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Research Article

Trends of Organisms and Their Antibiotic Sensitivity in NICU

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ABSTRACT

Aim and Objective: To assess the pattern of bacterial isolates in our NICU along with their antibiotic sensitivity pattern so that guidelines could be prepared for a rational antibiotic therapy.

Study Design: A retrospective hospital based study.

Place and Duration Of Study: NICU of Sangameshwar hospital, Gulbarga from Nov 2012 to Aug 2013.

Material and Methods: All neonates admitted in our NICU with positive culture were included in this study. Culture reports were analyzed for bacterial isolates along with their antibiotic sensitivity pattern.

Results: 139 organisms were isolated from the 442 cultures. Staphylococcus aureus was the main pathogen during this period. Resistance to methicillin is 18%. Among gram negative organisms, klebsiella is most common.

Conclusion: Staphylococcus aureus is the most common organism. Meropenam is the most sensitive drug for gram negative organisms, vancomycin followed by linezolid for gram positive organisms. These drugs should be used as second line drugs otherwise resistance increases over time.

Keywords: Antibiotic Sensitivity, Bacterial Isolates, Neonatal Sepsis.

Introduction:

Septicaemia in neonates is one of the major causes of morbidity and mortality among the newborns in the developing world [1]. It can be defined as "a clinical syndrome which is characterized by systemic signs and symptoms and bacteraemia during the first month of life". It is labelled as "early onset" disease, if it presents during the first 72 hours of life and as "late onset" if it occurs after 72 hours of life. Bacterial pathogens responsible for this serious condition vary with time and geographical area.[2] To initiate the appropriate antibiotic treatment, it is extremely important to diagnose the cases in time. The uncertainty which surrounds the clinical approach to the treatment of neonatal septicaemia can be minimized by undertaking periodic epidemiological surveys on the aetiological agents and their antibiotic sensitivity patterns, which lead to the recognition of the most frequently-encountered pathogens in a particular neonatal setting.

The same was the aim of this study; to find out the most commonly encountered pathogens and to formulate guidelines regarding the appropriate empirical antibiotic treatment of the cases.

Materials and Methods:

Blood specimens for culture were drawn from 442 newborns who were admitted in our NICU during the period nov 2012 – august 2013) and CSF specimens where indicated. Before administering any antibiotic, 1-2 ml of blood was obtained from peripheral vein of the neonate with all aseptic precautions for culture and sensitivity[5].The specimens were inoculated into brain heart infusion broth. Subcultures were performed on days 1, 2, 3, 5. The isolates were identified by doing standard biochemical tests. The antibiotic sensitivity patterns of the isolates were studied by the Kirby Bauer disc diffusion technique.

A structured Proforma was used to collect the information for the baseline characteristics like age, gender, birth weight, gestational age, mode of delivery of the neonate , age of onset of illness, place of delivery(intramural or extramural) and outcome.

Data analysis: The collected data was analyzed by using SPSS version 12.0. Frequencies and percentages for all categorical variables, i.e. organisms grown on blood culture, their antibiotics sensitivity pattern, gender, birth weight , gestational age (preterm or term), mode of delivery (vaginal or caesarean section) and age of onset of illness (early or late)were analysed. The results were presented in the form of tables and graphs along with description

Results:

139 organisms were isolated from the 442 cultures during this period 31.4%.As in table 1, among blood culture positive babies, Majority were males 61.8% and percentage of female babies was 38.1%. Majority were term babies 69.1% compared to preterm 30.9 %.(fig 1.) Birth weight AGA were more than SGA.(79.2% Vs 20.8%).

FIGURE 1

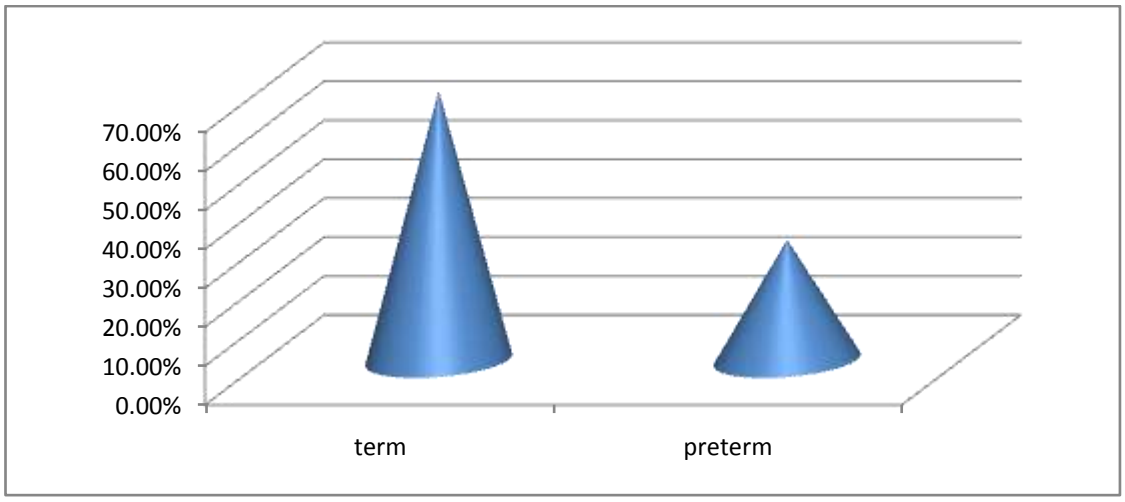


Table 1

Variables	percentage
Males	61.8%
females	38.2%
SGA	20.8%
AGA	79.2%
EONS	73.3%
LONS	26.7%
NVD	77.6%
LSCS	22.4%
Mechanical ventilation	11.07%
Death	8.6%
DAMA	5.7%
Referred	2.8%
I & D	82.9%

FIGURE 2 Extramural cases exceeded intramural cases (59.8 vs 40.2%)

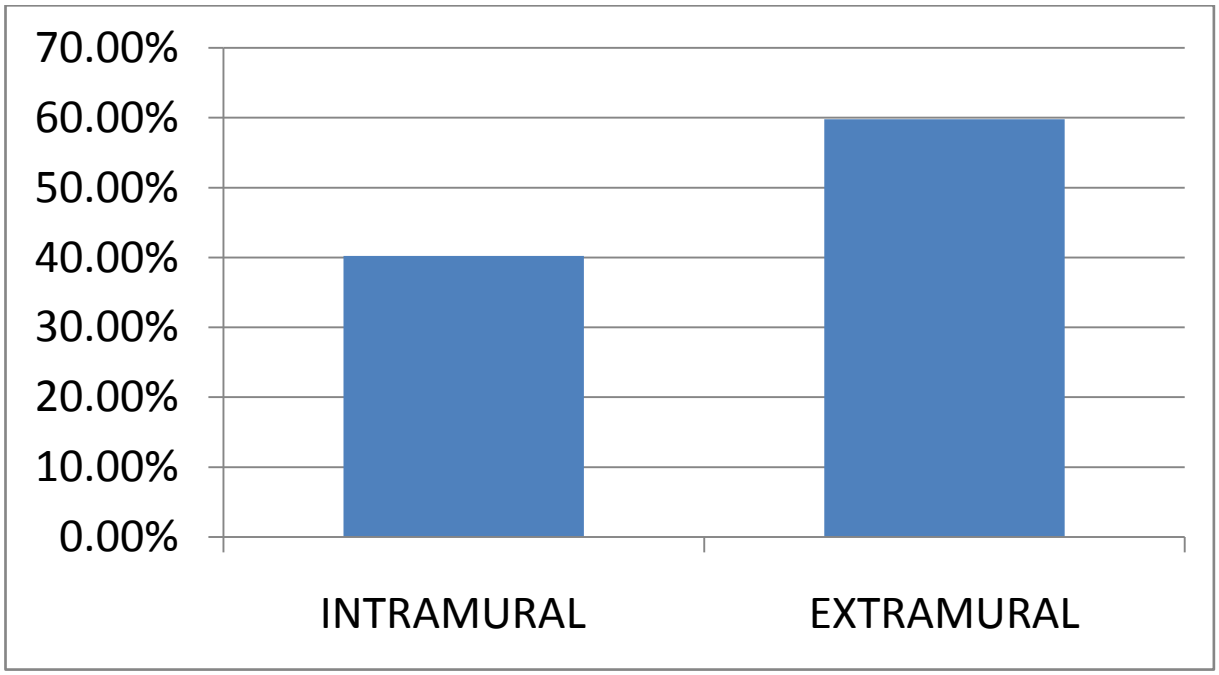


FIGURE 3 Early onsets neonatal sepsis was more prevalent than late onset 73.3% vs 26.7%

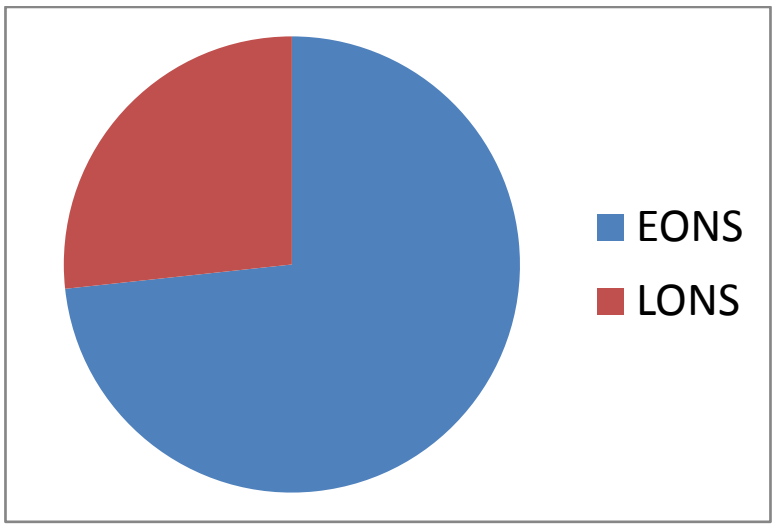
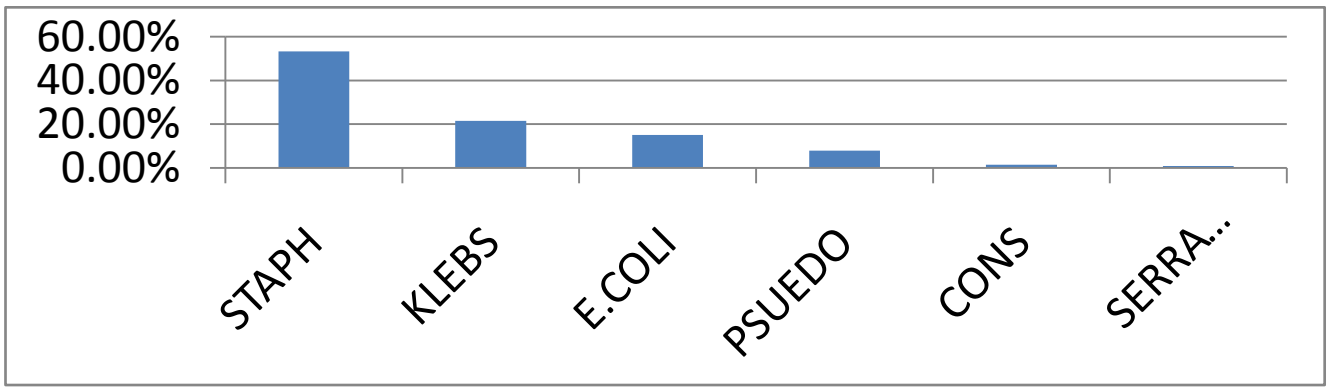


TABLE: 2

BACTERIAL ISOLATES	EONS(n= 105)	LONS(n= 34)
STAPH	49 (46.6%)	25 (73.5%)
CONS	1 (0.9%)	1 (2.9%)
E.COLI	19 (18%)	2 (5.8%)
PSEUDO	10 (9.5%)	1 (2.9%)
KLEBS	25 (23.8%)	5(14.7%)
SERRATIA	1(0.9%)	0

As in table 2, Among EONS, Staphylococcus aureus 46.6% , klesiella 23.8%, E. coli 18%, pseudomonas 9.5%, CONS and serratia 0.9% each. Among LONS, Staphylococcus aureus 73.5%, klesiella 14.7%, E. coli 5.8%, pseudomonas 2.9%, CONS 2.9%. Staphylococcus aureus was the main pathogen of both early and late onset neonatal sepsis. Resistance to methicillin was 18.9%.Majority of the organisms isolated from blood (94.3%) and few fom CSF(5.7%). These included Staphylococcus aureus 53.2% ,Coagulase Negative Staphylococcus (CoNS) 1.4%, Klebsiella pneumoniae 21.5%, Escherichia coli 15.1%, pseudomonas aeroginosa 7.9%,serratia 0.9% .

FIGURE 4



Meropenam is the most sensitive drug for gram negative organisms, vancomycin followed by linezolid for gram positive organisms. High resistance to tetracycline, ampicillin, amoxicillin, cloxacillin is noted.As in fig 6.Staphylococcus aureus showed highest sensitivity to vancomycin 81%followed by linezolid and meropenam 58%, netromycin 53%, piperacillin tazobactum 44%, ofloxacin 41% and azithromycin 35%.

FIGURE 5 showing sensitivity of antibiotics to staphylococcus aureus

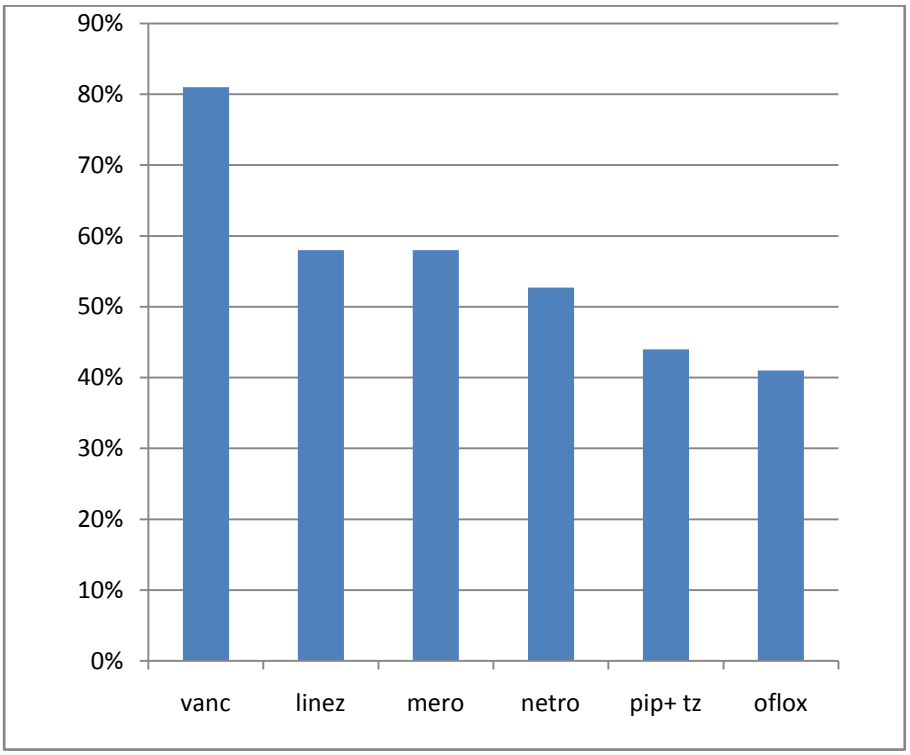


TABLE 3: Showing sensitivity of organisms to cephalosprins. Most of the third generation cephalosporins had higher resistance.

	STAPH (n =74)	E.COLI (n= 21)	PSUEDO (n= 11)	KLEBS (n=30)
CEFOTAXIME	22 (29.7%)	2 (9.5%)	4 (36.3%)	3 (10%)
CEFTAZIDIME	10 (13.5%)	2 (9.5%)	2 (18.1%)	1 (3.3%)
CEFAPRAZONE	24 (32.4%)	2 (9.5%)	2(18.1%)	1 (4.7%)
CEFTRIAXONE	17 (22.9%)	3 (14.2%)	3 (27.2%)	4 (13.3%)
CEFIPIME	21 (28.3%)	3 (14.2%)	4 (36.3%)	4 (13.3%)

TABLE 4 showing sensitivity of organisms to different antibiotics

	STAPH (n =74)	E.COLI (n=21)	PSEUDO (n=11)	KLEBS (n=30)
PIPERACILLIN TAZOBACTUM	26 (35.1%)	8 (38%)	6 (54.5%)	6 (20%)
MEROPENAM	43 (58.1%)	17(80.9%)	10 (90.9%)	28 (93.3%)
AZTREONAM	15 (20.2%)	4 (19%)	3 (27.2%)	4 (13.3%)
OFLOXACIN	30 (40.5%)	6 (28.5%)	8 (72.7%)	19 (63.3%)
AMIKACIN	12 (16.2%)	1 (2.7%)	3 (27.2%)	3 (10%)
LINEZOLID	43 (58.1%)	1 (2.7%)	3 (27.2%)	2 (6.6%)
AZITHRO	28 (37.8%)	7 (33.3%)	9 (81.8%)	12 (40%)
AUGMENTIN	9 (12.1%)	1 (2.7%)	1 (9%)	1 (3.3%)
NETROMYCIN	39 (52.7%)	4 (19%)	7 (63.6%)	7 (23.3%)
GENTAMYCIN	0	6 (28.5%)	3 (27.2%)	8 (26.6%)

Klebsiella pnuemoniae showed highest sensitivity to meropenam (93%)followed by ofloxacin 63%and azithromycin 40%. E.coli showed highest sensitivity to meropenam 81% followed by piperacillin tazobactum 38%, azithromycin 33%. Pseudomonas aeroginosa showed highest sensitivity to meropenam 91% followed by azithromycin 81%, ofloxacin 73%, and netromycin 64%.

Discussion:

The culture-positivity of the aerobic organisms in the neonates in our study was 32.1%, similar to the study done by Dias et al[3] whereas in a study which was done by Shaw CK et al.,[4] it was 54.64%, Bhattacharjee et al., [5] found it to be 48%. A male preponderance of neonatal sepsis is seen in almost all studies[8] and same is the case with our study. In present study early onset septicaemia was observed in 73%(average) cases, while it was 49.6% in Shaw ck et al[3] , 55.3% in studies by Vinod kumar et al[6], 73% in AH Movahedian et al[7], 64.7% in Aletayeb et al[8].

S. aureus was the predominantly isolated pathogen in this study; similar findings were seen in several studies [9,10]. Group B Streptococcus, which is a common cause of neonatal sepsis in the west, is infrequent in India and in other tropical countries[11]. Group B Streptococcus was not isolated from any culture in our study similar to studies by Malik MA et al [12]and Waheed M et al[13]. In contrast to this Robbilard et al19 from Guadeloupe reported Group B Streptococcus in 46% of blood cultures.

The horizontal transmission of S. aureus from colonized visitors or health care workers to the infants in the NICU has previously been documented [14-16] and it could have been a mode of transmission in some of our patients. In a similar study which was done by Sundaram V et al.[17] they reported an increase in the incidence of neonatal sepsis which was caused by S. aureus and a decrease in the incidence of neonatal sepsis which was caused by gram-negative bacilli. Similar findings were obtained in our study.

MRSA causes a significant proportion of S. aureus infections in the NICU, both in our NICU and in those at other centres [18].The high resistance rates in our study may be associated with frequent use of antibiotics for both prophylaxis and treatment of neonates in hospital. In view of this, we suggest that strategies of antibiotic usage in neonates be reviewed periodically.

The spectrum of gram-negative bacteria responsible for neonatal sepsis in this study is similar to that reported by other authors [19,20] with the predominant isolates being *Klebsiella* and *Escherichia coli*.

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[20].Our neonatal unit is no exception to this World wide antimicrobial emergency.

High resistance to tetracycline, ampicillin, amoxicillin, cloxacillin is noted in our study similar to study by Kokasal et al [21]

In present study all Gram positive and Gram negative bacteria were less sensitive to Cephalosporins like Cefotaxime and Ceftizoxime which is as in studies of Mutlu et al [22], Kokasal et al[21] and Zardad Muhammad et al[23]

Conclusion:

The present study emphasizes the importance of periodic surveys on the microbial flora which is encountered in particular neonatal settings, to recognize the trend. Vancomycin and meropenam should be used when the patient does not respond to the first line treatment or the combination of drugs. In order to prevent the horizontal transmission of infections in neonates, it is important for the health care workers to adopt strict universal precautions and there should be a restricted entry of visitors in the NICU.

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