

Relationship between Neonatal septicemia and birth weight

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Summary:

Background: Neonatal Septicemia (NNS) is generalized microbial symptomatic infection during the first 28 days of life. It's the most serious complication in Neonatal Intensive Care Units (NICU) that demand urgent diagnosis and accurate treatment.

Objective: To reveal the relationship of neonatal septicemia with birth weight (one of the neonatal risk factors).

Patients and Methods: Blood sample was obtained from 76 neonates aged 1 hour-28 days who were diagnosed clinically (poor feeding, respiratory distress, fever, hypothermia, gastrointestinal and/or central nervous system symptoms) and bacteriologically to have neonatal septicemia.

Results: One of the most important neonatal factor predisposing to infection is low birth weight, significant positive culture results were found among the group with birth weight 0.9–2 Kg. Gram negative bacteria constituted 71% of the total isolates.

Conclusion: The low birth weight infants were at high risk to neonatal Septicemia.

Keywords: Neonatal septicemia (NNS), birth weight.

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Introduction:

Neonatal septicemia (NNS) is the term used to describe any systemic bacterial infection documented by a positive blood culture in the first month of life (1). Neonatal septicemia remains one of the important causes of mortality and morbidity despite considerable progress in hygiene, introduction of new and potent antimicrobial agents and advanced measures for diagnosis and treatment. Up to 10% of infants have infections in the first month of life which are responsible for 30-50% of total neonatal deaths in developing countries. (2). Etiological agents of neonatal septicemia are bacteria, fungi (mainly candida), viruses and rarely protozoa. In numerous studies, certain predisposing factors related to pregnancy, delivery, as well as neonatal diseases has been identified as important causes of sepsis in the newly born infants such as prematurity, prolonged rupture of amniotic membrane, maternal fever and low birth weight neonates. For many years attention has also been drawn to the risk of cross infection in Neonatal Intensive Care Unit (nosocomial infection) (3, 4). However, the clinical diagnosis of neonatal septicemia is difficult in many situations as it presents with non-specific symptoms and signs (4). Thus microbiologic blood culture results continue to be considered the gold standard for diagnosis of bacterial sepsis (5,6). Neonatal sepsis can be classified into two relatively distinct illnesses based on the postnatal age at onset. Early-onset sepsis occurs in the first 7 days of life, is usually fulminant and multisystemic infection; and has

a higher case fatality rate than late-onset sepsis (7-28 days of life). Late-onset sepsis is usually more insidious but may have an acute onset (1).

Bacterial pathogens of neonatal septicemia may vary from one country to another and within a country from one hospital or region to another. These organisms may even vary at different times within the same place (7). In developed countries Group B streptococcus (GBS), *E. coli* and *Listeria monocytogenes* are the most common causes of neonatal sepsis, however, in developing countries, these bacteria are replaced by gram-negative bacilli, *Coagulase negative staphylococcus* (CONS) and others. Over the last two decades most of the organisms have developed increased drug resistance and management of the patients is becoming a major problem. Identification of the etiology is important since it can induce a change in management policy. For effective management of neonatal septicemia with appropriate antibiotics that would minimize the risk of severe morbidity and mortality besides reducing the emergence of multi-drug resistant organisms by rational antibiotic use, study of bacteriological profile and their antibiotic sensitivity pattern plays a significant role (1, 7, and 8).

Patients and Methods:

The study was conducted in the Neonatal Intensive Care Units of Children Welfare Teaching Hospital. Seventy-six neonates were selected to be included in the study, Fifty-eight (76.3%) neonates with septicemia weighed equal or

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less than 2500 gm, while eighteen (23.7%) neonates weighed more than 2500 gm. All the selected neonates had one or more signs of sepsis such as lethargy, poor feeding, abdominal distension, respiratory distress, instability in temperature, pathological jaundice, convulsions, chills, vomiting, fever, malaise, hypothermia, toxicity and eventually the extreme form being-shock (9). Approximately One to 5ml blood (according to the condition of the neonate) were aspirated from each neonate, and divided into two parts; the first part for aerobic blood culture bottle (brain heart infusion), and they remain blood was inoculated in anaerobic blood culture bottle (thioglycolate). Few drops of primary culture were subcultured into secondary culture media blood agar, chocolate agar and MacConkeys agar, then the media were inspected for the presence of bacterial growth. The isolated bacteria were defined by colonial morphology, Gram stain reaction, biochemical reactions and confirmed by API-20E biotyping (API 20E system)(10, 11).

Statistical analysis:

Statistical tables including observed frequencies with their percentages. The summary statistic of the readings distribution (mean, median).

Results:

Eleven different organisms were responsible for septicemia in neonates during the present study period. There were 76 isolates recovered from neonates who were less than 30 days of age. Gram-negative bacilli constituted the largest number (71%) of the total isolates. Table (1) shows that 58(76.3%) neonates with septicemia weighed equal or less than 2500 gm, while 18(23.7%) neonates weighed more than 2500 gm. The median was (2100 gm) and mean was (2087 gm). Table (2) shows that (26.7%) of neonates weighed less than 2000 gm were infected with *K. pneumoniae*, (25%) of neonates weighed 2000-2500 gm were infected with *E. coli*, while (33.3%) of neonates weighed more than 2500 gm were infected with each of *K. pneumoniae* and *S. aureus*.

Table (1): Distribution of neonates' birth weight (in grams) in 76 neonatal septicemia cases:

Birth weight (gm)	No.(%)
< 2000	30(39.5)
2000 - 2500	28(36.8)
> 2500	18(23.7)
Total	76(100)
Median = 2100gm	
Mean = 2087gm	

Table (2): Distribution of blood culture microorganisms causing neonatal septicemia in relation to birth weight

Microorganisms	Neonates birth weight (gm)			Total
	<2000	2000-2500	>2500	
	No.(%)	No. (%)	No. (%)	
<i>Klebsiella pneumonia</i>	8(26.7)	4(14.3)	6(33.3)	18
<i>Staphylococcus aureus</i>	4(13.3)	6(21.4)	6(33.3)	16
<i>Escherichia coli</i>	3(10)	7(25)	0(0)	10
<i>Enterobacter cloacae</i>	3(10)	3(10.7)	2(11.1)	8
<i>Pseudomonas aeruginosa</i>	2(6.7)	4(14.3)	1(5.6)	7
<i>Staphylococcus epidermidis</i>	2(6.7)	1(3.6)	1(5.6)	4
<i>Serratia marcescens</i>	2(6.7)	2(7.1)	0(0)	4
<i>Enterobacter aerogenes</i>	1(3.3)	1(3.6)	1(5.6)	3
Group- B-beta hemolytic streptococcus (streptococcus agalactiae)	2(6.7)	0(0)	0(0)	2
<i>Acinetobacter baumannii</i>	1(3.3)	0(0)	1(5.6)	2
<i>Citrobacter koseri</i>	2(6.7)	0(0)	0(0)	2
Total	30(100)	28(100)	18(100)	76

Discussion:

Gram negative bacilli were the most common organisms responsible for neonatal septicemia (71%), this result compatible with Ahmed et. al., (2002)(2) who reported that increased colonization with gram-negative organisms, probably due to long stay in NICU (nosocomial infection). In our study table(1) shows that with decreasing weight; there are more numbers of neonates with septicemia. This result is compatible with other reports from intensive care units by Tallur et. al.,(2000) and Makhoul et. al.,(2000) (12,13) who were indicated that the most important neonatal factor predisposing to infection is low birth weight; the lower the birth weight, the greater the susceptibility of the newborn to septicemia by 3-10 fold, as such patients were expected to be more debilitated and their immunity could be immature. The mean of the present study is 2087 gm, this result nearly coincide with Abida Malik et. al., (2001) (14) who reported that the mean of birth weight among neonates infected with septicemia was 2060 gm. It was observed from table (2) that *K. pneumoniae* was the most frequent microorganism infecting neonates of <2000 gm weight [8(26.7%)] as well as >2500 gm [6(33.3%)]. *S. aureus* had the same frequency of

K.pneumoniae in infecting normal birth weights [6(33.3%)]. However a similar number of neonates of 2000-2500 gm were infected with S. aureus too [6(21.4%)], also it infected low birth weight neonates <2000 gm weight [4(13.3%)]. Shitayeet. al.,(2010) (15) reported that The most common isolated organisms from low birth weight neonates were K.pneumoniae (39.2%) and S. aureus (22.2%). E. coli was frequently isolated from <2000 gm weight [3(10%)] as well as 2000-2500 gm [7(25%)] , whereas P. aeruginosa isolates were [2(6.7%)], [4(14.3%)] respectively. S. epidermidis infections in <2000 gm births was in a ratio 2:1 to other weights. Tallureet. al., (2000), Movahedianet. al.,(2006) and Al-Shamahyet. al.,(2012) (12,16,11) reported that E. coli, S. epidermidis and P. aeruginosa infected low weight births more frequently, that related to their low virulency and invasiveness.

Conclusions:

Gram negative bacteria were the most common organisms isolated from septicemic neonates in our study mainly K. pneumoniae, Enterobacter species, E. coli, P. aeruginosa, they are a significant cause of mortality and morbidity in the newborn, particularly in very low birth weight infants. Moreover there were high percentages of S. aureus isolates. Infants with low birth weight were at high risk to neonatal septicemia than normal weighted infants.

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