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Original Research Article

A study on bacteriological profile, drug sensitivity and resistance pattern of isolated organism in neonatal septicaemia in neonatal intensive care unit

Himanshu A. Joshi*, Seema S. Shah

Department of Pediatrics, GMERS Medical College, Gandhinagar, Gujarat, India

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***Correspondence:**
Dr. Himanshu A Joshi,
E-mail: drhimanshu.joshi60@gmail.com

ABSTRACT

Background: Neonatal Sepsis is one of the major cause of mortality and morbidity in Neonates. Bacterial pathogens and drug resistance varies from different hospitals areas, regions and countries. Advances in early diagnosis and treatment have led to better prognosis of newborns in NICU. This study will provide the bacterial pathogen causing neonatal sepsis along with their antibiogram. The pattern of susceptibility to antibiotics in NICU at GMERS Medical College centre, was very helpful to start the empirical therapy.
Methods: This retrospective study was carried out in GMERS Medical College, Gandhinagar from February 2015 to January 2016. Period in 228 neonates. Out of which 131 cases were positive for blood culture. The positive blood culture was detected by Bactec blood culture system.
Results: In present study 131 out of 228 cases were culture positive (57.48%). In gram negative organism *Klebsiella pneumoniae* was the commonest followed by *E. coli* (3.05%) and *Pseudomonas* (2.3%) *CONS* was the most common isolates in from the group. *Klebsiella pneumoniae* was sensitive to levofloxacin (9816), imipenem (88.15%) and piperacillin+tazobactam (88.15%). This organism was having less sensitivity to routine 1st line antibiotics like ampicillin (9.2%), gentamycin (27.4%), amikeine (35.5%) amoxy+clavulinic (21%) acid, cefotaxime (25%), gram positive *CONS* having sensitivity to vanceomycin (8.8%), amkacine, ampicillin, levofloxacin, cefotaxime were having limited effect on *CONS* organism.
Conclusions: There is an increasing trend of antibiotic resistance to the commonly used first line drugs. The pattern of sensitivity is changing hence continuous surveliance for antibiotic susceptibility is needed to ensure correct empirical therapy before blood culture reports are available.

Keywords: Bacterial Sepsis, Neonates, Resistance, Sensitivity

INTRODUCTION

The Neonatal Sepsis incidence is increasing in the recent years, Neonatal septicaemia refers to generalised infection with positive blood culture in the early 28 days of Neonates.[1] Advances in early diagnosis and prompt treatment have led to better prognosis of newborn's in NICUs. According to National Neonatal Prenatal database 2002/2003 neonatal septicaemia. In India comprised if 30/1000 live birth in rural india clinical sepsis rates are ranging from 49 to 170/1000 Live Bistes.[2,3] 36% death in newborn period is due to neonatal septicaemia and is the one of the major cause of neonatal mortality. There is a difference in the causative organises

for neonatal sepsis between the developed and developing countries. The causative organism and their sensitivity to drugs varies in each hospital and region. Neonatal seplicenta can be classified in:

- Early onset neonatal sepsis (EONs) symptoms appears before 72 hours.
- Late onset neonatal sepsis (LONs) symptoms appearing after 72 hours.[4]

This retrospective study was conducted to determine the causative organisms and pattern of sensitivity to antibiotics in NICU, which in turn help to implementations of effective empirical therapy till the culture reports are available. Early identification of organisms causing neonatal sepsis and appropriates use of antibiotic will minimise the mortality and morbidity. Emerging resistant strains of antibiotics will guide to reduce unnecessary use of antibiotics.

The aim of the study was to detect the bacterislogical profile, drug sensitivity and resistance from the blood culture causing septicaemia in neonates early and prompt management of the neonates admitted to NICU with sensitive drugs will reduce the mortality and morbility.

METHODS

The study was conducted at the GMERS Medical College, Gandhinagar. The design of the study was retrospective. The study period was about 12 months. (February 2015 to January 2016). The sample size was 228. Neonates admitted to NICU having clinical septicaemia were included in this study.

Blood for bacterial culture was aseptically collected and added to 2 ml. of B.D. Bactec tm. Pedsplus tm/F culture bottles containing 40 ml of processed water, soyabean, casein digest broth. 2.75% w/v and incubated at 37°C for 48 hrs. to 7 days in BD Bactec System.

Positive blood culture bottles were sub cultured onto 5% sheep blood agar, chocolate agar and macconkey's agar and incubated at 37ºC for 18 hours. Negative culture bottles were incubated for 7 days, the organisms isolated were identified by standard biochemical test and the sensitivity to the antibiotics was assessed by using the modified kirby bauer disc diffusion method on a mueller hinton Agar. Adequate rational data on bacterial pathogens causing neonatal sepsis along with antibiogram is obtained from this study, and It would be of immense help in prompt empirical management of neonatal septicape.

RESULTS

Out of 228 newborns admitted to NICU with clinical septicaemia, 131 positive blood culture reports were obtained. Before empirical antibiotic therapy was started in all neonates the blood culture samples were collected. After obtaining the report of culture and sensitivity the antibiotics were changed accordingly.

Table 1: Pathogen isolated from the blood culture n=131.

Organism Isolated	No. of patients	%
Klebsiella pneumonia	76	58.01
E. coli	4	3.05
Pseudomonas	3	2.3
Acinobacter baumannil	4	3.05
CONS	27	20.6
S. aureus	9	6.9
Gram negative bacilli	2	1.52
Enterococcus	6	4.58
Total	131	100

Table 2: Antibiotic sensitivity pattern of *Klebsiella Pneumoniac* isolates.

Antibiotic	n=76	*K. pneumoniac* sensitivity (%)
Amikacine	27	35.5
Amoxi+clavulinic acid	16	21
Ampicillin	7	9.2
Cefipime	20	26.5
Cefoperazone	19	25
Cefotaxime	19	25
Ceftazidime	22	28.5
Ceftrioxone	19	25
Cefuroxime	19	25
Ciprofloxacillin	26	34.2
Cotrimazole	72	94.7
Gentamycine	21	27.4
Imipenen	67	88.15
Levofloxancin	75	98.6
Piperacillin+Tazobactam	67	88.15
Tetracycline	45	58
Tobramycine	20	26.5
Astreonam	65	84

Table 3: Resistance pattern of *Klebsiella Pneumonie* isolates.

Antibiotic	No.	%
Ampicillin	53	69.1
Amoxiclavulinic acid	48	63.1
Aztreonam	4	5.2
Cefotaxime	42	55.2
Gentamycine	36	47.3
Imipenem	4	5.2
Levofloxacin	1	1.3
Piperacillin+Tazobactam	2	2.6

131 patients (57.45%) had positive blood culture which confirmed neonatal sepsis. Among the culture positive

specimen *Klebsiella pneumoniae* 76 patients (58.10%) was the most commonly gram-ve organism detected.

Coagulase oxidase negative *Staphylococcus* (*CONS*) 27 pt (20.6%) was common gram+ve organism *S. Aureus* 9 (6.9%), *Enterococcus* 6 (4.58%), *Acinobactor* 4 (3.05%) and *Pseudomonas* 3 (2.3%) were other isolated organisms in the study (Table 1).

Table 4: Antibiotic sensitivity pattern of coagulase oxidase negative *staphylococcus* (CONS) isolates.

Antibiotic	No.	%
Amikacine	7	25.9
Cefotaxime	8	29.6
Cotrimuxazole	8	29.6
Levofloxacin	9	33.3
Ofloxacin	8	29.6
Piperecillin+tazobactum	7	25.9
Vancomycin	24	88.9

DISCUSSION

During this study 131 (57.45%) newborns with clinical septicemia were found to be culture positive out of 228 admitted to N.I.C.U. This observation in present study correlates with other studies carried out by Nazeer S et al, Aurangzeb B et al, Shaw CK et al and Moncef A et al where positive cultures obtained were found to be 57.45%, 59.16%, 44.92%, and 25.2% respectively.[5-8] The gram-negative organisms accounted for 68.7% of all positive blood cultures. According to Nazeer S et al and Morahedian AH et al studies gram-negative organisms accounted for 87.71 and 72.1% respectively.[5,9]

As shown in Table 1 *Klebsiella pneumonae* was the most (58.01%) common organism isolated in our study. This finding are consistent with the studies carried out by Dr. Desai KJ et al, Anwer BK et al, Nazeer S et al where *Klebsiella pneumonae* was the most commonly isolated microorganism.[10,11,5] *Pseudomonas aeruginosa* was the most common organism by (36%) Movahedian AH et al study and *E. coli* was common organism for Moncef et al study.[9,8] In our study *Pseudomanas* is 2.3% and *E. Coli* is 3.05% cases.

In this study *CONS* were the most common gram-positive micro-organism isolated. These findings are consistent with Nazeer S et al, Movahedian AH et al studies where *CONS* were the commonest gram-positive organism isolated.[5,9] The observation is in contrast to the studies by Anwer SK et al where enterococcus and Kairavi et al where *S. Aureus* was most common gr positive organisms isolated.[11,10] This prevalence of different ogranisms causing neonatal sepsis at various institutes is of great significance and should be notified and can be useful while treating the patients. Table 2 shows the sensitivity pattern of various antibiotic for *Klebsiella pneumonae* organisms. This organism shows higher sensitivity to newer antibiotics like levofloxacin (98.6%), imipenem (88.15%), piperacillin+tazobactum (88.50%) and aztreonam (84%).

The organism (*Klebsiella pneumonae*) showed high degree of resistance to amikacin (68.4) ampillin 69.1%, amoxiclavulinic acid cefotaxime (55.2) and gentanycin (47.3%). Similar observations were by Nazeer S et al that ampicillin (76.82), ceftazedime (61.6%), amoxiclavulnic acid (57.7%), cefrioxone (42.3%).[5]

Movahedian et al in the study reported the observation that *Klebsiella Pneumonae* showed a high degree of resistance to commonly used antibiotics (ampicillin), as well as third generation cephalosporin.[9] Similar observations were in Mahmood A et al study that resistance to gentamycin was as high as 90.4% in cases with *Klebsiella Pneumonae* septicaemia.[12]

Table 4 show the sensitivity pattern of gram positive CONS micro-organisms for various antibiotics. Vancomjan (88%) was found to be most sensitive. This finding of study correates with other studies. Nazeer S et al and Kairavi et al in which CONS microorganism were having 100% sensitivity to vancomicin.[5,10]

Amikacine, cefotaime, levofloxacin and piperacillin+tazobactam were having limited effect on gram positive CONS microganism. Show CK et al also reported that the gram-positive organisms displayed a high degree of resistance to penicillins and cephalosparins but glycopeptides and monobactams were effective in most cases.[7]

Antibiotic resistance is a global problem, the antibiogram pattern differs from country to country depending up on the variability of epidemiology of neonatal sepsis.[7] The present study shows high degree of resistance to first time of antibiotics, gram negative *Klebsiella pneumonae* showed resistance to ampillin (69.1), amikacine (68.4), amoxyclavulenic acid (68.4%) and cefotaxime (55.2%). This increase in resistance in aminoglycosides and third generation cephalosporius are alarming as they are being used in our set up as empirical therapy. Imipenem, levofloxacin, piperacillin+tazobactum are having higher sensitivity for *Klebsiella pneumonae* and timely use of these antibiotics will definitely reduce mortality and morbidity in NICU. Hence, the changing antibiotic susceptibilities need continuous monitoring and reevaluation for putting forth the guidelines for empirical treatment in NICU.

CONCLUSION

Neonatal sepsis is a leading cause of neonatal admission, morbidity and mortality in developing countries. Bacterial spectrum for sepsis could be different in different regions. Sensitivity pattern also differs accordingly. The sensitively pattern in our study suggest that, initial empirical choice of therapy in the form of

cefotaxime and amikacine or gentamycin are showing low susceptibility to gram negative KP and Impenen, lerofloxacin, piperacillin and tazobactum are having significant higher sensitivity. Similarly, for gram positive *CONS* the low sensitivity to cefotaxime and amikacin are alarming. Higher susciptibility to vancomyan can justify its use. The knowledge of prevailing strains and the antibiotic sensitivity pattern in the region or institute is mandatory for each centre due to temporal changes in the causative organisms and their antibiotic susceptibility. Periodic evaluation not only reveals the recent trend of increasing resistance to commonly used antibiotics but also helps in implementation of a rational empirical therapy.

There is an increasing trend of antibiotic resistance to the commonly used first line drugs. The pattern of sensitivity is changing hence continuous surveillance for antibiotic susceptibility is needed to ensure correct empirical therapy before blood culture reports are available.

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