Microbiological Profile of Neonatal Septicemia

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ABSTRACT:

BACKGROUND :

Neonatal septicemia is a major cause of morbidity and mortality in developing countries.

OBJECTIVE:

The study is to determine the prevalence , the pattern of organisms and the mortality of neonatal septicemia in a neonatal care unit.

PATIENTS AND METHODS:

All the cases of neonatal septicemia diagnosed and treated in the neonatal care unit at al-kadimiya teaching hospital for the period january-june 2010 were included in this study. The collected data were : Gender, Birth weight, Gestational age, Onset of sepsis, Place of delivery and Outcome of disease.

RESULTS:

Out of 589 newborns admitted, 73(12.4%) were confirmed cases of neonatal septicemia. The mortality from neonatal sepsis was 16.4%.Low birth weight and prematurity were independent factors associated with death (P value=0.004 and 0.020 respectively).There were 24 cases (32.9%) of early onset sepsis and 49 cases (67.1%) cases of late onset sepsis. The most common pathogens were gram- negative bacilli causing early-onset sepsis (54%) and late onset sepsis (59%). Only 6 cases out of the total 73 cases of neonatal septicemia were caused by staphylococus aureus (8.2%) . Over 50% of gram-negative bacilli are antibiotic resistant.

CONCLUSION:

The high rate of gram-negative septicemia and the antibiotic resistance to both ampicillin and gentamycin indicate that the infection was most probably nosocomial in origin.

KEYWORDS: neonatal sepsis , prevalence , pattern ,outcome.

INTRODUCTION :

In spite of great advances in antimicrobial therapy , neonatal life support measures and the early detection of risk factors, septicemia continues to be a major cause of morbidity and mortality around the world. In their 2000-2003 report , the world health organinization estimated that neonatal sepsis and pneumonia are responsible for about 1.6 million death each year, mainly in developing countries[1]. Antibiotic resistance is an important problem in resource –poor countries[2-5]. Previous studies have reported rates of hospital –acquired neonatal infections that are 3-20 times higher in developing than developed countries[3].The most common reported organisms are gram negative bacilli and staphylococcus aureus[3].Because culture-proven neonatal sepsis is associated with increased mortality rates , morbidity and prolonged hospital stays, both the human and fiscal costs of this disease are high[6].Decision about how to prevent neonatal sepsis, who and how long to treat and which antibiotic to use remain important clinical problems[6]. A very wide spectrum of organisms has been described for cases of neonatal septicemia and this spectrum is subjected to geographical alterations [7]. Moreover, the isolated organisms are often resistant to multiple antimicrobials which make the treatment difficult and grave sequele ensue[7]. The choice of antibiotics treatment for neonatal sepsis must be driven by hospital –specific guidelines based on prevalent organisms and their susceptibility patterns in the particular nursery/hospital environments[6].The aim of this study was to determine the prevalence of neonatal septicemia , the pattern of organisms and the mortality of neonatal sepsis in the neonatal care unit at al-kadimiya teaching hospital.

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PATIENTS AND METHODS:

The study was conducted in the neonatal care unit (NCU) at AL-Kadimiya teaching hospital

during january- june 2010 . All newborns admitted to the NCU with signs and symptoms suggestive of septicemia that were confirmed by a positive blood culture were enrolled in this study. Neonatal sepsis 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 [8,9], and had supportive laboratory evidence of sepsis (e.g one or more of low or high white blood cells count , Low platelet or raised serum c reactive protein).We did not request two positive blood cultures because antibiotics are usually started empirically in our care unit after only one set of blood cultures had been taken. Early onset sepsis (EOS) was defined as sepsis presenting within the first 72 hours of delivery ,while the late onset sepsis (LOS) was the infection more than 72 hours after delivery [8,10]. The following data were collected :gestational age, birthweight , gender and whether the baby was born inside the hospital or outside the hospital and then transferred to the nursery. Blood culture was taken before starting antibiotics.

After cleaning with alcohol , Povidone iodine and again Alcohol ,a specimen of 1 ml of blood was taken in a small culture media bottle containing 5 ml of the liquid broth. Each patient suspected of having septicemia received a combination of ampicillin (100mg/kg) or ampicillin/cloxacillin (200 mg /kg) and gentamycin (5 mg /kg) . This therapy was later modified according to culture and susceptibility results. Supportive measures were administered as indicated. Statistical analysis was performed using SPSS version 10.Counts with percentages were used for categorical variables , The Pearson Chi Square Test was used for categorical variables to measure outcome differences between sepsis survivors and non-survivors. A P value less than (0.05) was considered significant.

RESULTS:

During the study period , 589 newborn were admitted to the NCU , 73 (12.4%) were confirmed cases of neonatal septicemia . The baseline characteristics of the(73) patients is shown in table (1). There were 44(60.3%) males and 29 (39.7%) females , 27 (37%) preterm and 46 (63%) term infants . Of the 73 cases , 33 (45.2%) were less than 2500 gm and 44 (45.8%) were more than 2500gm ,24 cases of (32.9%) of early onset sepsis and 49 (67.1%) of late onset sepsis. 59 cases (80.8%)were delivered at hospital and 14 (19.2%) at home .Twelve neonates died as a direct result of gram-negative septicemia (4 from early onset sepsis and 8 from late onset sepsis) resulting in an overall mortality of (16.4%). Birth weight of less than 2500 gm and gestational age less than 37 weeks were found to be significantly associated with death (p value =0.004 and 0.020 respectively) as in table (2). The organisms causing early onset sepsis are given in table (3). Gram negative bacilli were the most common organisms causing (13) out of (24) cases of early onset sepsis (54%), sensitivities were reported for (12)cases of gram-negative bacilli of early onset sepsis as shown in table (4), Six organisms (50%) were resistant to either ampicillin or gentamycin , Four organisms (33.3%) were resistant to both antibiotics and two organisms (16.7%) were sensitive to both ampicillin and gentamycin. There were (11) cases (46%) of early onset sepsis in which gram-positive organisms were isolated. Seven cases were reported to be due to coagulase-negative Staphyloccocus but we were unable to exclude that they may have been contaminants . Four organisms were due to Staphyloccocus. The organisms causing late onset sepsis are shown in table(5). Gram-negative bacilli were the most common organisms causing (29) out of (49) cases of late onset sepsis (59%). The most common gram-negative bacillus was E.coli (13) cases followed by Pseudomonas (11) cases and Enterobacter (3) cases. Sensitivities were reported for (20) gram-negative organisms as shown in table (6) . Four organisms (20%) were sensitive to both ampicillin and gentamycin , Six organisms (30%) were resistant to either ampicillin or gentamycin and Ten organisms (50%) were resistant to both antibiotics. There were (20) cases (41%) of late onset sepsis in which gram-positive organisms were isolated . Coagulase-negative Staphylococcus was the single most common isolate causing (18) cases of gram-positive sepsis and only two cases were due to Staphylococcus aureus.

Table 1: Baseline characteristics of enrolled patients (N=73).

Parameter	No.	%
Sex		
Male	44	60.3
Female	29	39.7
Gestational age		
< 37 weeks	27	37
> 37 weeks	46	63
Birthweight		
< 2500 gm	33	45.2
> 2500 gm	40	54.8
Onset of sepsis		
Early onset sepsis	24	32.9
Late onset sepsis	49	67.1
Place of delivery		
Hospital	59	80.8
Home	14	19.2
Outcome		
Died	12	16.4
Survived	61	83.6

N=total number of patients infected with organisms

Table 2: Univariate analysis for risk factors associated with death.

Variable	Survivors N=61	Nonsurvivors N=12	P value
	No.(%)	No.(%)	
Birthweight <2500gm	23 (37.7)	10 (83.3)	0.004
Gestational age < 37 weeks	19 (31.1)	8 (66.6)	0.020
Male	36 (59)	8 (66.6)	0.621

Table 3:Organisms causing early onset sepsis (N=24) .

Organisms	No.
Gram-negative bacilli	
Enterobacter	5
klebseilla	4
E.coli	3
Other	1
Total No.(%)	13 (54)
Gram-positive cocci	
Coagulase-negative Staphyloccocus	7
Staphylococcus aureus	4
Total No.(%)	11 (46)

N=total number of organisms causing early onset sepsis

Table 4: Sensitivities of gram-negative organisms causing early onset sepsis (N=12).

			Antibiotics		
Organisms	A(S)G(S)	A(R)	G(R)	A(R)G(R)	Total
Enterobacter	1	2	0	2	5
Klebsiella	0	1	1	2	4
E.coli	1	0	2	0	3
Total No.(%)	2(16.7)	3(25)	3(25)	4(33.3)	12(100)

A=ampicillin, G=gentamycin , S=sensitive , R=resistant ,N=total number of organisms with measured sensitivities

Table 5: Organisms causing late onset sepsis (N=49).

organisms	No.
Gram-negative bacilli	
E.coli	13
Pseudomonas	11
Enterobacter	3
Klebsiella	2
Total No.(%)	29 (59)
Gram-positive cocci	
Coagulase-negative Staphylococcus	18
Staphylococcus aureus	2
Total No.(%)	20 (41)

N=total number of organisms cauing late onset sepsis

Table 6: Sensitivities of gram-negative organisms causing late onset sepsis (N=20).

			Antibiotics		
Organisms	A(S)G(S)	A(R)	G(R)	A(R)G(R)	Total
E.coli	3	2	0	3	8
Pseudomonas	0	2	1	4	7
Enterobacter	1	0	0	2	3
Klebsiella	0	0	1	1	2
Total No.(%)	4(20)	4(20)	2(10)	10(50)	20(100)

A=ampicillin, G=gentamycin , S=sensitive , R=resistant , N=total number of organisms with measured sensitivities

DISCUSSION:

The prevalence of neonatal septicemia varies with considerable fluctuation over time and geographical and even from hospital to hospital. In this study, the finding that 12.4% of neonates admitted to the neonatal care unit had bacterial infection is similar to the reported septicemia at other teaching hospital in Baghdad (15.5%) in 2005 [11] and (9.3%) in 2006[12]. However, other workers reported much higher rates (36-55%)[13,14] in other developing countries and lower rates (1-5 per 1000 live births) in developed countries[15]. These variations may be related to rates of prenatal care ,prematurity and low birth weight , conduct of labor and

environmental conditions. The overall mortality figure in this study of (16.4%) is comparable to the Australian mortality figures for 1991-2 of (15%) [8] for early onset sepsis and (9%) for late onset sepsis but was lower than figures reported in various studies from India (45-58%)[16] and Nigeria (31%)[17]. These differences probably reflect suboptimal perinatal care and unhygienic umbilical cord care in the later communities. Our study found that birth weight of less than 2500 gram, and gestational age less than 37 weeks were independent factors associated with mortality. This result was similar to other reports in that low birth weight and premature babies had a higher mortality rate[9].The most common pathogen reported causing early onset sepsis were gram-negative bacilli responsible for 54% of early sepsis. 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[12,16,17,18]. In this study no group B streptococcal was reported which was similar to the results reported at other hospital in Baghdad and other developing countries[11,12,19]. In contrast ,the incidence of group B streptococci is 3.6 per 1000 live births in UK [10], and other developed countries , which have a high rate of vaginal colonization with group B streptococci [8,10,20] .Differences in vaginal colonization rates between woman in developed and developing countries are the reasons for this variation. Late onset sepsis is common in neonatal intensive care units and increases newborn mortality and morbidity[21] .In the present study , gram-negative bacilli were responsible for (59%) of late onset sepsis , followed by coagulase-negative Staphylococci , this pattern of organisms is similar to that reported by other workers [16,17,21]. As the majority of cases in this study were of late onset sepsis and were delivered in a hospital , nosocomial infection is possible. Sources of infection might include mothers , nursing staff or equipment . Strict infection control protocols and regular surveillance of the nursery care unit environment are necessary. Of the gram-negative infections for which sensitivities were reported , only (20%) of gram-negative organisms for late onset sepsis and (16.7%) of gram-negative organisms responsible for early onset sepsis were reported as being sensitive to both ampicillin and gentamycin. The rest were resistant to either antibiotic or both .This is in line with date from other studies suggesting high rates of antibiotics resistance among gram-negative bacilli [3,18,22].

CONCLUSION:

The high rates of gram-negative bacillary septicemia and the antibiotic resistance to both ampicillin and gentamycin indicate that the infection was most probably nosocomial in origin and a third generation cephalosporin should be used as an initial therapy while waiting culture results. Furthermore, our study highlights the importance of continuous surveillance of culture and sensitivity in the neonatal care unit environment.

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