

Risk factors related to neonatal bacterial septicemia in Al-Elwiya maternity teaching hospital.

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Abstract

Background: Neonatal septicemia is a major cause of morbidity and mortality worldwide. We analyzed the spectrum of pathogens causing neonatal septicemia in various Arabic countries as Iraq.

Materials and Methods: The study was conducted in the Neonatal Care Unit (NCU) at Al-Elwiya maternity teaching hospital, a total of (50) neonate admitted to NICU during the period January 2021 to June 2021. The case records were reviewed and information regarding gestational age, and medical history of the mother, bacterial isolate isolated from newborn and management procedures were collected. Blood cultures were used to establish the diagnosis of bacterial infection as well as (25) control group without neonatal septicemia (healthy).

Results: Current study appeared 30 (60%) males and 20 (40%) females, so about 31 (62%) in age (>7) day compare to age group (7-28 and 28 ≤) day as (22%, 16%) respectively, so the early onset sepsis (58%) more than late onset sepsis (42%), and most common pathogens were gram negative bacilli causing both early onset septicemia and late onset sepsis as percentage (28%, 34%) respectively compare to gram positive bacteria (30%, 8%), also most common pathogenic organisms were *E. coli* 13 cases (26%), both *Klebsiella* and *Pseudomonas* species 7 cases (14%), *Staphylococcus epidermidis* (11 cases or 22%) in both early and late onset neonatal septicemia. Results of current study showed, 36 cases (72%) were delivered at hospital and 14 (28%) at home, about to residency are a urban was 31 cases (62%) and 29 cases (58%) rural, also education of mothers as primary school (27%, 54%) compare to control (11%, 44%) and secondary school as (8%, 16%) compare to control (10%, 40%), whilst the mother as housewife and employer as (44%, 40%) respectively compare to control.

Conclusion: Current study appeared the males with septicemia more than females so about 31 (62%) in age >7 day compare to age group (7-28 and 28 ≤) day as (62%, 22%) respectively, early onset sepsis more than late onset sepsis. So most common pathogens were gram-negative bacilli causing both early-onset septicemia and late onset sepsis, as well as most common pathogenic organisms were *E. coli*, followed both *Klebsiella* and *Pseudomonas* species. Socio demographic characteristics play important role in neonatal septicemia.

Keywords: Risk factors, Neonatal bacterial septicemia, Al-Elwiya maternity teaching hospital, Iraq.

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Introduction

Neonatal Septicemia (NNS) (both early and late onset sepsis) is an important common cause of mortality and morbidity among Iraqi neonates, the incidence of neonatal septicemia is 1-4 per 1000 live births in developed countries while in developing countries, the incidence of neonatal septicemia is about 3.5-4.3 cases per 1000 live births [1,2]. Newborns receiving care in the Neonatal Intensive Care Unit (NICU) are at increasing risk of hospital acquired infections, which is the most important cause of morbidity and mortality among hospitalized newborns [3].

Neonatal septicemia was defined as the pure growth of a single potentially pathogenic organism from the blood of a baby who was clinically septic according to defined criteria [4,5]. The neonatal deaths in Asia account for over 60% of the estimated global total of neonatal deaths; however, the average rates are

lower, mainly because of the high fertility rate and large population [6].

Neonatal infection is a clinical syndrome found in infants who are 28 days or younger and manifested by systemic signs of infection and isolation of a bacterial pathogen from the bloodstream [7].

The pathogens responsible of neonatal septicemia has also changed dramatically, since the mid-20th century the infectious agents that cause neonatal septicemia have changed from *Escherichia coli* and *Staphylococcus aureus* which were the most common bacterial pathogens among neonates in the United States for decades to Group B *Streptococcus* (GBS) as the most common gram-positive organism that caused early-onset septicemia [8].

Materials and Methods

The study was conducted in the Neonatal Care Unit (NCU) at Al-Elwiya maternity teaching hospital, a total of (50) neonate admitted to NICU during the period January 2021 to June 2021. The case records were reviewed and information regarding birth weight of the neonate, gestational age, and medical history of the mother, bacterial isolate isolated from newborn and management procedures were collected. Blood cultures were used to establish the diagnosis of bacterial infection as well as (25) control group without neonatal septicemia (healthy).

Statistical analysis

The data analyzed using Statistical Package for Social Sciences (SPSS) version 22. The data presented as mean, standard

deviation and ranges. P value less than 0.05 was considered statistically significant.

Results

The total number of newborns who were included in the study was 50 were diagnosed as septicemia (cases) and the other 25 without neonatal septicemia (control). Table 1 showed 30 (60%) males and 20 (40%) females, so about 31 (62%) in age (>7) day compare to age group (7-28 and 28 ≤) day as (22%, 16%) respectively, so the early onset Sepsis (58%) more than late onset sepsis (42%).

Neonatal variables	Study group		Control group	
	No. (50)	%	No. (25)	%
Gender				
Male	30	60	15	60
Female	20	40	10	40
Age (day)				
>7	31	62	10	40
Jul-28	11	22	10	40
28 ≤	8	16	5	20
Classification of sepsis				
Early onset sepsis	29	58	0	0
Late onset sepsis	21	42	0	0

Table 1. Distribution of neonatal septicemia according to gender, age and classification of septicemia.

The most common pathogens were gram negative bacilli causing both early onset septicemia and late onset sepsis as

percentage (28%, 34%) respectively compare to gram positive bacteria (30%, 8%), these results are shown in Table 2.

Name of bacterial isolate	No. of early onset sepsis	No. of late onset sepsis	Total
	No. (%)	No. (%)	No. (%)
Gram-negative bacteria	14 (28)	17 (34)	31 (62)
Gram-positive bacteria	15 (30)	4 (8)	19 (38)
Total	29 (58)	21 (42)	50 (100)

Table 2. Distribution of bacterial isolate isolated from neonatal septicemia as early and late onset sepsis according to gram stain.

The most common pathogenic organisms were *E. coli* (13 cases–26%), both *Klebsiella* and *Pseudomonas* species 7 cases (14%), *Staphylococcus epidermidis* (11 cases or 22%),

Staphylococcus hemolyticus 6 cases (12%), as well as *Enterococcus* species 3 cases (6%) in both early and late onset neonatal septicemia.

Name of bacterial isolate	No. of early onset sepsis (29)	No. of late onset sepsis (21)	Total
	No. (%)	No. (%)	No. (%)
<i>E. Coli</i>	5(10)	8(16)	13(26)
<i>Klebsiella pneumonia</i>	3(6)	4(8)	7(14)
<i>Pseudomonas species</i>	3(6)	4(8)	7(14)
<i>Acinetobacter cloaca</i>	1(2)	0(0)	1(2)
<i>Acinetobacterbaumannii</i>	1(2)	1(2)	2(4)
<i>Citrobacter species</i>	1(2)	0(0)	1(2)
Total of gram-negative bacteria	14(28)	17(34)	31(62)
<i>Staphylococcus epidermedis</i>	11(22)	0(0)	11(22)
<i>Staphylococcus hemolyticus</i>	3(6)	3(6)	6(12)
<i>Enterococcus species</i>	1(2)	1(2)	2(4)
Total of gram-positive bacteria	15(30)	4(8)	19(38)
Total	29(58)	21(42)	50(100)

Table 3. Types of bacterial isolate in early and late onset neonatal septicemia.

Results in Table 4 showed, 36 cases (72%) were delivered at hospital and 14 (28%) at home, about to residency area urban was 31 cases (62%) and 29 cases (58%) rural, also education of mothers as primary school (27%, 54%) compare to control

(11%, 44%) and secondary school as (8%, 16%) compare to control (10%, 40%), whilst the mother as housewife and employer as (44%, 40)% respectively compare to control.

Sociodemographic characteristics	Study group		Control group	
	No.(50)	%	No.(25)	%
Place of delivery				
Hospital	36	72	17	68
Home	14	28	8	32
Residence				
Urban	31	62	19	76
Rural	29	58	6	24
Education				
Illiteracy	10	20	2	8
Primary school	27	54	11	44
Secondary school	8	16	10	40
Higher education	5	10	2	8
Occupation				
Housewife	22	44	10	40
Employer	20	40	10	40
Student	8	16	5	20

Table 4. Relationship between sociodemographic characteristics and neonatal septicemia.

Discussion

In Current study, males were found to have a higher incidence of septicemia compared to female. Other researchers in Iraq [9], Nigeria [10], Ethiopia [11], reported similar findings. Whereas Omoregie et al. found no significant sex difference in

the incidence of bacterial septicemia [12]. The most common pathogens were gram negative bacilli causing both early-onset septicemia and late onset sepsis as percentage (28%, 34%) respectively compare to gram positive bacteria (30%, 8%) Gram negative bacteria is more common in EOS and LOS with

predominant of *E. coli* in two categories [13]. Similar results were obtained by many previous studies in Dubai [14] (Koutouby), Saudi Arabia [15] and Mexico [16]. All these studies showed a higher incidence of gram negative microorganisms among neonates with septicemia who died compared to those who survived. Revealed that Gram negative organism is most common and represented by *E. coli*, *Klebsiella*, *Salmonella* and *Pseudomonas* [17]. While Gram positive bacteria, CoNS, *Staph. aureus*, *Strep. pyogenes* and *Strep. pneumoniae* are most commonly isolated [18].

The source of infection for EOS is highly associated with the organisms that are carried in the maternal genital tract leading to vertical transmission, while LOS is typically caused by either nosocomial (hospital-acquired) or community-acquired sources [19]. The most common pathogenic organisms were *E. coli* 13 cases (26%), both *Klebsiella* and *Pseudomonas species* 7 cases (14%), in Baghdad teaching hospital/medical city, Ibraheem, 2011 was found (similar to current study) that *E. coli* was the most common bacteria isolated in 19 (23.7%), followed by *Klebsiella pneumoniae* 16 (20%) [20].

Results of Hoffman explain the organisms most frequently involved in early-onset neonatal septicemia of term and preterm infants together are GBS and *Escherichia coli*, which account for approximately 70% of infections combined. Additional pathogens to consider, which account for the remaining minority of cases, are other streptococci [21]. The most common pathogen reported causing early onset sepsis were gram-negative bacilli responsible for 54% of early septicemia. Coagulase-negative *Staphylococcus* was the next most common, either due to rapid early postnatal acquisition of the organism or as blood culture contaminants followed by *Staphylococcus aureus*. This pattern of organisms is similar to that observed by other investigators [22-24]. The mortality was higher in neonates whose blood culture, as well as the education mothers, housewife and rural of residency area were more prone to septicemia than other neonates [25,26].

Conclusion

Males with septicemia more than females, so about 31 (62%) in age (>7) day compare to age group (7-28 and 28 ≤) day as (62%, 22%) respectively. Early onset sepsis more than late onset sepsis. The most common pathogens were gram negative bacilli causing both early-onset septicemia and late onset sepsis. The most common pathogenic organisms were *E. coli*, followed both *Klebsiella* and *Pseudomonas species*. Socio demographic characteristics play important role in neonatal septicemia.

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