



BACTERIOLOGICAL PROFILE & ANTIBIOGRAM OF NEONATAL SEPTICAEMIA IN A TERTIARY CARE HOSPITAL.

Microbiology

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ABSTRACT

Background : Neonatal sepsis is a major cause of mortality & morbidity worldwide. This is one of the indicators measuring the health status of Nation. The present study was aimed to know the various bacteria causing neonatal sepsis & their antibiogram, so that we can start an appropriate empirical life saving antibiotic therapy.

Materials & Methods: Blood culture was performed in clinically suspected cases of neonatal sepsis over a period of one year. All pathogenic isolates were identified with proper antibiotic sensitivity testing.

Results: Analysis of results showed 15% neonates had definite culture positive septicemia with 1:1 equal proportion of Gram positive (50%) & gram negative (50%) isolates. Gram Negative isolates were most sensitive to Aminoglycosides & Imepenems. Gram positive isolates most sensitive to Vancomycin, Linezolid & Amikacin.

Conclusion: Findings of our study will enhance the knowledge of likely organisms causing neonatal sepsis for the clinicians & appropriate therapy to reduce mortality & morbidity.

KEYWORDS

Neonates, Septicemia, Blood culture, Antibiotic policy.

INTRODUCTION :

Septicaemia denotes to presence of multiplying bacteria & their toxins in blood. Neonatal septicaemia refers to generalised bacterial infections documented by positive blood culture in first four weeks of life & is one of the leading cause of mortality in India. Neonatal septicaemia continues to be a major causes of neonatal mortality & morbidity around the world (approximately 25% of neonatal deaths) & mostly in the developing countries. In INDIA according to National perinatal data base (NNPD)2002-2003, the incidence of neonatal septicaemia has been reported to be 30/1000 live births. Increased prevalence of extended of spectrum beta lactamase producing bacteria & methicillin resistant staphylococcus aureus (MRSA) and multidrug resistant Gram Negative Bacilli is a major concern in neonatal intensive care units worldwide. Neonatal sepsis is broadly divided into two types according to the age of onset: Early – onset sepsis (EOS < 72 hrs) and late onset sepsis (>= 72 Hrs- 28 days, LOS) Early onset sepsis is acquired during fetal life, delivery or at nursery. The microorganisms associated with EOS included group – B *Streptococcus* (GBS), *Escherichia coli*, *coagulase negative staphylococcus species* (CONS), *Hemophilus influenzae* and *listeria monocytogenes* and LOS is caused by *CONS*, *Staph. aureus*, *E.coli*, *Klebsiella spp*, *Pseudomonas spp*, *Enterobacter spp*, *Candida spp*, *Acinetobacter spp*, *Serratia spp* & anaerobes. Ever changing bacteriological profile of neonatal sepsis needs periodic evaluation of organisms essential for appropriate management of neonates.

AIMS & OBJECTIVES:

The present study was undertaken to determine the profile & antibiotics sensitivity patterns of aerobic isolates from blood cultures in neonates for planning the strategy for the management of these cases.

Also to form a logical & calculated antibiotic policy so that empirical treatment can be started early & fruitfully.

MATERIAL&METHODS:

A cross – sectional study was carried out in NICU of a tertiary care Hospital from MAY 2019 till MAY 2020.

The various neonatal & maternal risk factors were also analysed. The neonatal risk factors include low birth weight (LBW), birth asphyxia, congenital anomalies, prematurity, central venous catheterisation for >10 days, nasal canula usage, continuous positive airway pressure use etc.

The maternal risk factors include low socioeconomic status, lack of periodic antenatal check up, difficult delivery (caesarean section, forceps, vacuum), Pre mature rupture of membrane, prolonged rupture of membrane, Pregnancy with UTI, H/O still birth, amniocentesis, chorioamnionitis.

A total of 265 suspected cases of neonatal septicaemia were included in the study. Neonatal septicaemia was suspected if one or more of the following signs & symptoms were present: convulsions, respiratory rate > 60 /mins, severe chest in drawing, nasal flaring, grunting, discharge from ear, bulging fontanelle, umbilical sepsis, temperature > 37.5°C or < 36.4 °C, lethargy, unconsciousness, poor feeding not sucking at all, crepitations at lung bases, cyanosis, reduced digital capillary refill time.

2ml of blood was collected aseptically from a peripheral vein of all neonates before administration of antibiotics & inoculated in 20 ml of Brain – heart infusion broth (Hi – media, India) on the bedside.

Blood culture bottles were transported immediately to microbiology laboratory & were incubated at 37° C, subcultures were done in sheep blood agar and MacConkey agar at the earliest on visual detection of turbidity on 1,4 & 7 days. Isolates were identified by characteristics appearance in respective media, gram staining & confirmed by standard biochemical reaction tests for both gram positive & gram Negative organisms.

Antibiotic sensitivity testing was performed on Muller – Hinton agar plates by modified Kirby – Bauer disk diffusion techniques as per latest CLSI guidelines.

RESULTS:

Total 265 neonates suspected to have septicemia on a clinical basis was included in the study. Amongst these 40 (15%) neonates had definite septicaemia as they were bacteriologically blood culture positive. 20 cases (50%) were gram negative organisms & 20 (50%) cases were gram positive organisms (Table I). Amongst 20 gram positive organisms commonest is *Staphylococcus aureus* (MSSA) 13 cases (65%), followed by *CONS*, *MRSA*, *Enterococci*. *Gram positive cocci* showed highest sensitivity to cephalixin, Vancomycin, Linezolid, Levofloxacin. (Table 2 showing the sensitivity pattern & bar diagram of Antimicrobial sensitivity of gram positive isolates)

Amongst 20 gram negative isolates *Klebsiella*(40%) was commonest followed by *Pseudomonas* ,*E .coli* ,*Acinetobacter* ,*Citrobacter* .Gram Negative bacilli were highly sensitive to Ampicillin – sulbactam ,Amikacin , Gentamicin, Ceftazidime – clavulanic acid , Aztreonum ,Meropenem , Imepenem . (Table 3 showing the sensitivity pattern & bar diagram of Antimicrobial sensitivity of gram negative isolates)

FIGURES & LEGENDS :

Table-1 Bacterial Isolates Causing Neonatal Septicemia

Gram positive cocci	No. of Isolates
Enterococci	02
Staphylococcus aureus	13
MRSA	02
CONS	03
Total	20

Gram Negative bacilli	No. of Isolates
Pseudomonas	04
Acinetobacter	02
Klebsiella spp.	08
E. coli	04
Citrobacter	02
Total	20

GRAND TOTAL : 40 ISOLATES

Table -2 Sensitivity Pattern of Gram Positive cocci

Antibiotics	Staphylococcus aureus (n=13)	CONS (n=3)	Enterocococi (n=1)
Ampicillin + Sulbactum	69%	60%	50%
Cephalexin	60%	100%	
Cefotaxime	61%	66%	
Cefuroxime	56%	50%	
Amikacin	100%	70%	
Ciprofloxacin	30%	66%	
Levofloxacin	30%	66%	
Gentamycin	61%	66%	
Clindamycin	23%		
Cefoxitin	76%	100%	
Pip + Tazo	53%		
Linezolid	100%	100%	100%
Amoxy + clav	61%		
Vancomycin	92%	90%	100%
Chloramphenicol	30%		
Ofloxacin	53%	50%	70%

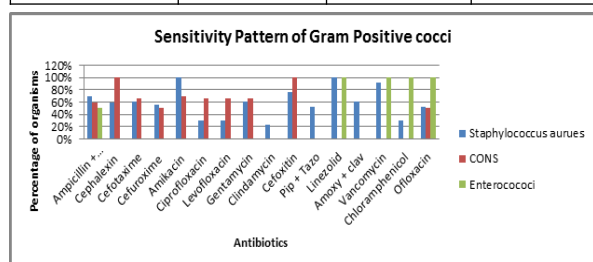
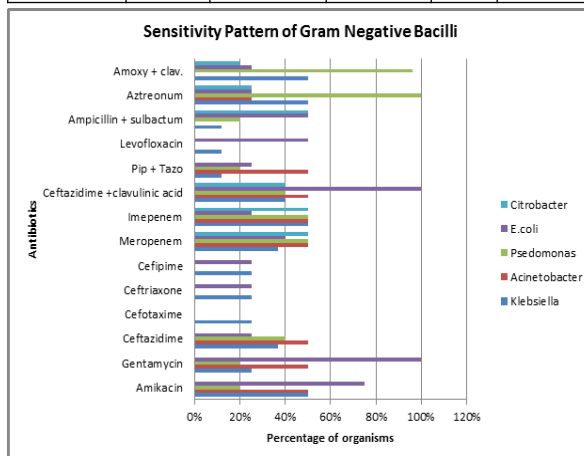


Table-3 Sensitivity Pattern of Gram Negative Bacilli

Antibiotics	Klebsiella (n=8)	Acinetobacter (n=2)	Pseudomonas (n=4)	E.coli (n=4)	Citrobacter (n=2)
Amikacin	50%	50%	20%	75%	-
Gentamycin	25%	50%	20%	100%	-
Ceftazidime	37%	50%	40%	25%	-
Cefotaxime	25%	-	-	-	-
Ceftriaxone	25%	-	-	25%	-
Cefipime	25%	-	-	25%	-
Meropenem	37%	50%	50%	40%	50%
Imepenem	50%	50%	50%	25%	50%
Ceftazidime +clavulanic acid	40%	50%	40%	100%	40%
Pip + Tazo	12%	50%	20%	25%	-
Levofloxacin	12%	-	-	50%	-

Ampicillin + sulbactum	12%	-	20%	50%	50%
Aztreonum	50%	25%	100%	25%	25%
Amoxy + clav.	50%	-	96%	25%	20%



DISCUSSION:

Septicaemia remains a significant cause of mortality & morbidity amongst newborns .The clinical diagnosis of neonatal septicaemia is difficult due to non specific signs & symptoms . So early diagnosis & proper identification of infectious agents & their antibiogram is an essential guide to clinicians regarding empirical & definitive treatment .

The bacteriological profile of septicaemia keeps changing with the passage of time from region to region & hospital to hospital . The emergence of resistance leads to failure in treatment in NICU . So longitudinal surveillance of NICU to formulate guidelines for empirical treatment is desirable and should be an on going study.

Our present study shows 1:1 ratio of gram negative bacilli (50 %) versus gram positive cocci (50%) .

Many recent studies reported an increased emergence of Gram positive organisms, particularly CONS as a cause of neonatal septicaemia.

Amongst all gram negative isolates, *Klebsiella* (40%), has been found to be the predominant organism correlated with the study of Mathur .M .et al (1994).Gram positive isolates *Staphylococcus aureus* (65%) was most common comparable with the study of Fleer A et al (1986) (more than 90%) .

Empirical treatment of neonatal sepsis consist of Ampicillin & aminoglycosides .In our study, results revealed that majority of Gram negative bacilli were sensitive to Ampicillin – sulbactum , Amikacin, gentamicin, Imepenem, ceftazidime-clavulanic acid, Aztreonum respectively.

Amongst Gram positives isolates were most sensitive to Levofloxacin, Amikacin, vancomycin , Linezolid . So an appropriate combination empirical antibiotics should be started as soon as blood culture is sent.

The colonisation of skin & nasopharynx by *CONS* & *Staph. aureus* in health care workers , overcrowding in nurseries & NICU ,improper hand hygiene techniques may lead to transmission of gram positive organisms in neonates horizontally . Our study reveals *Staph aureus* (65%) & *CONS*(15%) as most common gram positive organisms which is quite high ,compared to studies conducted by Agnihotri et al (2004) & Sundaram et al(2009) Non fermenters & *Klebsiella pneumoniae* are most common gram negative isolates , Non fermenters tend to colonise in nurseries & transmitted by cross-infection.

An effective infection control programme , regular antibiotic susceptibility surveillance & evaluation ,periodic review of antibiotic policy & encouragement of rational use of antibiotics will reduce the rates of acquiring nosocomial infections & development of antibiotic resistance.

CONCLUSION:

The study concludes that empirical therapy for neonatal septicemia should cover both gram Negative bacilli & gram positive cocci. An effective infection control programme, regular antibiotics susceptibility surveillance & evaluation, periodic review of antibiotic policy & encouragement of rational use of antibiotics will reduce the rates of acquiring nosocomial infections & development of bacterial resistance, along with early patient cure and reduced hospital stay.

REFERENCES:

- 1) Jyothi P, Basavaraj MC, Basavaraj PV. Bacteriological profile of neonatal septicemia and antibiotic susceptibility pattern of the isolates. *J Nat Sc Biol Med* 2013;4(2):306-9.
- 2) Muley et al, Bacteriological Profile of neonatal septicemia in a tertiary care hospital from Western India. *Journal Of Global Infectious Diseases*, 2015 Apr-Jun;7(2):75-77.
- 3) Sweta et al, Bacteriological profile & anibiogram of blood culture isolates from patients of rural tertiary hospital. *International Journal of Microbiology & Mycology*, 2016, vol4, No: 3, p1-7
- 4) Bacteriological Profile and Antibigram Of Neonatal Septicemia, Bhatt Sima K et Al, *National Journal Of Community Medicine*, Vol 3, Issue 2, April – June 2012.
- 5) S.Thakur et al, Bacteriological profile & antibiotic sensitivity pattern of neonatal septicemia in a rural tertiary hospital in North India, *Indian Journal Of Medical Microbiology*, 2016, 34(1): 67- 71.
- 6) Jayasimha et al, Neonatal Septicemia and Antibigram : Peadiatrician's Challenge, *RGUHS Med Science*, January 2017 / Vol 7 / Issue 1, Pg 12-14.
- 7) Report of the National Neonatal Perinatal Database, Report 2002 -2003, NNPD Network.
- 8) Agnihotri et al, Antimicrobial susceptibility of isolates from neonatal septicemia, *Jpn J Infect Dis* 2004 ; 57 : 273-5
- 9) Sundaram V et al, Blood culture confirmed Bacterial sepsis in Neonates in a North Indian Tertiary care centre : Changes over the last decade, *Jpn J Infect Dis* 2009 ; 62 : 46-50.
- 10) Mathur et al, Bacteriological profile of Neonatal septicemia cases, *J Post Grad Med* . 1994, 40: 18-20.
- 11) Fleer A et al, The Pathogenic role of Coagulase Negative Staphylococci. *Am J Med* 1986. Jan 30, 80 (6B) : 161-5