ORIGINAL ARTICLE

Neonatal Sepsis in Tertiary Care Hospital: Bacteriological Profile and Antibiotic Susceptibility Patterns

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ABSTRACT

Aim: To determine the most common pathogen responsible for neonatal sepsis and their antimicrobial sensitivity
Method: This retrospective cross-sectional study was carried out in the Department of Microbiology, Shaikh Zayed Hospital, Lahore from March 2017 to April 2018. A total of 618 samples were received with history of neonatal sepsis. All samples of blood culture were received from neonatal ward with history of sepsis. All patients were between the age of 1-28 days. Blood culture results and their antibiotic sensitivity were collected and analyzed.
Results: Blood cultures were positive in 85 (13.75%) cases. The isolated pathogens in early and late onset sepsis were 60% and 40% respectively. The blood cultures reported the most prevalent isolate in early and late onset neonatal sepsis was the coagulase negative Staphlycoccus (CONS) 44.7%, followed by Klebsiella 16.47%, Staphylococcus aureus 8.23%, Citrobacter/Eneterobacter 9.41%, and Acinetobacter 7.05%, Escherichai coli and Pseudomonas were 5.88%.
Conclusion: Coagulase negative Staphylococcus is a major cause of neonatal sepsis.
Keywords: Neonatal sepsis, Bacteriological profile, Antibiotic susceptibility

INTRODUCTION

One of the leading global causes of neo natal mortality is considered to be Sepsis, especially in the developing countries[1]. With the emergence of antibiotic resistant strains and constrained resources of antibiotics antimicrobial resistance this has become a great challenge in the management of neonatal sepsis and is a cause of global concern[2]. Neonatal sepsis is recognized as a life threatening clinical emergency that requires an immediate and urgent diagnosis and thus becomes a typical reason for admittance in a neonatal care unit in developing countries[3]. It is caused by micro-organism usually received by the baby from the mother before or during birth and is repeatedly associated with obstetric complications as in premature onset of labor, chorioamnionitis, peripartum maternal fever and rupture of membrane.[4] The incidence and the type of bacterial isolates responsible for neonatal sepsis may vary from one country to another and may change in the same area at times[5].

Neonatal sepsis is a systemic infection occurring in infants of ≤28 days of life and is an important cause of morbidity and mortality of newborn[6]. Neonatal sepsis is responsible for 30-50% of total deaths in developing countries[7].

This disease (early onset sepsis) is most regularly explained as occurring during the first 3 days after the birth of the baby. The cause of this disease is a bacterial pathogen that is transmitted directly from the mother to the newborn child before or during the delivery.[8] Late onset sepsis is defined as a type of sepsis occurring after the first three days in the life of the newborn baby in neonatal intensive care unit in preterm infant and 7 days of life in term infant up to the age of 28 days.[9,10] This study was carried out to determine the bacteriological profile and antibiotic susceptibility of neonatal sepsis in a tertiary care hospital of Lahore.

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MATERIALS AND METHODS

This retrospective cross-sectional study was carried out in the Department of Microbiology, Shaikh Zayed Hospital Lahore from March 2017 to April 2018. A total of 618 blood samples were received during this period, all were included. Blood culture bottles were incubated at 35-37°C for 7 days with daily manual examination for evidence of bacterial growth and subculture on solid media (blood agar MacConckey agar and chocolate agar) after 48 hours. The cultures showing negative results were held under observation for up to seven days before being awarded with a negative report.

Colony morphology, gram staining and other standard bio-chemical tests were used to identify the micro-organism growth in blood cultures showing positive results. In accordance with the directions of Clinical Laboratory Standards Institute guidelines, a modified version of Kirby-Bauer method was utilized to identify the antibiotic susceptibility of isolated micro-organisms.[11] Antibiotic discs were used according to gram positive and gram negative isolated micro-organism. The data entered and analyzed through SPSS-20.

RESULTS

A total of 618 blood samples were collected during study period. Out of which growth was positive in 85 (13.75%). Early onset sepsis cases were 51 (8.25%) and late onset sepsis was 34 (5.50%). Dissemination of bacterial isolates with their relative prevalence is shown in Table 1. Gram positive isolated were 45 (53%) and gram negative isolated were 38 (44.75%). Candida was isolated in 2 (2.35%) cases. Among gram positive isolate coagulase negative Staphylococcus was 38 (44.70%) and Staph aureus was 7 (8.23%). Among gram negative isolate Klebsiella species was 14 (16.47%), enterobacter/Citrobacter 8 (9.41%), acintobacter 6 (7.05%) and pseudomonoas aeruginosa or Escherichia coli 5 (5.88%) and 5 (5.88%) respectively. No

case of α-haemolytic Streptococcus and group B streptococcus were seen. Resistance to commonly used antibiotic e.g. ampicillin and amoxicillin were up to 100%. Pattern of micro-organisms isolated in early onset and late onset sepsis is shown in Table 2.

Table 1: Dissemination of bacterial isolates corresponding to their relative prevalence (n=85)

Bacterial isolate	No.	%
CONS	38	44.7
E. coli	5	5.9
Klebsiella spp.	14	16.4
Staphylococcus aureus	7	8.2
Pseudomonas	5	5.9
Enterobacter/Citrobacter	8	9.4
Acinetobacter	6	7.0
Candida	2	2.4

Table 2: Pattern of micro-organisms isolated from blood cultures

Bacterial isolate	Early onset sepsis	Late onset sepsis
CONS	23 (60%)	15 (39.9%)
E. coli	4 (80%)	1 (20%)
Klebsiella spp.	12 (85%)	2 (14.3%)
Staphylococcus aureus	2 (28.5%)	5 (71.4%)
Pseudomonas	1 (20%)	4 (80%)
Enterobacter/Citrobacter	4 (50%)	4 (50%)
Acinetobacter	4 (66.6%)	2 (33.3%)
Candida	1 (50%)	1 (50%)

DISCUSSION

Despite major scientific advances in neonatal care, neonatal sepsis is still considered to be a major cause of infant morbidity and mortality in intensive care units dealing with neonatal complications[12,13]. In our study positive blood cultures in neonates were 13.75% which is comparable to the studies from Nepal where in neonatal sepsis, blood culture positivity was 13.7% and 19.56%[14,15]. Similar results were found by another research conducted in the same country, prevalence of positive blood cultures was 20.5%.[2] Similar studies conducted by Garg et al[16] and Gohel et al[17] in India report the prevalence of positive cultures to 20.5% and 9.2% in the same order. Another study from Jordan showed blood culture positive upto 13.8%.[3] In Pakistan according to Chaudhry et al[18] and Latif et al[19] the reported prevalence rate of positive blood cultures was up to 20%.

Incidence of gram positive micro organisms represented the major class of isolates in this study (53.93%) and in gram positive isolates coagulase negative Staphylococcus being the most common 44.7%. In study done by Younis[3] coagulase negative Staphylococcus were reported to be 58.2% in neonatal sepsis.[3] In a study of Garg et al[16] reported incidence of coagulase negative Staphylococcus was 20.7%. One of the most prevalent and major cause of neonatal sepsis is Coagulase Negative Staphlycoccus as reported by various research studies[20,21]. Similarly study on neonatal sepsis by Pokhrel et al[2] showed coagulase negative Staphylococcus up 20.3%.

Role of coagulase negative Staphylococcus in neonatal sepsis is still controversial.[22] Until 1970, coagulase negative Staphylococcus was mainly recognized as contaminant, however, since that time, several major studies have declared coagulase negative staphylococcus to be a major reason for the increase in neonatal infections[23-25].

This study revealed that 13.75% of the neonates had positive blood culture, similar to the study by Younis[3] 13.8%. Our observed data is somehow higher than those reported in countries like Saudi Arabia 9%[26] and Kuwait 6.6%[27].

In our study 2nd common gram positive isolate in sepsis was Staph aureus (8.23%) which is similar to the study conducted by Mahmood et al[28] and Ingale et al[29]. Similar was the case in the study conducted by Garg et al[16] shown higher incidence of coagulase negative Staphylococcus upto 20% and lower incidence of Staph aureus upto 8.3%. The study conducted by Sharma et al[30], in India, displayed a predominance gram positive micro organisms out of which the most common was Staph aureus.

In gram negative isolated Klbesiella was the most common (16.47%) followed by entrobacter/citrobacter (9.41%), acinetobacter (7.05%), Escherichia coli and pseudomonas (5.88%) and 5.88% respectively in the present study.

In our study Klebsiella spp was the second common isolate upto 16.47% in neonatal sepsis. Similar finding was also seen in study of Shrestha et al[31] and in the study of Anjum et al.[32] Klebsiella spp. was 16.47%. This is comparable to the study of Panday et al[33] where he reported a higher incidence of Klebsiella spp. 19.56% while Garg et al also reported Klebsiella spp. as 7.3%[16]. While in the study done by Pokhrel et al[2], Klebsiella species was 33.3% which is quite high.

Multi-drug resistance to antibiotic in our societies has increased over the last two decades, probably due to over the counter sales of broad spectrum antibiotic and ineffective infection control[27,34].

In our study gram positive organism are completely resistant to amoxcillin 100%. This outcome is conferring with the research undertaken by Panndey et al and Garg et al which has shown that the gram positive organism are completely resistant (100%) to penicillin and their resistance to ampicillin lingered around 80.3%[16,33].

Coagulase negative Staphylococcus has been reported to be most common cause of neonatal sepsis[20,21] and similar is the case in our study. Coagulase negative Staphylococcus shows low susceptibility to pencillin, cephrosporin and aminoglycoside and high susceptibility to vancomyin and linizoled in our study. This was shown that vancomycin and linizoled was the most effective antibiotic for gram positive micro-organism. For gram negative organism the most effective drug in our study were colistin, amikacin and meropenem 100%, 61% and 52% respectively.

Confirming to what was found by Pokhrel et al, Vancomycin and Linezolid showed high responsiveness (100%) towards the gram positive isolates.[2] Similar was also seen in Mulla et al[35], Singh et al[36], Sarangi et al[37] and Dalal et al[38].

In our study a major percentage of coagulase negative Staphylococcus showed low susceptibility to penicillin, oxacillin, 3rd generation cephalosporin and aminoglycosides in India and Pakistan.[14,28]

Gram negative isolates showed high responsiveness to colistin, a result similar to the research findings of Pokhrel et al.[2] Moderate susceptibility to carbapanim is

observed in our study for gram negative isolates which is different from studies of Pokhrel et al[2], Sheth et al[21] and Yusef et al[39] Third generation cephalosporin showed low susceptibility in our study similar to that finding of Pokhrel [2].

CONCLUSION

Coagulase negative Staphylococcus together with Klebsiella was the most common cause of neo natal sepsis in Sheikh Zayed Hospital, Lahore. These micro-organisms were highly resistance to commonly used antibiotic. The high resistance of these bacteria to antibiotics is corresponding to consequential neo natal morbidity and mortality.

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