Prevalence of Neonatal Septicemia in Karbala Pediatric Teaching Hospital and Al-alwiyah Pediatric Teaching Hospital, Iraq

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Abstract

Background: Neonatal sepsis is a major cause of morbidity and mortality worldwide and especially in developing countries. The incidence of neonatal septicemia varies widely between the developed world and developing countries. **Methods:** The data was collected from the records of the Department during period (February 2019- December 2020). incubated blood culture at 37°C for 7 days. Subcultures were done onto blood agar and MacConkey agar plates. **Results:** Clinical feature of neonatal septicemia as Fever 31(67%); Feeding difficulty 22 (48 %); both Jaundice and Lethargy as 9(19.5%); also, Diarrhea 7(15%); Skin rash 6(13%) and Meningitis 3(6.5%).so current results showed male with positive bacterial culture (69.5%) when compare with Female (30.5%), Among a total of 46 bacterial isolates recovered, 34 (74%) were Gram-negative isolates more than Gram-positive isolates 12 (26%) , so among a total of 46 bacterial isolates recovered, *E.coli* were recovered from the cases as (24%) followed by *both Klebsiella pneumoniae* and *Pseudomonas* as (13.5%), So *Citrobacter species* and *Proteus mirabilis as* (8.5%) , and *Strep pneumonia and Staphylococcus aureus* were recovered from a single case , *Staphylococcus epidermedis* (7 cases - 15%). **Conclusions:** Most clinical feature of neonatal septicemia as Fever; Feeding difficulty; and Jaundice and Lethargy, so the male with positive bacterial culture more than Female as well as gram negative bacteria is more common septicemia children with predominant of *E.coli* .

Keywords: *neonatal septicemia; Karbala Pediatric Teaching Hospital; Karbala.*

Introduction

Neonatal septicaemia (NNS) may be defined as systemic bacterial infection in a neonate documented by positive blood culture within the first twenty eight days after birth[(1)] , or define as the clinical syndrome of bacteraemia with signs and symptoms of infection in the first twenty eight days after birth[(2)] .

Neonatal sepsis accounted for 1.4 million neonatal deaths or around 40% of total lives lost, annually [(3)], About 99% of neonatal deaths occur in low and middle-income countries (LMIC) and approximately 62% occurred during the first 3 days of life [(4)] .

There are two types of neonatal sepsis, early- and late-onset. There is little consensus about applicable age limits in literature[(5)] . Usually, the age limit defined for early-onset sepsis varies from 3 to 7 days[(6)] . Some clinicians and researchers use 7 days as the limit [(7)] . Late-onset sepsis is usually caused by organisms acquired after delivery and considered as nosocomial community-acquired infection[(8)].

Breast feeding is another effective strategy in term and preterm infants that improves cognitive and behavior skills, and decreases rates of infection[(9)] .An increase in sepsis caused by Gram-negative organisms has been

reported in recent years[10] . Neonatal sepsis caused by Gram-negative microorganisms is responsible for 18%–78% of all neonatal sepsis[11] .Early-onset neonatal sepsis is caused by microorganisms acquired from the mother before or during birth (vertically transmitted and perinatally acquired); thus, microorganisms from the maternal genital tract may play an important role in early infection[12].

In the developing world, *Escherichia coli* (*E. coli*), *Klebsiella* species, and *Staphylococcus aureus* (*S. aureus*) are the most common pathogens of EOS, whereas *S. aureus*, *Streptococcus pneumoniae*, and *Streptococcus pyogenes* are the most commonly reported organisms in LOS [13].

Patients and methods:

This retrospective observational study was conducted in the Department of Microbiology in Karbala Pediatric Teaching Hospital and Al-alwiyah Pediatric Teaching Hospital. The data was collected from the records of the Department during period (February 2019- December 2020). 2ml blood drawn under aseptic precautions and inoculated into 20 ml blood culture bottles, these blood culture bottles were incubated at 37°C under aerobic conditions in the incubator for 7 days. The first subculture was done after 24 hours of incubation, the second on the third day and a final on the seventh day. Subcultures were done onto blood agar and MacConkey agar plates. The inoculated plates were incubated aerobically at 37°C for 24 hours, and the plates were observed for growth. The growth was identified by colonial characteristics, gram's stain and standard biochemical tests as well as used Vitek system for identified bacterial isolates.

Results

Table (1): Common Clinical features of Neonatal Septicemia (46 case)

Clinical features	Frequency	%
Fever	31	67
Feeding difficulty	22	48
Jaundice	9	19.5
Lethargy	9	19.5
Diarrhea	7	15
Skin rash	6	13
Meningitis	3	6.5

Results in table 2 showed clinical feature of neonatal septicemia as Fever 31(67%); Feeding difficulty 22 (48 %); both Jaundice and Lethargy as 9(19.5%); also, Diarrhea 7(15%); Skin rash 6(13%) and Meningitis 3(6.5%) .

Table (2): Bacterial culture according to gender patients of Neonatal Septicemia

Gender	Positive bacterial culture		Negative bacterial culture		Total	
	Number	%	Number	%	Number	%
Male	32	69 .5	18	39	50	70.4
Female	14	30.5	7	15	21	29.6
Total	46	100	25	54.5	71	100

This table (2) showed male with positive bacterial culture (69.5%) when compare with Female (30.5%).

Table (3): Types of bacterial isolate from patients of Neonatal Septicemia

Number	Type of bacteria	Percentage
34	Gram negative bacteria	74
12	Gram positive Bacteria	26
46	Total	100

Among a total of 46 bacterial isolates recovered, 34 (74%) were Gram-negative isolates more than Gram-positive isolates 12 (26%) were (table-3).

Table (4): Distribution of isolated bacteria according to gram stain

Name of bacterial isolate	No.	%
Gram negative bacteria		
E. coli	11	24
Klebsella pneumonia	6	13.5
Pseudomonas	6	13.5
Proteus mirabilis	4	8.5
Citrobacter species	4	8.5
Enterobacter cloacae	3	6.5
Total Gram negative bacteria	34	
Gram positive bacteria		
Strep pneumonia	1	2
Staphylococcus aureus	1	2
Staphylococcus hemolyticus	3	6.5
Staphylococcus epidermedis	7	15
Total Gram positive bacteria	12	
Total	46	100

Among a total of 46 bacterial isolates recovered, *E. coli* were recovered from the cases as (24%) followed by both *Klebsiella pneumoniae* and *Pseudomonas* as (13.5%), So *Citrobacter species* and *Proteus mirabilis as* (8.5%), and *Strep. pneumonia* and *Staphylococcus aureus* were recovered from a single case, *Staphylococcus epidermedis* (7 cases - 15%) (Table-4).

Discussion

Data from developing countries shows variable prevalence of Gram negative and gram-positive organisms in neonatal septicemia. Some have predominant gram-negative isolates [14], others show Gram positive isolate predominance [15&16], During lysis, Gram-positive bacteria release peptidoglycans whilst the Gram-negatives release lipopolysaccharides-A (LPS-A) or endotoxins. These substances initiate a cascade of events that lead to the sepsis syndrome, septic shock, multiple organ failure and death. Bacterial fragments, endotoxins and/or exotoxins stimulate monocytes and neutrophils to produce inflammatory mediators [17] .

The reason for male preponderance is unknown, but this could be due to sex-dependent factors [18]. The synthesis of gamma globulins is probably regulated by X–linked immuno regulatory genes and as males are having one X chromosome, they are more prone for neonatal septicemia than females [19]. Previous study as Aletayeb *et al.,* ; Celicia *et al.,* ; Rabia *et al.,* and Ahmad *et al.,* have reported higher number of male neonatal septicaemia than female neonatal septicaemia [20 ;21;22].

A study by Ojukwu reported Gram-positive organisms as the predominant with Staphylococcus aureus accounting for 45% while for Gram-negative, *E.coli* accounted for 18.2%[23] , Although Gram-positive organisms are the most common causes of nosocomial blood stream infections, Gram-negative bacteremia carries higher risks of severe sepsis, septic shock, and death. Of these, one-third were caused by gram negative bacilli and 70 (18.6%) were multidrug resistant [24]. Some of the most frequently isolated bacteria in sepsis are *Staphylococcus aureus* (*S. aureus*), *Streptococcus pyogenes* (*S. pyogenes*), *Klebsiella* spp., *Escherichia coli* (*E. coli*), and *Pseudomonas aeruginosa* (*P. aureginosa*)[25]. Also Hornik *etal.,* showed most commonly bacterial isolate as GBS, Escherichia coli, CONS, *Haemophilus influenzae* and Listeria monocytogenes[26].

Sundaram *et al.,* [27] records *S. aureus* was (22%), Klebsiella spp. (18%) and NFGO were (17%). Other organisms in decreasing frequencies were Enterobacter spp. (11%), *E. coli* (9%), *Acinetobacter spp*. (7%), CONS (6%), and Pseudomonas spp. (3%). so Kaistha *etal.,* 2010[28] found that CONS were 41%, NFGO were 27% and Klebsiella were 18% of the total isolates.So Al-Shamahy *etal.,* from Yemen had 97% Gram negative isolates. Klebsiella spp. (36%) and Pseudomonas spp. (30%) were the two commonest isolates [29].

Conclusions

1) Most clinical feature of neonatal septicemia as Fever; Feeding difficulty; and Jaundice and Lethargy.

2) Male with positive bacterial culture more than Female.

3) Gram negative bacteria is more common septicemia children with predominant of *E. coli* .

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