such as Ampicillin, Cefotaxime and Gentamicin which is comparable with studies done by Jyothi et al. Gram Positive isolates were mostly sensitive towards linezolid and Vancomycin and high resistance was seen to Ampicillin, Amoxycylav and Cefoperazone+sulbactam antibiotics also shown resistance. Similar reports of high resistance to Ampicillin and Amoxycylav were reported by S Thakur (2016) et al. Study of Muley et al also showed Vancomycin as drug of choice for Staphylococcus.

Conclusion

Gram positive and Gram negative bacteria both can cause neonatal sepsis. Extended spectrum antibiotics are more sensitive antibiotics while first and second line antibiotics show variable sensitivity even resistance also in neonatal sepsis. Bacteria causing neonatal sepsis show multidrug resistance.

Limitations of Study: As study was hospital based only patients seek medical care were included in study and also a small scale study so the result may not be the exact reflection of whole population.

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