Original Article

Bacterial Sensitivity Pattern in Neonatal Sepsis at Civil Hospital Hyderabad

Asif Zafar Abro, Muhammad Nadeem Chohan, Mumtaz Mahesar

ABSTRACT

OBJECTIVE: To evaluate the bacterial sensitivity pattern in neonatal sepsis at Neonatal Unit, Civil Hospital Hyderabad.

METHODOLOGY: The observational Cross-sectional study was conducted at Neonatal Unit, Department of Paediatrics, Civil Hospital, Hyderabad from 1st January to 30th June 2014. Total 332 Neonates (1 – 28 days of life) with neonatal sepsis were included in this study. Neonates who had already received antibiotics and with gross congenital malformation were excluded from the study. All neonates who meet the inclusion criteria were investigated (complete blood count, prothrombin time, & Blood cultures). Positive Blood cultures were evaluated for their sensitivity to various antibiotics.

RESULTS: The mean age was 17.3±7 days, 181 (54.5%) were male and 151 (46.4%) were female, 200 (76.6%) were cases of early onset neonatal sepsis and 132 (66.2%) were late onset sepsis. History of Premature rupture of membrane was present in 24.6%. Klebsiella pneumoniae was the most common organism isolated from blood (39.78%) followed by E. coli (22.58%) and staphylococcus aureus (18.27%).Klebsiella was sensitive to Amikacin, Gentamycin and Ciprofloxacin in 100% cases, while it was resistant to Ampicillin in 100% cases.

CONCLUSIONS: It is concluded from this study that Klebsiella was the most common organism for neonatal sepsis and it was sensitive to common antibiotics.

KEY WORDS: Bacterial Sensitivity Pattern, Neonatal Sepsis.

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INTRODUCTION

Neonatal sepsis is a leading cause of morbidity and mortality among neonates[1]. Clinical manifestations may be subclinical infection or severe manifestations of focal or systemic disease. Pathogen can arise from in-utero infection, maternal flora, or postnatally from the hospital or community[2]. Recently there is significant decrease in neonatal mortality all over the world[3]. Clinically diagnosed sepsis is present in 49-170 per 1000 live births in developing countries, while culture-proven sepsis in 16 per 1000 live births[4].

Early-onset sepsis is caused by Group B Streptococcus (GBS), isolated in 50% cases, followed by Escherichia coli, isolated 25% of cases[5]. Late onset sepsis is caused by CoNS, in 50% of cases, while the other important agents are E. coli, Klebsiella and Candida. Pathogens causing late onset sepsis are more resistant to antibiotics than pathogens causing early-onset sepsis[6].

Neonatal sepsis should be treated by keeping in mind, the most common pathogens and their antibiotic resistance patterns[7]. In last 10 years ampicillin plus aminoglycosides remained sensitive to 90% of pathogens so, this should be the initial therapy for suspected early-onset sepsis[8-10].

This study was to evaluate the micro organisms among various prenatal risk factors. This will help in planning a risk based strategy for management of early onset neonatal sepsis (EONS), by focused antibiotic therapy rather than to start empiric treatment which also carries the risk of antibiotic resistance. Although this study is done in a neonatal unit of a local hospital further studies should be done at various hospitals to detect the most common organisms and their sensitivity pattern in our locality, because the organisms and their sensitivity pattern is different in different countries and areas, hence local data is very important for the selection of empiric therapy for suspected neonatal sepsis.

METHODOLOGY

This observational cross sectional study was carried out at Neonatal Unit, Department of Paediatrics, Civil Hospital Hyderabad from 1st January to 30th June 2014. Total 332 neonates were included in this study with probability purpose technique. Sample size was calculated with 95% Confidence Interval, 4% bound on error and based on least frequent proportion of presumed sepsis with culture proven in Pakistan, 32% by the statistical formula. Approval was taken from

ethical review committee of the institute.

Inclusion criteria was Neonate's age within 28 days, Full term or preterm baby with either gender having clinical symptoms & signs of sepsis or certain high risk groups like +ve history of PROM (Prolong rupture of membrane) > 18 hours. Neonates having the History of antibiotic administration 48 hours prior to admission and neonates having Gross congenital anomalies were excluded from the study.

Neonates aged less than 28 days of life having the history of sepsis like, Poor temperature control, Refuse to feed or poor sucking, Inactivity or irritability or Seizure and patients who were meeting the inclusion criteria were enrolled in the study. After taking the history, an informed consent was taken from every patient's parents or care taker after explaining the purpose of the study. Blood samples were collected with all aseptic precautions for culture and sensitivity studies, inoculated into bottles containing Trypticase Soya Broth for isolation of aerobic bacteria.

As anaerobic bacteria are infrequent cause of neonatal sepsis, that's why its isolation was not included.

The blood culture bottles were incubated at 37^0C and sub cultured on solid media (blood agar, Mac-Conckey agar and chocolate agar) after 24hr to 48hr and at 7 days. Isolates were identified by Gram stain and conventional biochemical methods.

The isolated pathogens were tested for the ten commonly used antibiotics susceptibility test, as it is done as a protocol of our laboratory. The method used was the disk diffusion method which principally depends on the determination of minimum inhibition concentration and the inhibition zones are measured. The calibrated inoculums of the pathogenic microorganism at 0.5 concentration of McFarland standard was inoculated into Muller Hinton media and the antibiotic disks were placed on the surface of plates. Inhibition zones were determined after incubation at 37^0 C for 24 hrs.

Positive blood culture cases records were entered in separate record file, cases were classified as early onset sepsis if they presented at the hospital at less than 7 days of life and late onset sepsis if at or after 7 days of life. All the data was recorded on pre-designed proforma by the researchers. Data was entered and analyzed in statistical program SPSS version 20.0. Simple frequencies and percentages were calculated for qualitative data such as gender, sepsis, microorganisms and drug sensitivity etc. and chi square test was applied to compare the proportions between early and late onset sepsis. Mean ± standard Deviation was calculated for numerical variables like age (in years) and t' test (2 tailed) was applied. All data was calculated on 95% confidence Interval. A p value <0.05 was considered as statistically significant level.

RESULTS

A total of 332 patients were enrolled in this study. 332 patients, the mean age was 17.3±7 days (Table I), 181 (54.5%) were male and 151 (46.4%) were female and male to female ratio of 1.2:1 (Table I), 200 (60.24%) were cases of early onset neonatal sepsis and 132 (39.75%) were late onset sepsis (Table I). Most common presentation of neonates was poor feeding, lethargy and respiratory distress (Table II). 17.7% hospital born neonates had sepsis and among them 75.86% were resistant to Ampicillin / Gentamycin, while 82.22% home born neonates has sepsis and among them 40.62 were resistant to Ampicillin / Gentamycin (Table III). History of Premature rupture of membrane was present in 24.6% and (Table I). Blood Culture was positive in 93 (28.01%) neonates. Klebsiella pneumoniae was the most common organism isolated from blood 39.78% cases followed by E. coli 22.58% and staphylococcus aureus 18.28% cases (Table IV). Antibiotic sensitivity is summarized in (Table V).

TABLE I: GENERAL STATUS (n=332)

Age	Number	Percentage
< 7 days	200	60.24%
>7 days	132	39.75%
Sex		
Male	181	54.5%
Female	151	46.4%
Sepsis Onset		
Early onset neonatal sepsis	200	60.24%
Late onset sepsis	132	39.75%
Antenatal Status		
Antenatal Checkup	92	27.7
No antenatal Checkup	240	72.28
Socioeconomic Status		
Good	43	12.95
Low	289	87.04%
Weight		
>2.5 Kg	95	28.61
1.5 - 2.5 Kg	167	50.30
1 - 1.49 Kg	70	21.08
< 1 Kg	0	0
PROM	82	24.6
Mean age: 17.3±7 days, Male to Female ratio: 1.2:1		

TABLE II: CLINICAL FEATURES

Features	Number	Percentage
Poor Feeding	292	87.95%
Lethargy	260	78.31%
Respiratory distress	222	66.86%
Jaundice	39	11.7
Fever	74	22.28
Vomiting	54	16.26
Apnea	14	4.2
Hypothermia	21	6.32
Convulsions	48	14.45

TABLE IV: FREQUENCY OF PATHOGENS ISOLATED FROM BLOOD (n=93)

Pathogen	Number	Percentage
Blood Culture Positive	93	28.01
Blood Culture Negative	239	71.98
Klebsiella Pneumoniae	37	39.78
E.coli	21	22.58
Staphylococcus aureus	17	18.27
Pseudomonas	4	4.30
Proteus	5	5.37
Listeria	1	1.07
Streptococcal viridians	4	4.30
Streptococcal pneumonia	4	4.30

TABLE III: COMPARISON BETWEEN HOSPITAL VERSUS HOME BORN NEONATES WITH SEPSIS (n=332)

Birth Place	Number (%)	Positive Blood Culture (n=93)	Birth Weight	Mode of Delivery	Bacterial Sensitivity to Ampicillin/ Gentamycin
Hospital Born	59 (17.7)	29(31.18%)	>2.5 Kg=38 (64.4%) 15-2.5Kg=20(33.8%) 1-1.49 Kg=1(1.6%)	C/Section=38 (64.40%) Spontaneous=21 (35.59%)	Sensitive = 7 (24.13%) Resistant= 22 (75.86%)
Home Born	273 (82.22)	64(68.81%)	>2.5 Kg=57(20.8%) 15-2.6 Kg=147(53.8%) 1-1.49 Kg=69(24.1%)	C/Section= 0 Spontaneous=273(100%)	Sensitive = 38 (59.37%) Resistant= 26 (40.62%)

TABLE V: FREQUENCY OF ANTIMICROBIAL SENSITIVITY PATTERNS (n=93)

	Amp	Gent	Amk	cefta	Vanc	Mero	ceftria	cipro	cefur
E.coli (21)	R	S	S	S	S	S	S	S	S
Listeria (1)	S	S	S	S	S	I	I	S	S
Klebsiella sp (37)	R	S	S	S	S	-	S	S	R
Staph aureus (17)	S	R	R	R	S	S	I	I	S
Streptococcal viridians (4)	S	R	R	R	S	S	S	I	S
Streptococcal pneumonia (4)	S	S	R	R	R	S	I	S	S
Pseudomonas (4)	R	R	S	S	S	S	R	S	R
Proteus species (5)	R	S	S	S	S	S	S	S	S

Amp-Ampicillin, Gent-Gentamycin, Amk-Amikacin, cefta-cefotaxime, Vanc-Vancomycin, Mero-Meronium, ceftria -ceftriaxcin, cipro-cipraftoxcin, cefur-cefurcxim R= Resistant, S=Sensitive, I=Intermediate

DISCUSSION

This study was done in 332 neonates with suspected neonatal sepsis, among them 60.24% were < 7 days old (Early onset neonatal sepsis), while 39.75% were > 7 days old (Late onset sepsis). In our study male neonates were 54.5% and female neonates were 46.4%. Weight of the neonates at the time of admission was <2.5 Kg in 71.38% and >2.5Kg 28.61% cases. In an unsimilar study Late Onset Sepsis was present in 139 (78.53%) neonates and 38 (21.46%) had early onset sepsis (EOS)[11], while in a similar study among the 140 cases of culture proven

sepsis, 86 (61.4%) presented as early onset sepsis and 54 (38.6%)as late onset sepsis[13]. Regarding sex of neonates with neonatal sepsis, a similar study had 309 (70.2%) malesand 131 (29.8%) were females. Mean age of patients was 8.93±8.70 days[14]. In our study 27.7% mothers had the history of antenatal checkup, while 72.28% mothers had no antenatal checkup. 12.95% women belonged to good socioeconomic background and 87.04% belonged to low socioeconomic families.

In present study 87.95% neonates presented with poor feeding, 78.31% with lethargy, 66.86% with fast breathing, 11.7 with Jaundice, 22.28% with fever, 16.26 with Vomiting, 4.2% with Apnea, 6.32% with Hypothermia and 14.45% neonates with Convulsions.In an unsimilar study the most common clinical signs of neonate were: hyperthermia, somnolence and hypotonia[16].

About 24.6% mothers had the history of prolonged rupture of membrane, 17.7% neonates born at Hospital and 82.22% born at home. Our data is consistent with a similar study in which, 95 (47.0%) were inborn and 107 (53.0%) out born, with M: F ratio of 1.3:1[19].

In current study out of 332 neonates Blood Culture was positive in 93 (28.01%) neonates. Klebsiella Pneumoniae was the most frequent pathogen 39.78%, E.coli was present in 22.58% neonates, Staphylococcus aureus in 18.27%, Proteus in 5.37%, Pseudomonas in 4.30%, Listeria in 1.07%, Streptococcal viridians in 4.30% and Streptococcal pneumonia in 4.30% neonates. Our results were different to a study which showed, Staphylococcus epidermidis the most frequent agent (37.9%), followed by Staphylococcus aureus (12.9%)[11]. In another different unsimilar study Escherichia coli (44.3%) were the commonest organism followed by Staphylococcus aureus (26.3%), Klebsiella (18.6%) and Pseudomonas (12.1%). Most of the organisms were resistant to Ampicillin[13]. In another study the predominant isolated strain was G+ Streptococcus, which accounted for 60% (50/84) of cases [15]. In another different study Eighty-five (10.29%) showed positive results, Coagulase-negative staphylococci were the predominant organism (41.18%) [17]. The similar results were from a different study showed coagulase-negative staphylococci (CONS), Staphylococcus aureus, and Klebsiella pneumoniae the most common pathogens[18] These un-similar studies signify the presence of different organism in different areas. Results of a similar study showed Klebsiella pneumonia in 25% neonates, Enterobacter in 12.5%, Group B Streptococcus in 12.5% neonates[12]. In a study from Peshawar E. coli was the dominant pathogen seen in 811 (52.8%) followed by Staphylococcus aureus 300 (19.5%), Pseudomonas 199 (13%), Klebsiella 102 (6.7%), Proteus 87 (5.7%), Staphylococcus epidermidis 28(1.8%) and Salmonella in 7 (0.5%) samples[20].

In present study Klebsiella (most common pathogen) was sensitive to commonly used antibiotics like Amikacin, Gentamycin and Ciprofloxacin while it was resistant to Ampicillinand Cefuroxime. E Coli was also sensitive to commonly used antibiotics like Amikacin, Gentamycin Ciprofloxacin and Cefuroxime, while it was resistant to Ampicillin. Staph aureus was sensitive to Ampicillin and Cefuroxime, while it was resistant to Amikacin and Gentamycin. Listeria was sensitive to all commonly used drugs like Ampicillin, Amikacin, Gentamycin and Ciprofloxacin. Gram positive organisms were mostly sensitive to Vancomycin, Imepenem, Cefotaxime, Amikacin and Amoxicillin, while gram negative organisms were mostly sensitive to Amikacin and Imepenem[14]. In a study the most common isolates were Staphylococcus aureus (52%). All the isolates except Staphylococcus aureus were susceptible to ampicillin[19].

In current study neonates born at hospital versus home had blood culture positive among birth weight > 2. 5 Kg Blood in 38 (64.4%) versus 57 (20.8%) neonates, among birth weight 1.5 to 2.5 Kg it was positive in 20 (33.8%) versus 147 (53.8%) while it was positive in 1 (1.6%) versus 69 (24.1%) neonates having birth weight between 1 to 1.4 kg respectively. A different study from Peshawar showed more positive blood culture (58.3%) in low birth weight neonates, this difference may be due to inclusion criteria ie all hospital born neonates in their study, increasing the risk of infection[20], while a similar study from Indonesia showed 62.6% positive blood Cultures in normal weight neonates[24].

Hospital born Neonates who were born by C/Section had 38 (64.4%) positive blood cultures, while it was positive in 64 (23.4%) neonates born at home. The neonates who born at hospital were sensitive to first line antibiotics (Ampicillin and gentamicin) in 7 (24.1%) cases while it was sensitive in 39 (59.3%) cases in home born neonates. In a unsimilar international study bacterial sensitivity to gentamycin was high (50%) to all organism, showing the diff erence in sensitivity pattern at various countries[21]. Other un-similar studies from Ghana and India showed 100% resistance of all organisms to Ampicillin[22,23].

CONCLUSION

It is concluded that Klebsiella was the most common organism for neonatal sepsis and it was sensitive to common antibiotics.

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Conflict of interest:

There is no conflict of interest to declare.

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