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Bacteriological Profile of Neonatal Sepsis in a Tertiary-care Hospital of Northern India

With an objective to study the bacteriological profile of neonatal sepsis a retrospective study was conducted in the neonatal unit of a referral teaching hospital in Northern India. Among neonates born over 5-year period (*n*=22363) incidence of culture-positive sepsis was 7.5/1000 live births (7.5%). *Staphylococcus aureus* (47.3%), *Klebsiella pneumonia* (14.9%) and *Acinetobacter* (14.9%) were most common organisms isolated. Sensitivity pattern of isolated organisms is presented.

Key words: *Antibiotics, Neonate, Sepsis.*

Systemic infections cause 1.6 million neonatal deaths every year, majority in middle and low income countries [1]. South-east Asian studies report high resistance to antibiotics used commonly for empirical treatment of neonatal sepsis [2]. Widespread use of third-generation cephalosporins and lack of reliance on blood culture reports could be a major cause for this resistance. This study was planned to evaluate causative organisms of neonatal sepsis and their antibiotic sensitivity pattern in a setting with negligible third-generation cephalosporin use.

After approval from Institute ethics committee, blood culture records of inborn neonates born from January 2008 to December 2012 in a tertiary care hospital were screened. Detailed information was extracted from case records of neonates with positive blood culture. Neonates with perinatal risk factors or clinical features suggestive of sepsis were investigated for bacterial sepsis. Standard procedures were followed for sample collection, studying bacterial growth and antibiotic sensitivity patterns [3,4]. For empirical treatment of early-onset sepsis (EOS) intravenous ciprofloxacin and amikacin, and for nosocomial late-onset sepsis (LOS), intravenous piperacillin-tazobactam and vancomycin, were administered. Antibiotic policy was based on periodic review of the culture sensitivity pattern. Cephalosporins were not used unless identified as solitary antibiotic to which isolated bacteria were sensitive.

Among 22363 live births, 883 were screened for sepsis and 167 (7.5/1000 live birth) had culture proven sepsis. Of these, 142 (85%) had EOS and 25 (15%) had LOS. *Staphylococcus aureus* (47.3%) was commonest isolated organism followed by *Klebsiella pneumoniae* (14.9%) and *Acinetobacter* (14.9%). EOS was caused by *S. aureus* (50.7%) followed by *K. pneumoniae* (14.8%) and *Acinetobacter* (12.7%). LOS was caused by *S. aureus* (28%), *Acinetobacter* (28%), *E. coli* (16%) and *K. pneumoniae* (16%). The antibiotic sensitivity pattern for common organisms is shown in ***Table* I**.

Incidence of blood culture proven sepsis was comparable to the largest dataset reported from tertiary care hospitals of India [5]. EOS constituted majority (85%) of culture-proven cases in our study as we included only intramural babies. The spectrum of pathogens in India and south-east Asian countries is different from Western data where *group B streptococci* and *coagulase negative staphylococci* (CONS) are the predominant pathogens [6]. Gram-negative bacilli are predominant pathogens in developing countries with *K. pneumoniae* being the most common [5,7]. Recently, *S. aureus* has emerged as predominant pathogen in studies from developing countries [8-10]. This changing pattern of organisms from gram negative to gram positive has been attributed to prolonged stay, improved intensive care facilities and invasive procedures [9]. The higher rates of *S. aureus* sepsis in both EOS and LOS and a similar profile of isolated bacteria indicate that majority of EOS in inborn babies may be hospital-acquired rather than maternally acquired [7]. We observed high resistance to oxacillin but good sensitivity to aminoglycosides, vancomycin and linezolid among *S. aureus* isolates. Low cephalosporin resistance was noticed in this study, probably due to uncommon use of this drug in our unit [7].

TABLE I SENSITIVITY PATTERN OF MAIN ORGANISMS ISOLATED IN THE STUDY

	S. aureus (*n*=79)	*K. pneumoniae* (*n*=25)	*Acinetobacter* (*n*=25)	*E. coli* (*n*=11)
Penicillin G	4/37	0/1	0/1	0/1
Oxacillin	35/68 (51.5)	–	–	–
Ampicillin	3/8 (37.5)	2/3 (66.7)	1/5 (20)	0/2 (0)
Piperacillin	1/4 (25)	6/13 (44.5)	6/12 (50)	3/5 (60)
Imipenem	–	13/14 (92.8)	5/10 (50)	6/7 (85.7)
Cefotaxime	3/3 (100)	2/3 (66.7)	4/8 (50)	2/3 (66.7)
Ceftazidime	0/3 (0)	3/13 (23)	4/15 (26.7)	3/5 (60)
Gentamicin	37/43 (86)	1/4 (25)	1/4 (25)	3/4 (75)
Amikacin	4/8 (50)	17/22 (77.2)	7/19 (36.8)	8/10 (80)
Ciprofloxacin	32/48 (66.7)	9/17 (53)	8/19 (42.1)	4/11 (36.3)
Vancomycin	39/39 (100)	–	1/1 (100)	–
Linezolid	35/35 (100)	–	–	–
Colistin	–	4/4 (100)	8/9 (88.9)	0/1 (0)
Polymyxin B	–	3/3 (100)	6/6 (100)	–

Limitations of our study include its retrospective nature, and not testing sensitivity of all organisms against similar set of antibiotics. Of all isolates, 58% were sensitive to either ciprofloxacin or amikacin which are our unit's first line antibiotics for EOS. Although not approved for use in neonates, ciprofloxacin is widely used and is the cornerstone for empirical treatment of neonatal sepsis in regions with high degree of resistance to cephalosporins.

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POONAM MARWAH, DEEPAK CHAWLA, #JAGDISH CHANDER, VISHAL GUGLANI AND *ASHISH MARWAH
*From Department of Pediatrics GMCH, Chandigarh and *BPS GMC for women, Khanpur Kalan, Sonepat, Haryana; and #Department of Microbiology, GMCH, Chandigarh, India.*
poonammehta73@gmail.com

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