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PATTERN OF ANTIBIOTIC SUSCEPTIBILITY AND MICROBIAL GROWTH TO BLOOD CULTURE IN NEWBORNS IN A TERTIARY CARE HOSPITAL

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Abstract:

Aim: *To study the pattern of bacterial isolates in neonatal sepsis with antibiotic sensitivity patterns.*

Study design: *An observational study.*

Place and duration of the study: *In the Pediatric Unit II of Services Hospital Lahore for one year duration from January 2019 to January 2020.*

Material and methods: *All neonates with early or late sepsis were included in the study. All these patients were cultured with blood to identify relevant pathogens, and then analyzed to determine their susceptibility to commonly used antimicrobials.*

Results: *100 (100) newborns with sepsis were included in the study. 71% were men and 29% were women. Gram-negative organisms (74%), Gram-positive organisms 24% and Candida 2% dominated among bacterial isolates. Among Gram-negative bacteria, Citrobacter is the most common (61%), while Staphylococcus aureus is the most common Gram-positive isolate (100%). Gram-negative isolates are more sensitive to imipenem / meropenem (34%), while Gram-positive isolates are more sensitive to vancomycin (100%).*

Conclusion: *Local antimicrobial susceptibility patterns could help in deciding empiric therapy for septicemia due to gram negative or gram positive isolates.*

Key words: *blood culture, sepsis, antimicrobial sensitivity.*

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INTRODUCTION:

Neonatal sepsis remains one of the leading causes of neonatal admission, morbidity, and mortality in developing countries. The incidence of sepsis in newborns is about 1-10 / 1000 live births in developed countries, but three times more in Pakistan[1-3]. The World Health Organization (WHO) estimates that 1 million deaths a year (10% of all deaths of children under five) are caused by neonatal septicemia, with 42% of these deaths occurring in the first week of life[4-5]. Blood culture to isolate the causative pathogen remains the gold standard in the final diagnosis of sepsis. However, the most common approach is to initiate empirical broad-spectrum antibiotic therapy in all young infants suspected of having a bacterial infection[6-7]. Knowledge of the antimicrobial susceptibility pattern of sepsis predictors and common pathogens in a given area is essential to direct local empirical antibiotic selection. The proper use of antibiotics will minimize the risk of serious morbidity and mortality in sepsis and reduce the appearance of drug-resistant organisms[8-9]. For the success of early empirical treatment, periodic case study is important to assess changing trends in infected organisms and their susceptibility to antimicrobials.

MATERIALS AND METHODS:

This study was held in the Pediatric Unit II of Services Hospital Lahore for one year duration from January 2019 to January 2020. All neonates (0-28 days old) admitted with clinical signs of sepsis at admission or who developed sepsis during hospitalization were included in the study. Neonatal sepsis was classified as early onset sepsis (0–7 days) or late sepsis (8–28 days). Blood culture was performed for all neonates with clinical sepsis. Blood was drawn from the peripheral vein with appropriate aseptic measures, inoculated into the brain-heart infusion broth and sent to a microbiological laboratory, where it was cultured in various centers. The bacterial growths obtained were identified by standard microbiological techniques. Sensitivity to commonly used antibiotics was determined by disk diffusion. Reports from blood tests were analyzed for bacterial isolates along with their antibiotic sensitivity patterns.

RESULTS:

A total of 100 cases of confirmed sepsis were included in the study. 71% of them are boys and 29% are girls; 76% were diagnosed with early onset sepsis and 24% were diagnosed with late sepsis; While 15% of patients were born, 85% were sent to the hospital. The bacterial isolates were dominated by Gram-negative microorganisms (74%): Citrobacter 61% (45/74) was the most common gram isolate, followed by 16% Acinetobacter (12/74), Pseudomonas 13% (10/74), Klebsiella% 3 (2/74) and 7% unclassified (5/74). Gram + and its isolates accounted for 24%, with Staphylococcus aureus (100%) being the most common. The remaining 2% of isolates are Candida spp. Regarding the antibiotic susceptibility pattern, 7% (5/74) of Gram-negative isolates were resistant to all routinely used antibiotics (ampicillin, cefotaxime, ceftazidime, amikacin, meropenem and cefepime); 15% (11/74) were sensitive to cephalosporins, 9% (7/74) to fluoroquinolones, 24% (18/74) to amikacin / gentamycin, 34% (25/74) to carbepenems (imipenem / meropenem) and 11 % (8/74) for aztreonam

TABLE 1: Antibiotic susceptibility pattern of Blood culture isolates.

	Gram Negative Organisms 74% of total N (%)	Gram Positive Organisms 24% of total N (%)
Ampicillin	00 (0.0)	01 (4.0)
Augmentin	00 (0.0)	03 (12.0)
Amikacin	14 (18.0)	01 (4.0)
Meropenem	22 (30.0)	03 (12.0)
Imipenem	03 (4.0)	03 (12.0)
Vancomycin	---- *	24 (100.0)
Cefixime	07 (9.0)	03 (12.0)
Cefipime	01 (1.5)	03 (12.0)
Ceftriaxone	02 (3.0)	03 (12.0)
Erythromycin	00 (0.0)	02 (8.0)
Clarithromycin	00 (0.0)	01 (4.0)
Azithromycin	00 (0.0)	01 (4.0)
Aztreonam	08 (11.0)	---- *
Cephradine	00 (0.0)	03 (12.0)
Gentamicin	02 (3.0)	00 (0.0)
Ciprofloxacin	04 (5.0)	00 (0.0)
Norfloxacin	02 (3.0)	00 (0.0)
Enoxacin	01 (1.0)	00 (0.0)
Tobramycin	02 (3.0)	00 (0.0)
Cefoperazone	01 (1.5)	03 (12.0)
Resistant to all	05 (7.0)	00 (0.0)

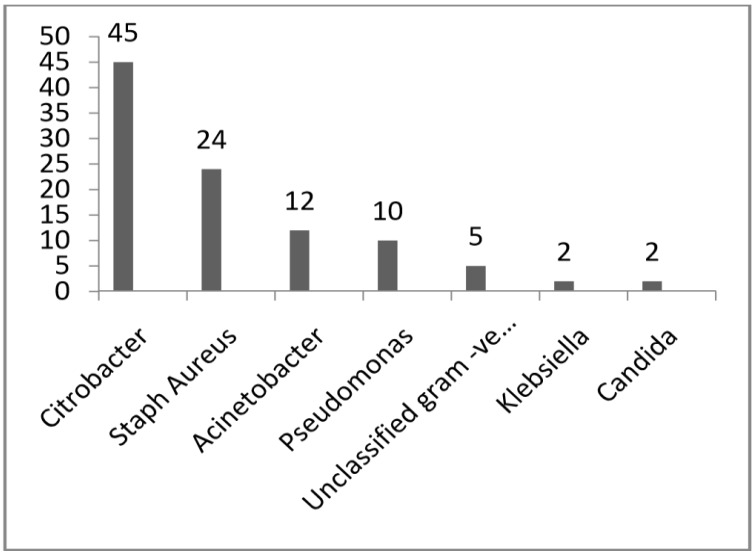

Fig 1: Frequency of different isolates on blood culture

DISCUSSION:

Early sepsis in newborns is mainly caused by colonization of the maternal birth canal with a pathogen. Group B streams, E. coli and coagulase-negative staphylococci are more common. The late onset is usually caused by the acquisition of the health environment and is mainly caused by Staphylococcus negative coagulase, Staphylococcus aureus, E. coli, Klebsiella, Pseudomonas, group B streptococci, anaerobes and Candida[11-12]. In addition to microbial factors, various host factors are prone to developing neonatal sepsis. These factors primarily include host defense mechanisms, including cellular immunity, humoral immunity, and barrier function. Most asymptomatic children are usually examined for risk factors for sepsis in developed countries[13]. The results of this study show this; 71% men and 29% women. Premature newborns are also more likely to develop sepsis as a result of impaired neurological development. Often, diagnostic tests are performed, and neonatal treatment is started prior to the sepsis test, as the symptoms may not be specific. For neonatal sepsis, aerobic and anaerobic blood cultures should be ordered. Results can usually be obtained in 36-48 hours. Although the number of white blood cells can help, it is often unpredictable and non-specific[14]. In the West, combination therapy with parenteral aminoglycoside and broad-spectrum penicillin is usually prescribed for early neonatal sepsis. It is effective against commonly isolated organisms based on trends in local antibiotic susceptibility models. Late onset sepsis therapy should be targeted at isolated organisms in healthcare settings. While most Staphylococcus aureus strains produce beta-lactamase, which makes them resistant to all unstable penicillins, beta-lactamase, some strains produce modified penicillin binding protein (amoxicillin-clavulanic acid), cephalosporins and carbapenems that provide stable penicillin beta-lactam cell. Vancomycin is the drug of choice for such isolates. Zaidi et al. The failure rates of three clinical antibiotic regimens for infants aged 0-59 days in Karachi, Pakistan, were compared with possible serious bacterial infections. In a randomized study, researchers found that outpatient treatment with injectable antibiotics is an effective alternative when hospitalization is not possible[15]. Procaine penicillin / gentamicin outperforms oral trimethoprim-sulfamethoxazole, ceftriaxone is more expensive and less effective than penicillin / gentamicin.

CONCLUSION:

Isolated Gram -ve organisms were most sensitive to carbepenems (especially meropenem) and aminoglycosides, and Gram + ve isolates were most sensitive to vancomycin. The study, compared with further studies at this hospital, can help develop empirical antibiotic guidelines for use in all cases of clinically likely sepsis where the causative organism cannot be isolated and / or when "blind" therapy is needed.

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