

Sensitivity Pattern among Bacterial Isolates in Neonatal Septicaemia in Tertiary Care Hospital

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ABSTRACT

Objective: To study the frequency of bacterial isolates of neonatal sepsis and their sensitivity pattern.

Patients and methods: It is a cross-sectional descriptive study and conducted at Department of Pathology, Postgraduate Medical Institute Lahore from January to December 2012. Blood samples for culture and sensitivity were collected from clinically suspected cases of neonatal sepsis, using the standard technique of specimen collection. Cultures were inoculated on Blood and MacConkey agar plates. Antibiotic sensitivity test was done by modified Kirby-Bauer disc diffusion method according to the Clinical and Laboratory Standards Institutes Guidelines 2011.

Results: Total 478 blood culture bottles have been received from LGH during the study period, out of which 139(29%) were culture positive. Gram-negative organisms recovered were 82% from the culture-positive cases. The predominant Gram negative organisms were *Pseudomonas* followed by *Enterobacter species*. While Gram positive organisms were only *Staphylococcus species* which were 14%. *Candida species* isolated was 4% from culture positive cases.

Conclusion: Studies from different geographical area at different time should be compared to see the different pathogens and changing antibiotic susceptibility trend.

Keywords: Neonatal sepsis, Blood culture, Bacterial pathogen, Antibiotic susceptibility

INTRODUCTION

Neonatal sepsis is a clinical syndrome characterized by systemic signs and symptoms of infection accompanied by bacteremia during first 28 days of life. Neonatal sepsis is associated with significant morbidity and mortality justifying prompt initiation of appropriate empirical antibiotic therapy¹. The organisms responsible for neonatal sepsis (NNS) vary across geographical boundaries and with the time of onset of illness². In addition, one organism or a group of organisms may over time replace another as the leading cause of neonatal sepsis in a particular region. Antimicrobial susceptibility patterns of pathogens are temporally dependent on local pathogens and patterns of antibiotic use. Knowledge of both the common pathogens causing septicemia in neonates and their antimicrobial susceptibility is essential in order to select appropriate antimicrobial treatment³. In most of developing countries, Gram negative organisms remain the major cause of neonatal sepsis⁴. Mostly the studies indicate that in developing countries *Pseudomonas* and *Enterobacteriaceae* played a major role and *Staphylococci* contributed to the rest^{5,6}. However, in the developed countries, Gram positive organism has been implicated as the most common cause of neonatal sepsis⁷. In Western countries, Group B

Streptococci is mainly responsible for neonatal sepsis⁸. The pattern of organisms causing sepsis varies across geographical boundaries and can replace overtime by another organism as the leading cause of neonatal sepsis⁹.

PATIENTS AND METHODS

It is a cross-sectional descriptive study, over a period of 12 months (January to December 2012). Blood samples for culture and sensitivity were collected from clinically suspected septicemic neonates before the start of antibiotics in tryptic soya broth blood culture bottles. The tryptic soya broth bottles were incubated at 37°C for 24 hours under aerobic conditions. Next day broth was observed for any sign of bacterial growth such as turbidity, hemolysis or gas formation. First subculture from broth bottle was done on Blood agar, MacConkey agar and Chocolate agar plates on day 2. At the same time smears were made for Gram staining. The sub culture plates were incubated at 37°C. Second and third subculture was inoculated at day 4 and 7 or when signs of positivity appear. The blood culture bottles were incubated for a period of seven days in case of negative subculture. Preliminary identification was done by Gram staining, catalase test, oxidase test and motility test. Biochemical tests were put up for further identification of organisms by following standard recommended method. The isolates recovered were tested for sensitivity against different antibiotics by modified Kirby Bauer disk diffusion method on

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Mueller Hinton agar using CLSI guidelines (CLSI, 2011).

RESULTS

Total 478 blood culture bottles were received from the neonates clinically suspected septicemic before the start of antibiotics admitted in neonatology unit of Lahore General Hospital during the study period from 1st Jan to 31st Dec 2012. As shown in figure 1 out of 478 blood culture, 339 blood cultures were negative and 139 blood culture were positive, positivity rate being 29%. Out of 139 positive blood cultures Gram-negative organisms isolated were 114 (82%), in Gram-positive only 20 *Staphylococcus species* (14%) were isolated and only 5 (4%) *Candida species* isolated. Among 114 Gram negative isolates common isolates were *Pseudomonas species* 70 (61%), *Klebsiella species* 27 (24%) and other pathogens were *Acinetobacter species* 10(9%) and *Escherichia coli* 7(6%). Table 1 shows the antibiotic susceptibility pattern of different bacterial isolates. *Pseudomonas species* were most susceptible to Piperacillin/ Tazobactam (91%) followed by Meropenem (86%),

Ciprofloxacin (81%), Amikacin (67%), Ceftazidime (65%), Cefepime (55%), Cefotaxime (50%) and Aztreonem (38%). *Klebsiella species* were most susceptible to Meropenem (92%), Piperacillin/ Tazobactam (91%), Cefepime (71%), Ciprofloxacin (52%), Amikacin (24%), Aztreonem (17%), Ceftazidime (12%), Cefotaxime (5%) and Amoxicillin/clavulanic (4%). *Escherichia coli* were most susceptible to Ciprofloxacin (83%) followed by Aztreonem (71%), Piperacillin/ Tazobactam (67%), Cefotaxime (60%), Meropenem (57%), Amikacin (50%), Cefepime (50%), Ceftazidime (43%) and Amoxicillin/clavulanic (33%). *Acinetobacter species* were most susceptible to Amikacin (66%) followed by Piperacillin/ Tazobactam (57%), Cefepime (40%), Ciprofloxacin (38%), Meropenem (30%), Ceftazidime (20%), Cefotaxime (13%) and Ampicillin/Salbutam (10%). Table-2 revealed that *Staph species* were 100% susceptible to Linezolid followed by Cefoxitin (85%), Clindamycin (75%), Amikacin (71%), Ciprofloxacin (42%), Tetracycline (33%), Erythromycin (26%), Penicillin (17%) and Septran (8%).

Fig 1: Distribution of gram positive and gram negative organism recovered from Blood culture (n=478)

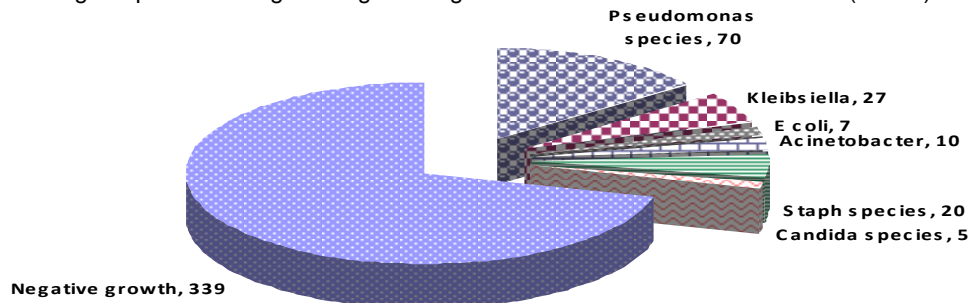


Table 1: Antibiotic susceptibility pattern of gram negative organism isolated from blood culture

Antibiotic	<i>Pseudomonas spp</i>	<i>Klebsiella spp</i>	<i>E coli</i>	<i>Acinetobacter spp</i>
Ampicillin/Salbutam	-	-	-	10%
Amoxicillin/clavulanic	-	4%	33%	-
Cefotaxime	50%	5%	60%	13%
Ceftazidime	65%	12%	43%	20%
Piperacillin/Tazobactam	91%	91%	67%	57%
Aztreonam	38%	17%	71%	-
Meropenem	86%	92%	57%	30%
Amikacin	67%	24%	50%	66%
Ciprofloxacin	81%	52%	83%	38%
Cefepime	55%	71%	50%	40%

Table 2: Antibiotic susceptibility pattern of gram positive organism isolated from blood culture

Organism	Penicillin	Cefoxitin	Amikacin	Erythromycin	Clindamycin	Ciprofloxacin	Linezolid	Tetracycline	Septran
<i>Staph Species</i>	17%	85%	71%	26%	75%	42%	100%	33%	8%

DISCUSSION

In the present study out of 478 blood culture samples, 139(29%) blood cultures were positive. The organisms recovered were both Gram negative and Gram positive. Among Gram negative organism commonest were *Pseudomonas species* (61%) followed by *Klebsiella species* (24%), *Acinetobacter species* (9%) and *Escherichia coli* (6%). Among Gram positive *Staph aureus* was the only organisms which was 14% and *Candida* 4% of total cases (Fig. 1). Similar type of study was conducted in India by Chandel et al¹⁰. The finding was as follow 42%, 17% and 20% positive culture from BYL Nair Hospital Bombay, Capital Hospital Bhubaneshwar (Oresa) and Ispart General Hospital, Rourkela (Oresa) respectively. Gram negative isolates were 53% from all culture positive cases followed by Gram positive isolates 33% and fungus 6%. Higher incidences of positive blood cultures were also observed in study conducted by Sharma et al¹¹ in India which was 56%. A comparatively lower positive blood culture 8.7% was reported by Huda et al in Kuwait.¹² Bhat et al¹³ reported 18% positivity rate. In a similar study by Rosenberg et al¹⁴ showed that Gram-negative organisms grew predominantly (87%) in the positive cultures, *Pseudomonas species* (31%) was predominant among Gram-negative organism. These results are compare-able with present study. Sharma et al¹⁵ also revealed 81% Gram negative organism with *Pseudomonas species* 48% as the predominant pathogen. *Pseudomonas species* has also been reported most common etiological agent of neonatal septicemia in India by Kulkarni et al¹⁶, Bhattacharjee et al¹⁷ and Moniri et al¹⁸. In the present study *S aureus* was the only Gram-positive organism recovered from neonatal sepsis. In Western countries, Group B Streptococci (GBS) is the Gram positive organism mainly responsible for neonatal sepsis¹⁹. In present study there was not a single case of GBS similar to the studies conducted by Khan et al²⁰ from Peshawar and Rehman et al²¹ also from Peshawar.

Staph species as shown in Table 2 were 100% susceptible to Linezolid followed by Cefoxitin (85%), Clindamycin (75%), Amikacin (71%), Ciprofloxacin (42%), Tetracycline (33%), Erythromycin (26%), Penicillin (17%) and Sulphamethoxazole/trimethoprim (8%) in present study. Among Gram negative organisms (Table 1) high-level resistance to ampicillin/salbutam was observed in 90% isolates of *Acinetobacter species* followed by Amoxycillin/clavulanic in 96% cases of *Acinetobacter spp* and in 67% of *E. coli*. Sensitivity to Meropenem was 92% in *Klebsiella species*, 57% in *E. coli* and 30% in *Acinetobacter species*. Sensitivity to Piperacillin/

tazobactam was 91% in *Klebsiella species*, 67% in *E. coli* and 57% in *Acinetobacter species*. Sensitivity to Cefepime was 71% in *Klebsiella species*, 50% in *E. coli* and 40% in *Acinetobacter species*. Sensitivity to Cefotaxime was 60% in *E. coli*, 13% in *Acinetobacter species* and 5% in *Klebsiella species*. Sensitivity to Ceftazidime was 43% in *E. coli*, 20% in *Acinetobacter species* and 12% in *Klebsiella species*. Sensitivity to Aztreonam was 71% in *E. coli* and 17% in *Klebsiella species*. Sensitivity to Amikacin was 66% in *Acinetobacter species*, 50% in *E. coli* and 24% in *Klebsiella species*. Sensitivity to Ciprofloxacin was 83% in *E. coli*, 52% in *Klebsiella species* and 38% in *Acinetobacter species*. Resistance to antimicrobial agents is a burgeoning problem in Western and developing countries alike. Antimicrobial susceptibility patterns of pathogens vary geographically and are temporally dependent on local pathogens and pattern of antibiotic use²².

CONCLUSION

In the present study, high bacterial resistance among the pathogens suspected to cause neonatal septicemia is demonstrated which can be controlled by prudent use of available antibiotics. Periodic monitoring of the antimicrobial sensitivity of the causative organisms in a particular setting is needed to emphasize on implementation of infection control policies at the national level for effective management of such infections.

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