

Blood Culture and Drug Sensitivity in Presumed Sepsis of Neonates

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ABSTRACT

Objective: To assess the causative organisms and their sensitivity and resistance in presumed sepsis of neonates at tertiary care Hospital

Study design and setting: This cross-sectional study was conducted at the Paediatric department of Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad.

Duration: Study duration was 6 months from November 2015 to April 2016

Data Collection: All neonates aged within 28 days, full-term or preterm babies with both male and female gender and clinical & some high-risk groups such as positive PROM history (prolonged rupture of membrane) less than 18 hours were included. Blood samples were taken from study subjects for blood culture with all aseptic precautions, inoculated in bottles having trypticase soy broth for aerobic bacterial isolation. Gram stain and standard biochemical techniques were applied to identify isolates. The screening of isolated pathogens was done for the 10 frequently used antibiotics susceptibility tests. Cases were categorized as EOS (early-onset-sepsis) if they were presented at hospital for <7 days of life and late onset sepsis if they were presented at or following the age of 7 days. The researcher registered the entire data on pre-planned proforma. Data entry and analysis was done via SPSS version 20.0.

Results: Overall 332 patients were enrolled in this study. The patients mean age was 17.3±7 days. Males were found in majority 181 (54.5%). Most frequent organism isolated from blood was Klebsiella pneumoniae in (28.6%) cases, followed by E.coli 23.5%, staphylococcus aureus 19.6%, Listeria 13.3%, Streptococcal pneumonia 8.7%, Pseudomonas 3.9%, Proteus species 1.8% and Streptococcal viridians was seen in 0.6% cases, respectively. E. coli was found highly resistant to Ampicillin and highly sensitive to Amikacin; whereas Listeria was highly resistant to Cefuroxime and highly sensitive to Ciprofloxacin; Klebsiella species was highly resistant to Cefuroxime and highly sensitive to Ceftriaxone; Staph aureus species was highly resistant to Amikacin, Streptococcal pneumonia species were highly resistant to Amikacin and highly sensitive to Ciprofloxacin, Pseudomonas species were more resistant to Ampicillin & Gentamycin and highly sensitive to Cefotaxime; Proteus species were resistant to Ampicillin and Cefuroxime, more sensitive to Gentamycin, Cefotaxime, and Ciprofloxacin.

Conclusion: It was conclude that Klebsiella pneumoniae was the most common organism isolated from blood 28.6%, followed by E. coli 23.4% and staphylococcus aureus in 19.5% cases. Most common sensitive antibiotics were Amikacin, gentamycin, and ciprofloxacin, gentamycin, Cefotaxime, Amikacin and ceftriaxone.

Key words: Antibiotic, sensitivity, Neonatal Sepsis

INTRODUCTION

Neonatal sepsis (NS) is a set of clinical signs and symptoms defined by systematic indications of circulatory damage triggered by bacterial invasion of the circulatory system during the initial age of four weeks.¹ Neonatal sepsis is among the major factors of neonatal mortality as well as morbidity in underdeveloped world. According to 2011 NDHS statistics neonatal mortality levels in Nepal are 33/1000 live births². Neonatal sepsis (NS) prevalence in India was about 30/100 live births.³ Neonatal (NS) mortality rates (NMR) are 27/1000 live births⁴ and NS accounts for 36 percent of total deaths in Bangladesh⁵. Neonatal sepsis recorded prevalence ranges between 7 and 38 per thousand live births within Asia. Compared to developed countries, sepsis is more prevalent in developing nations. Neonatal sepsis may be grouped as late onset sepsis (LOS) and early onset sepsis (EOS) in terms of time of the onset. The difference is clinically relevant, as EOS disease is primarily induced by bacteria during and before delivery, and LOS disease is induced by bacteria (community or nosocomial sources) after delivery.⁶ Early sepsis generally occurs during the age of initial 72 hours, and late sepsis

generally occurs after the age of 72 hours. Infections are far more prevalent in low birth weight and premature babies.⁷ Among neonates, the disease may progress faster contrasted to adults; thus, early diagnosis is highly important.⁷ Neonates are not specific to clinical characteristics of sepsis and a strong suspicion index is needed for early diagnosis against sepsis. For diagnosis, positive-blood-culture is a benchmark, but it takes time (needs 72 hours, minimum 24 hours for BacT-ALERT®) and requires a well-furnished laboratory.⁸ Many researchers have assessed different inflammatory indicators like interleukin-6, plasma elastase, and interleukin-8. But these are advanced and inefficient for underdeveloped countries.⁹⁻¹¹ With early accessibility of outcomes, a successful screening test needs high specificity and sensitivity and should be cost-effective.⁹ Although for the diagnostic process in neonatal sepsis, a positive-blood-culture is the benchmark, the method takes a lot of, requiring a proper configuration of laboratory and being positive for only 40 percent of cases. Early antibiotic therapy with some indirect markers like neutropenia is feasible. This study has been conducted to determine the causative organisms and their

sensitivity and resistance in presumed sepsis of neonates at tertiary care Hospital

MATERIAL AND METHODS

This cross-sectional study was conducted at the Paediatric department of Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad. Study duration was 6 months from November 2015 to April 2016. All neonates aged within 28 days, full-term or preterm babies with both male and female gender and clinical & some high-risk groups such as positive PROM history (prolonged rupture of membrane) less than 18 hours were included. Patients with antibiotic administration history 48 hours before admission and gross congenital abnormalities were excluded from the research. Having explained the motive of the study, the history and well-versed consent were taken from the parents/caretaker of each patient. Blood samples were taken for sensitivity studies and blood culture with all aseptic precautions, inoculated in bottles having trypticase soy broth for aerobic bacterial isolation. The incubation of blood-cultured bottles was done at 37°C and sub-culture was done on solid media (chocolate agar, blood agar and Mac-Conckey agar) after 24hrs to 48hrs and at 7 days.

Gram stain and standard biochemical techniques were applied to identify isolates. The screening of isolated pathogens was done for the 10 frequently used antibiotics susceptibility tests. The technique used was “disk diffusion-technique”, which relies mainly on determination of the minimum concentration of inhibition and the measurement of the inhibition areas. The pathogenic microorganism’s calibrated inoculums were inoculated in Muller Hinton media at 0.5 concentration of the McFarland standard and the antibiotic disks were positioned on the plate surface. After 24hr incubation at 37°C, inhibition zones were determined. In a separate record file, records of positive-blood-culture were saved. Cases were categorized as EOS (early-onset-sepsis) if they were presented at hospital for <7 days of life and late onset sepsis if they were presented at or following the age of 7 days. The scientists registered the entire data on pre-planned proforma. Data entry and analysis was carried out by the statistical program SPSS version 20.0.

RESULTS

Overall 332 patients were enrolled in this study. The patients mean age was 17.3±7 days, minimum and maximum age limit was 1 day and 28days, respectively. Males were found in majority 181 (54.5%) while females were 151 (45.48%), with male to female ratio as 1.2:1. In

the cases of neonatal sepsis, early onset cases were 60.55% and late onset were 39.5%. (Table1)

The most frequent organism isolated from blood was Klebsiella pneumoniae (28.6%) cases, followed by E.coli 23.5%, staphylococcus aureus 19.6%, Listeria 13.3%, Streptococcal pneumonia 8.7%, Pseudomonas 3.9%, Proteus species 1.8% and Streptococcal viridians was seen in 0.6% cases, respectively. (Figure 1)

As per antibiotic sensitivity, E. coli was found highly resistant to Ampicillin and highly sensitive to Amikacin; whereas Listeria was highly resistant to Cefuroxime and highly sensitive to Ciprofloxacin; Klebsiella species was highly resistant to Cefuroxime and highly sensitive to Ceftriaxone; Staph aureus species was highly resistant to Amikacin and highly sensitive to Vancomycine; Streptococcal viridians species was highly resistant to Cefotaxime & Ceftriaxone and highly sensitive to all antibiotics except Cefotaxime & Ceftriaxone; Streptococcal pneumonia species was highly resistant to Amikacin and highly sensitive to Ciprofloxacin; Pseudomonas species was highly resistant to Ampicillin & Gentamycin and highly sensitive to Cefotaxime; Proteus species was found highly resistant to Ampicillin, &Cefuroxime and highly sensitive to Gentamycin, Cefotaxime, and Ciprofloxacin. (Table 2)

Table 1: Demographic characteristics of patients (n=332)

Variables	Frequency(%)
Gender	
Males	181(54.5%)
Females	151(45.5%)
Total	332(100.0%)
Neonatal sepsis	
Early onset	200(60.5%)
Late onset	142(39.5%)
Total	332(100.0%)

Age (mean+SD) 17.3±7 days

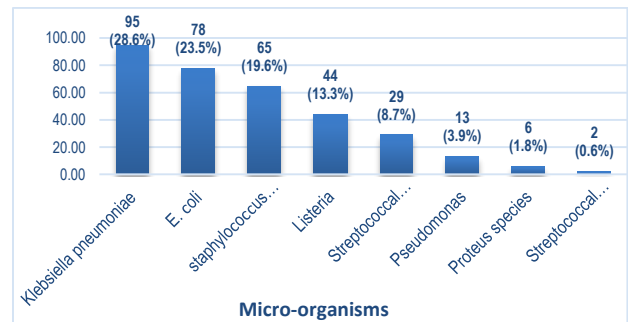


Figure 1: Frequency of pathogens Isolated from blood (n=332)

Table 2: Antibiotic Sensitivity Pattern (n=332)

Micro-organisms	Antibiotics																	
	Genta		Ampi		Ceftria		Amk		Mero		Vanco		Cipro		Cefotaxime		Cefur	
	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S
E.coli	19	59	5	73	8	76	12	66	9	75	20	7	10	68	8	70	5	73
Listeria	2	42	3	41	4	40	3	41	5	39	-	-	-	-	1	43	7	37
Klebsiella	23	71	7	88	12	83	9	86	6	89	87	8	3	92	11	84	27	67
Staph. Aureus	5	60	16	48	19	45	13	51	2	63	7	58	-	-	-	-	6	59
Streptococcal viridians	0	2	0	2	0	2	1	1	0	2	0	2	1	1	-	-	0	2
Streptococcal pneumonia	4	25	3	26	11	18	10	18	9	20	2	27	-	-	1	28	4	26
Pseudomonas	5	8	5	8	2	11	1	12	1	12	10	3	4	9	2	11	3	10
Proteus species	2	4	0	6	1	5	0	6	2	4	5	1	1	5	0	6	2	4

Amk-Amikacin, Amp- ampicillin, Ceftria-Ceftriaxone, Cefta-Cefotaxime, Cefur- Cefuroxime, Cipro- Ciprofloxacin, Gent-Gentamycin, Mero- Meronium Vanc- vancomycin, R= Resistant S= Sensitive - = not tested

DISCUSSION

Early onset sepsis (EOS) associated with bacteria continues to be a significant cause of morbidity as well as mortality among neonates.^{12,13} In addition to obstetric risk variables, low birth weight and prematurity are linked with enhanced rates of bacterial infection.^{14,15} The bacterial profile, incidence of sepsis and pattern of resistance varies between developed and underdeveloped nations and among nurseries. A general prevalence of 1-8 cases per 1000 live births has been recorded for culture proven sepsis from developed nations and 4.8-20.7 per 1000 live births from India. Bhatt et al revealed 57.6% males and 42.3% females with 1.36:1 of male to female ratio. These results are comparable to current study; where, mean age was 17.3±7 days, 42 (54.5%) males and 35 (46.4%) females with male to female ratio of 1.2:1.¹⁶ 59 (76.6%) were hospital-born and 51 (66.2%) had a weight of 5 kg. Poor feeding remained the commonest sign representing 85.7% of cases after that 79.2% lethargy and 59.7% cases of respiratory distress. A research reported that lethargy (80.7%) was the commonest clinical feature, after that respiratory distress (57.6%) and feed intolerance (53.8%). In 34.5 percent of the neonates, there was temperature instability,¹⁷ the finding concerning respiratory distress was similar to current study.

In current study *K. pneumoniae* was the commonest blood isolated organism with 28.6% subjects, followed by 23.4% cases of *E. coli* and 19.5% cases of *Staphylococcus aureus*. Likewise, a study concerning neonatal sepsis microorganism documented that *Klebsiella* (27%) was predominant in EOS. Similar results were noted in one more study from the region.¹⁸ Numerous possible factors for the association of these organisms in EOS could be there, as in the underdeveloped countries most of the deliveries (75-90%) take place at home by customary birth attendant. In the study of Maiwald M et al¹⁶ complicated and prolonged deliveries, poor obstetric practices, increasing prevalence of low birth weight and premature babies, absence of aseptic measures, raised handling and postnatal achievement of infection from atmosphere; all partake in neonatal sepsis.¹⁶ *E. coli* was the 2nd most frequent organism. The elevated rate of *E. coli* was as well discovered in one more study.¹⁹ An observational research carried out at Sheik Zayed Hospital, Lahore revealed that of 150 supposed sepsis cases, the majority were gram-negative (86%), including *Klebsiella* (13%) and *E. coli* (20%).²⁰ The other released data on the subject in Nepal shows that *E. coli* is the most prevalent isolate.^{21,22} The research in western Nepal showed that *Staphylococcus aureus* was the most prevalent isolate.²³ In several surveys in Nepal, *E. coli* was the major cause,^{21,22} and the second most prevalent isolate recorded from Uganda.²⁴ *Staphylococcus aureus* is the 3rd most prevalent isolate as it is in India.²⁵ *Klebsiella* was the 4th most prevalent isolate, however in India and Nepal *Klebsiella* was the 2nd most prevalent factor and in Western India it was the most prevalent cause.²⁶ In this research, *Pseudomonas* was isolated from one situation, but the accounts from Iran and India showed that *Pseudomonas* was the most prevalent cause.

In this study according to the as per antibiotic sensitivity, *E. coli* was found highly sensitive to Amikacin, gentamycin and ciprofloxacin. *Klebsiella* species was highly sensitive to gentamycin, Ceftriaxone, Amikacin and ceftriaxone antibiotics, which is similar to another study which also showed quinolones as the most potent antibiotics in neonatal sepsis.²⁷ High sensitivity to Amikacin was seen in other studies as well, which was parallel to this study.²⁸ In contrast, Kathmandu N et al²⁹ reported that the highest sensitivity was noted with ciprofloxacin and Amikacin.

CONCLUSION

It was concluded that *Klebsiella pneumoniae* was the most common organism isolated from blood 28.6%, followed by *E. coli* 23.4% and *Staphylococcus aureus* in 19.5% cases. *E. coli* was found highly sensitive to Amikacin, gentamycin, and ciprofloxacin. *Klebsiella* species was highly sensitive to gentamycin, Ceftriaxone, Amikacin and Cefotaxime antibiotics

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