ORIGINAL ARTICLE

Neonatal Sepsis: Determine the Etiology and Antimicrobial Patterns in Pediatrics

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ABSTRACT

Objective: The aim of this study is to determine the etiology and antimicrobial patterns of neonatal sepsis.
Study Design: Cross-Sectional
Place & Duration: Paediatric department of Alkhidmat Hospital Peshawar for six months duration from June, 2019 to December, 2019.
Methods: Total 340 blood samples of both genders were extracted in this study. Patients demographics were recorded after written consent. All the patients were worked up with complete history, clinical examination and investigations to rule out confounders and bias in the study results. All the follow ups were done by the researcher himself. Antimicrobial susceptibility testing was carried out by Modified Kirby Bauer disk diffusion method on Mueller Hinton agar using CLSI protocols.
Results: In this study, 93 (27.35%) were culture positive extracted from 340 blood samples. Out of 93 positive blood cultures, 52 (55.91%) were observed gram negative organisms and gram positive organisms were 34 (36.56%) and the rest were positive for Candida spp 7 (7.53%).Pseudomonasspp 18(34.62%) was the most common isolated in gram negative organisms while in gram positive organisms Coagulase Negative Staphylococci (CoNS) 23 (67.65%) was the most frequent isolated organism.Variable pattern of resistance was seen among other members of enterobacteriaceae, non-fermenters and Gram positive organisms.
Conclusion: We concluded in this study that the occurrence of gram-positive isolated species was lower in number than that of gram-negative organisms due to the isolation of gram-positive coagulase-negative staphylococci (CoNS) and gram-negative Pseudomonas spp.
Keywords: Neonatal sepsis, Bacteriological profile, Antibiotic susceptibility, Neonates

INTRODUCTION

Neonatal septicemia is one of the four main causes of neonatal death and morbidity in India. It refers to a generalized bacterial infection, which is documented by positive blood culture in India in the first four weeks of life. [2,3,4] In neonatal intensive care centers around the world, neonatal septicemia remains an important concern for neonates. [5] One proxy for a nation's measurement of health status is neonatal mortality.

[6] Septicemia is still an important cause for neonatal morbidity and mortality worldwide, however. There may be different causes of neonatal mortality. The incidence varies between countries, but in developed countries is much higher. [6] [6] [6] It is estimated that approximately five million neonatal deaths a year occur, with 98% in developed countries, according to the World Health Organization (WHO). [7]

In selecting an effective antibiotic therapy to lower neonatal morbidity/mortality, knowledge of common pathogens and patterns of antimicrobial susceptibility causing neonatal septicemia are important. Geographical trends of the antibiotic sensitivity differ depending on local pathogen prevalence and typical antibiotic usage in the neonatal unit[8]. In neonatal septicemia treatment, the widespread development of antibiotic resistances to widely used antibiotics has been a major challenge. The varying microbiological pattern of neonatal septicemia ensures a constant examination and antimicrobial susceptibility pattern for causative species.

Neonatal sepsis is widely classified into two forms by age of onset: early sepsis (less than 72 hrs) and late sepsis (alternative sepsis 72-28 days). In the course of fetal life, birth or nursery, earlier-start Sepsis is acquired. [9] A number of grampositive as well as gram-negative bacteria, and occasionally yeast, are the causes of neonatal sepsis. [5] Over the time period and vary from region to region, the range of species that cause a new birth sepsis. This is because of changing antibiotic patterns and lifestyle changes. [11] In a newborn hospitalized child an invasive bacterial infection is recommended before the results of anticulture tests and antimicrobial susceptibility that allow for specific management are available; [11,12] it is therefore crucial to know the epidemiology and the resistance trends of bacteria detected. The purpose of this study was to outline etiologic agents and their antimicrobial sensitivity in a Neonatal Intensive Care Unit in newborn infants with early or late-onset neonatal sepsis.

MATERIAL AND METHODS

This study was conducted at**:** Paediatric department of Alkhidmat Hospital Peshawar for six months duration from June, 2019 to December, 2019.

In this analysis, a total of 340 blood samples from both sexes were extracted. Detailed demographics of

patients, including age, sex, residence and body mass index, were reported after written consent was received. Samples were obtained from patients admitted to Lahore General Hospital, Lahore Peadiatric Ward, Lahore. In the paediatric emergency of the hospital, paediatrictryptic soya broth blood culture bottles were given to the medical house employees to obtain blood samples. The house staff were given detailed instructions on the technique of aseptic blood collection for culture. Before any antimicrobial medicines started in the hospital, all the samples were obtained. One blood sample was taken, i.e. 0.5-1ml, and then inoculated into 9 ml of tryptic soy broth.

The antibiotic susceptibility testing of isolates, based on the revised Kirby-bauer discharge procedure, has been carried out under Clinical Standards Institute and Laboratory (CLSI) guidance. A preliminary identification was based upon gram staining, catalase test, oxidase test and motility using a hanging drop process. Biochemical experiments were carried out in order to recognize the cells. In both the positive and negative catalase and oxidase rods, triple sugar iron, citrate, urease, indole, motility, methyl red and vogesproscaur tests were performed.

Development on Mannitol salt agar, Coagulase test (slide and tube method), and Deoxyribonuclease tests were classified as catalase positive Gram positive cocci. By Streptococcal grouping latex kit UK, gramme positive cocci with catalase test negative were further categorised. The complete data was analysed using version 22.0 of SPSS.

RESULTS

Total 340 samples were included in this study. Out of these 93 (27.35%) were extracted culture positive. Out of 93 positive blood cultures, 52 (55.91%) were observed gram negative organisms and gram positive organisms were 34 (36.56%) and the rest were positive for Candida spp 7 (7.53%). (Table 1)

Table 1: Baseline frequency of blood cultures

Blood cultures	Frequency	%age
Gram Negative	52	55.91
Gram Positive	34	36.56
Candida spp	7	7.53
Total	93	100

Table 2: Frequency of positive/negative isolated organisms

Isolated Organisms	Frequency	%age
Gram negative	(n= 52)	-
Pseudomonas spp	18	34.62
Escherichia coli	12	23..08
Klebsiellapneumoniae	8	13.46
Acinetobacterspp	6	11.54
Enterobacterspp	5	9.62
Citrobacterspp	3	5.77
Gram negative	(n=34)	
Coagulase Negative Staphylococci (CoNS)	23	67.65
Staphylococcus aureus	9	26.5
Group D Streptococci	2	5.9

Pseudomonas spp 18 (34.62%) was the most common isolate among Gram negative organisms (n=52), followed by Escherichia coli 12 (23.08%), Klebsiellapneumoniae8 (13.46%), Acinetobacterspp 6(11.54%), Enterobacterspp5 (9.62%) and Citrobacterspp3 (5.77%) and Coagulase Negative Staphylococci (CoNS)23 (67.65%) was the most prevalent among Gram positive organisms (n=34). (Table 2)

In this study, 100 percent resistance of ceftazidime, ceftriaxone, cefotaxime and aztreonam to various antibiotics among enterobacteriaceae was observed in Escherichia coli and Klebsiellapneumoniae in neonatal septicemic patients. In Enterobacterspp, 100% resistance to cefipime and gentamicin was observed and Citrobacterspp showed 100% resistance to aztreonam and ciprofloxacin, whereas the level of resistance of non-fermenters to various antibiotics, i.e. Acinetobacterspp demonstrated 98% resistance to ceftazidime, ceftriaxone and cefotaxime, while gentamicin showed the highest resistance to Pseudomonas spp (70.4%).

Frequency of resistance to different antibiotics between Gram positive species. Coagulase Negative Staphylococci are shown to be 80% resistant to trimethoprim sulfamethoxazole followed by 72.8% resistant to penicillin and ciprofloxacin (CoNS). The resistance to penicillin in Staphylococcus aureus was 88 per cent. Penicillin has 99% resistance in Group D Streptococcus. None of the isolates of Gram-positive is resilient to LZD.

DISCUSSION

Neonatal bacterial sepsis is a significant cause of death in developing countries. The development and spread of antibiologically resistant bacteria is exacerbated by inappropriate antimicrobial intake and insecure living conditions. Geographical location and time of infection are different in the main species associated with neonatal septic sepsis [13]. Knowledge on the bacteriological profile of neonatal sepsis and successful antimicrobial agents is therefore important in order to combat neonatal morbidity and mortality concerns. In our country the causes of neonatal death and morbidity are mostly affected by the neonatal sepsis[14].

In this analysis, a total of 340 blood samples from both sexes were extracted. Out of these 93 (27.35%) were extracted culture positive. Out of 93 positive blood cultures, 52 (55.91%) were observed gram negative organisms and gram positive organisms were 34 (36.56%) and the rest were positive for Candida spp 7 (7.53%).these findings showed similarities to previous studies performed [15] Other studies also indicate a much higher rate of culture positivity.[16,17]

We found that the most common isolate was Pseudomonas spp 18 (34.62%) was the most common isolate among Gram negative organisms (n=52), followed by Escherichia coli 12 (23.08%). Similar trends were also recorded in India[18]. Another research in Quetta was performed in which Pseudomonas spp (21.4 %) and Klebsiellapneumoniae (21.4 %) were the most common species [19].The neonatal blood samples of a previous study in Bangladesh were also most often isolated from these organisms[20]. Klebsiella pneumoniae is the most commonly isolated organism identified in another study from Bangladesh[21]. However, blood samples from patients with LONS were mainly included and LONS was mainly caused by Klebsiella pneumoniae in our research

samples too. The most common causative species of neonatal sepsis have been identified worldwide to include Klebsiellapneumonia, Escherichia coli, Staphylococcus aureus, and coagulase negative Staphylococcus[22-24].

Frequency of resistance to different antibiotics between Gram positive species. Coagulase Negative Staphylococci has shown 80% resistance to trimethoprim-sulfamethoxazole, followed by 72.8% to penicillin and ciprofloxacin (CoNS). 88% tolerance to penicillin was shown by Staphylococcus aureus. Penicillin has 99% resistance in Group D Streptococcus. None of the isolates of Gram-positive is resilient to LZD.

In this study, Escherichia coli and Klebsiellapneumoniae in neonatal patients have shown 100% Tolerance of ceftazidim, ceftriaxone, cefotaxime and aztreonam to various antibiotics in enterobacteriaceae. 100% cefipime and mentamicine resistant were observed with Enterobacterspp and 100% aztreonam and ciprofloxacin resistant Citrobacterspp, with 98% ceftazidime, ceftriaxone and cefotaxime resistance from non-fermenters, with Psiomonasspp showing highest resistance to gene, i.e. S et al. Gandhi. [25]

CONCLUSION

We concluded in this study that the occurrence of gram-positive isolated species was lower in number than that of gram-negative organisms due to the isolation of gram-positive coagulase-negative staphylococci (CoNS) and gram-negative Pseudomonas spp.

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