

Neonatal Sepsis: Single Center Experience

Mansour Alzahrani^{1*}, Sami Alrashidi¹, Abdulaziz Alnujaydi¹,
Abdulqudos Aljenendil¹, Omar Alomar¹, Abdulaziz Alareefy¹, Yazeed Alsubaie¹,
Mohammed Alghoshimi¹, Dayel Alshahrani²

Departments of ¹Pediatric, and ²Infectious Diseases, King Fahad Medical City, Riyadh, Saudi Arabia

*Corresponding author: Mansour Alzahrani, Mobile: (+966)508776660, E-Mail: msgalzahrani@kfmc.med.sa

ABSTRACT

Background: Neonatal sepsis is a major cause of morbidity and mortality worldwide, especially when an infant is delivered preterm.

Objectives: The aim of the current work was to evaluate the clinical presentation, etiology, antibiotics use, and mortality in neonatal sepsis cases at King Fahad Medical City. Duration of antibiotics and length of hospital stay were also included.

Patients and Methods: This cross sectional retrospective descriptive, single-institute study included a total of 225 neonates suspected to have neonatal sepsis, attending at tertiary hospital, Department of General Pediatric, King Fahad Medical City, Riyadh, Saudi Arabia. This study was conducted between January 2014 to July 2017. Subjects were hospitalized through Emergency Department and included all neonates underage of 28 days.

Results: Among the included 225 neonates, 134 (59.6%) were male and 91 (40.4%) were female. Most of them Term neonates 203 (90.2%). Fever found to be the most common symptoms 184 patients (81.8%) followed by decrease feeding and activity in 124 (55%) and 101 (44.9%) respectively. Respiratory symptoms like cough, tachypnea, runny nose and cyanosis found in 56 (25%). Empirical antibiotics frequently used were ampicillin 209 (92%) and cefotaxime 185 (82%) with median duration of 4days (range 1-47 days). Blood cultures came positive in 8 patients (3.6%). Coagulase negative staphylococci came in 3 (30%) patients and E.coli in 3 (30%) patients as well.

Conclusion: It could be concluded that large number of neonates admitted as suspected neonatal sepsis in our hospital resolved their symptoms without find identifiable etiology. In those who had identifiable etiology urinary tract infections (UTI) and viral infections were the common etiology. However, blood stream sepsis and meningitis were quite rare.

Keywords: Neonatal, Sepsis, Antibiotics.

INTRODUCTION

Neonatal sepsis remains one of the leading causes of mortality and morbidity in neonate ⁽¹⁾. Based on the timing of infection neonatal sepsis has been classified into early and late onset sepsis. This classification helps to guide antibiotic therapy according to predominant organisms at onset. Early onset sepsis is defined as onset of sepsis in the first week of life and mostly it is caused by vertical transmission from mother to infant ⁽²⁾.

Most common organisms are Group B streptococcus (GBS) which is the most common leading cause of neonatal sepsis and meningitis in united states. E.Coli described to have emerged as 2nd most common ⁽³⁾, Listeria monocytogens was also associated with intensive disease in neonates. Late onset sepsis is defined as onset of sepsis beyond the first week of life until 28 days of life.

Mostly it is caused by horizontal transmission of pathogens acquired postnatally ⁽²⁾. Most common organisms (70%) are gram positive cocci, being coagulase negative staphylococcus.

Other organisms associated with high rates of death are pseudomonas aeruginosa, Serratia marcescens and E.coli ⁽⁴⁾.

However, Local results and outcome of neonatal sepsis is sufficient.

The aim of the current work was to evaluate the clinical presentation, etiology, antibiotics use, and mortality in neonatal sepsis cases at King Fahad Medical City. Duration of antibiotics and length of hospital stay were also included.

PATIENTS AND METHODS

This cross sectional retrospective descriptive, single-institute study included a total of 225 neonates suspected to have neonatal sepsis, attending at tertiary hospital, Department of General Pediatric, King Fahad Medical City, Riyadh, Saudi Arabia. This study was conducted between January 2014 to July 2017.

Ethical approval:

Approval of the ethical committee was obtained from King Fahad Medical City.

Subjects were hospitalized through Emergency Department and included all neonates underage of 28 days. Cases who showed clinical signs of neonatal sepsis such as fever, decreased activity or oral intake, apnea, cyanosis, respiratory symptoms, abnormal movement, vomiting, diarrhea, or abdominal distension were included. Cases who known to have major comorbidities e.g., complex heart disease and neonates



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who born at KFMC and admitted to Neonatal Intensive Care Unit were excluded.

All data were collected from patient files, hospital Information Management system, CORTEX (hospital management system).

Collected data included clinic presentation, general look, type of antibiotic, duration of antibiotics, organisms' sensitivity and length of stay. Also, outcome labeled as recovery, intensive care admission and death. All cases were subjected to complete blood count (CBC), Blood Culture, Urine Culture and Cerebral Spinal Fluid Culture. Chest X-Ray and Nasopharyngeal Panel Aspiration (NPA) were done to all patients with respiratory symptoms. Diagnosis of neonatal sepsis was based on clinical presentation with positive culture blood, urine or CSF.

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean \pm standard deviation (SD). Qualitative data were expressed as frequency and percentage.

RESULTS

Total of two hundred twenty-five suspected neonates with sepsis were admitted with mean age of (13.48 \pm 8.31) days. 134 neonates (59.6%) were male and 91 (40.4%) were female. Most of them Term neonates 203 (90.2%).

Clinical presentations of neonates were fever in 184 (81.8%), decreased feeding and decreased activity in 124 (55%) and 101 (44.9%), respectively. Respiratory symptoms like cough,

tachypnea, runny nose and cyanosis were found in 92 cases (41%). Cases who had contact with sick people were 77 cases (34%). Urinary symptoms like change in urine color or smell found in 22 cases (10%). Ninety-four of neonates (41%) were well looking at presentation.

Complete Blood Count (CBC) revealed that 79 cases (35%) found to have leukopenia with total white blood count less than 10.000 /mm³. Other aspects of Complete Blood Count (CBC) test found to be in the normal range for most of them.

All suspected case underwent full septic work up where blood cultures came positive in 8 patients (3.6%) and one of suspected cases had 2 grew organisms. Of them, coagulase negative staphylococci came in 3 (30%) and Ecoli in 3 (30%) as well. The other 3 organisms were found to be Group B streptococcus, Streptococcus Bovis and Klebsiella pneumonia.

All blood cultures growth seen in less than 38 hours (range 10-38 hours). CSF cultures only came positive in 6 (2.7%) neonates.

Group B streptococcus found in 3 (50%), streptococcus Bovis in 2 (33%) patients and HSV in 1 (16%). Urine cultures were most found etiology in 59 (26%) of our patients. E.Coli was the most frequent organism found in 31 (52%) of positive urine cultures.

For the respiratory pharyngeal aspiration (NPA), it was done for 82 (36%) patients. Positive results came in 57 (70%) in patients who did NPA, Rhino virus found in 25 (44%) patients, Respiratory Syncytial Virus found in 15 (26%).

Frequently antibiotic used were ampicillin 209 (92%) and cefotaxime 185 (82%) with median duration of 4 days (range 1-47 days). No deaths among patients but 4 (1.7%) neonates needed intensive care admission.

Table (1): Clinical Characteristics of the Patients (n = 225).

Characteristics	Descriptions	N (%)	Characteristics	Descriptions	N (%)
Sex	Male	134 (59.6%)	Anterior fontanel	Bulging	1 (0.4%)
	Female	91 (40.4%)		Not Bulging	217 (96.4%)
Pregnancy	Term	203 (90.2%)		NA	7 (3.1%)
	Preterm	22 (9.8%)	Irritability	Present	15 (6.7%)
Previous Admission	Yes	20 (8.9%)		Absent	210 (93.3%)
	No	205 (91.1%)	Retractions	Present	11 (4.9%)
Fever	Yes	184 (81.8%)		Absent	214 (95.1%)
	No	41 (18.2%)	Nasal flaring	Present	12 (5.3%)
Cough	Yes	56 (24.9%)		Absent	213 (94.7%)
	No	169 (75.1%)	Murmur	Present	15 (6.7%)
Rapid breathing (tachypnea)	Yes	33 (14.7%)		Absent	210 (93.3%)
	No	192 (85.3%)	Abdominal distension	Present	4 (1.8%)
Runny nose	Yes	57 (25.3%)		Absent	221 (98.2%)
	No	168 (74.7%)	hepatomegaly	Present	2 (0.9%)
Abnormal movement	Yes	8 (3.6%)		Absent	223 (99.1%)
	No	217 (96.4%)	Skin changes	Present	9 (4.0%)
Cyanosis	Yes	26 (11.6%)		Absent	216 (96.0%)
	No	199 (88.4%)	Circumcised	Present	21 (9.3%)
Decreased feeding	Yes	124 (55.1%)		Absent	117 (52.0%)
	No	101 (44.9%)		NA	87 (38.7%)
Decreased activity (Lethargy)	Yes	101 (44.9%)	Rash	Present	8 (3.6%)
	No	124 (55.1%)		Absent	217 (96.4%)
Rash	Yes	6 (2.7%)			
	No	219 (97.3%)			
Vomiting	Yes	36 (16.0%)			
	No	189 (84.0%)			
Diarrhea	Yes	16 (7.1%)			
	No	209 (92.9%)			
Change in urine color	Yes	17 (7.6%)			
	No	208 (92.4%)			
Change in urine smell	Yes	9 (4.0%)			
	No	216 (96.0%)			
Contact with sick patient	Yes	77 (34.2%)			
	No	148 (65.8%)			
Looking	Well	212 (94.2%)			
	Not Well	12 (5.3%)			
	NA	1 (0.4%)			

Table (2): Positive blood culture organisms.

Organisms of positive blood culture	Cons	3 (1.3%)
	E.coli	3 (1.3%)
	GBS	1 (0.4%)
	S. BOVIS	1 (0.4%)
	k. pneumoniae	1 (0.4%)

Table (3): Positive CSF culture organisms.

Organisms of positive CSF culture	GBS	3 (1.3%)
	S.BOVIS	2 (0.9%)
	HSV	1 (0.4%)

Table (4): Positive Urine Culture Organisms.

Organisms of positive urine culture	K.pneumoniae	17 (7.6%)
	E.Coli	31 (13.7%)
	Enterococcus. fecalis	4 (1.8%)
	Others	

Table (5): Positive NPA organisms.

Organisms of positive NPA	RSV	15 (6.7%)
	RHINO	25 (11.1%)
	ENTERO	2 (0.9%)
	Influenza A	2 (0.9%)
	RSV + RHINO	2 (0.9%)
	RSV + Parainfluenza	2 (0.9%)

DISCUSSION

This study included a total of 225 neonates suspected to have neonatal sepsis. The majority of them (184 (81.8%)) presented with fever followed by decreased feeding and decreased activity in 124 (55%) and 101 (44.9%) respectively. Respiratory symptoms like cough, tachypnea, runny nose, and cyanosis were less frequent found in 56 cases (25%). Ninety-four of neonates were well looked at presentation. Out of confirmed cases of neonatal sepsis (8 cases), symptoms were nonspecific, 4 cases came with fever, decreased feeding and activity (50%), 1 case came with vomiting (20%) and another case came with cyanosis (20%). Regarding to neonatal sepsis in Saudi Arabia, a study by **Haque et al.** (5), 190 cases with proven bacteremia, i.e.; positive blood and or cerebrospinal fluid culture, gram-positive organisms were cultured from 132 (69%) and Gram-negative organisms from 47 (25%) of the babies.

The single most frequent organism was staphylococcus epidermidis accounting for 36% (58/190) of all proven cases (6). Other study conducted by **Dawodu et al.** (7), included sixty-one cases of neonatal septicemia, incidence of Neonatal septicemia was 4.9 per 1000 live births. Staphylococci were the

major Gram-positive isolate occurring in both 'early' (< or = 48 h) and 'late' (48 h) onset septicemia. **Kilani and Basamad** (8) studied patterns of proven bacterial sepsis in NICU at King Khaled University Hospital- Saudi Arabia. Incidence of proven-bacterial-sepsis (PBS) was 10.2% of NICU admissions. Coagulase negative Staphylococcus (CONS) (50%) was the most common infecting organism causing late onset sepsis and Escherichia coli (29%) the most common causing early onset sepsis. Gram-negative bacteria were the infecting organisms in 50% of the early onset sepsis episodes and 29% of late onset sepsis episodes. Only 11% (14) of the proven bacterial sepsis were early onset sepsis. Only 10 (10.4%) infants had bacterial meningitis. The overall Proven bacterial sepsis related mortality was 9%, representing 22% of all neonatal deaths (8). **Al-Zamil**(9) studied the incidence and pattern of bacteremia in Riyadh, Saudi Arabia. Incidence of bacteremia found in patients aged less than 1 year (57.9%), and the majority of patients (30.5%) were neonates. Staphylococcus aureus was the most common isolated pathogen (18.7%).

In our study, all suspected case underwent full septic work up where blood cultures came positive in 8

patients (3.6%) one of suspected cases had 2 grew organisms. The types of organisms are mentioned in result section. Study conducted by **Al-Mouqdad *et al.***⁽¹⁰⁾ on Emirical antibiotic use for late onset neonatal sepsis, found that usage of Amikacin and Cloxacillin compared to Ampicilon and Cefotaxime have lower mortality in late onset sepsis with very low birth weight.

In our study all suspected cases started on empirical antibiotics, the most frequently antibiotic used were ampicillin 209 (92%) and cefotaxime 185 (82%) with median duration of 4 days (range 1-47 days). No deaths among our patients but 4 (1.7%) neonates needed intensive care admission.

Limitations:

Few confirmed cases of neonatal sepsis in our study were a big limitation, excluding cases with major diseases and newborns in the same institute limited the data. On the other hand, few local articles to compare was another limitation, we recommend future studies to include confirmed case including newborn for better result.

CONCLUSION

It could be concluded that large number of neonates admitted as suspected neonatal sepsis in our hospital resolved their symptoms without find identifiable etiology. In those who had identifiable etiology UTI and viral infections were the common etiology. However, blood stream sepsis and meningitis were quite rare, but no mortality found. So, are we overacting? We recommend patients who completed 48 hours antibiotics with no cultures growth to discontinue the antibiotics depending on clinical condition.

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