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RESEARCH ARTICLE

BACTERIAL CAUSES OF NEONATAL SEPSIS, PROSPECTIVE STUDY IN NEONATAL INTENSIVE CARE UNIT IN CENTRAL TEACHING HOSPITAL FOR CHILDREN IN BAGHDAD

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ABSTRACT

Neonatal sepsis categorized as early and late onset. Early onset sepsis (EOS) occurs in the first 7 days of life with 85% occurs in the first 24 hours of life. Late onset sepsis (LOS) occurs after the first week of life and is mostly acquired from care giving environment. The study was performed to determine the incidence of pathogenic agents, risk factors and outcome of septicemia in neonates admitted to neonatal intensive care unit (NICU) in central teaching hospital for children in Baghdad governorate. A prospective study was done among 200 neonates with clinical suspicion of neonatal sepsis who were admitted in neonatal intensive care unit of central teaching hospital for children in Baghdad governorate during 4 months from 20th of August 2011 to 20th of December 2011. The causative agents have been isolated by blood culture in 15% of the neonates, late onset sepsis is more common (71%) than early onset sepsis (29%) and the predominant isolates in both early and late onset diseases were Gram negative bacteria (76.6%). *E. coli* was the commonest organism in early and late onset sepsis (23.3%), *Klebsiella* was the 2nd commonest organism specially in the late onset sepsis (20%). Overall death rate was (28%), in the early onset was (42.55%) and (25.17%) was in the late onset disease. *Pseudomonas aeroginosa* and proteus have the highest fatality (100%), while no death was recorded among pneumococcal sepsis, *E. aerogenes* and *Listeria*.

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INTRODUCTION

Neonatal sepsis categorized as early and late onset. Early onset sepsis (EOS) occurs in the first 7 days of life with 85% occurs in the first 24 hours of life. Late onset sepsis (LOS) occurs after the first week of life and is mostly acquired from care giving environment .The study was performed to determine the incidence of pathogenic agents, risk factors and outcome of septicemia in neonates admitted to neonatal intensive care unit (NICU) in central teaching hospital for children in Baghdad governorate.

Patients and Method: A prospective study was done among 200 neonates with clinical suspicion of neonatal sepsis who were admitted in neonatal intensive care unit of central teaching hospital for children in Baghdad governorate during 4 months from 20th of August 2011 to 20th of December 2011, we prepared a questionnaire paper including the name, age in days and age of starting symptoms, gender, perinatal and maternal history, a blood samples of at least 2 ml of blood were taken from peripheral vein from 2 separate sites after disinfection with 70% alcohol and povidone iodine solution and each mixed with brain-heart infusion broth then incubated at 37 C for 7 days and cultured aerobically.

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RESULTS

The causative agents have been isolated by blood culture in 15% of the neonates, late onset sepsis is more common (71%) than early onset sepsis (29%) and The predominant isolates in both early and late onset diseases were Gram negative bacteria (76.6%) . *E. coli* was the commonest organism in early and late- onset sepsis (23.3%), Klebsiella was the 2nd commonest organism specially in the late onset sepsis (20%). Overall death- rate was (28%), in the early onset was (42.55%) and (25.17%) was in the late onset disease. *Pseudomonas aeroginosa* and proteus have the highest fatality (100%), while no death was recorded among pneumococcal sepsis, E. *aerogenes* and *Listeria*.

Statistical analysis: All data were analyzed by using x^{-}- x/SD, the percentage and P value (not significant if > 0.05, significant < 0.05 and highly significant <0.001). During the 4 months period of the study 200 neonates with features of sepsis symptoms were included in the study (after excluding those with prior antibiotics therapy). The causative agents had been isolated (by blood culture) in 30 (15%) of the neonates. As shown in table (1) Preterm patients were 118 (59%) while full term patients were 82 (41%). As shown in table (2), among the total number of patients, 120 neonates were male (60%). While 80 neonates were female (40%).As shown in table (3) Prolonged

Table 1. Classification of 200 cases presented with symptoms suggestive for studied cases according to gestational age .P value > 0.06 (not significant)

Variable	No.	Percentage %
Full term	82	41%
Preterm	118	59%
Total	200	100%

Table 2. Sex distribution of cases studied

Variable	**No.**	**Percentage %**
Male	120	60 %
Female	80	40 %
Total	200	100 %

P value > 0.08 (not significant)

Table 3. Relation of prolonged rupture of amniotic membranes with neonatal sepsis

Variable	No.	Percentage %
Prolonged rupture of membrane	123	61.5 %
Not prolonged rupture of membrane	77	38.5 %

P value < 0.04 (significant).

Table 4. Classification of 200 patients with neonatal sepsis according to the age of onset of the disease and blood culture result

Patient group	Early onset (0-7) days		Late onset (8-28) days	
	No.	%	No.	%
Culture +ve	10	33.3%	20	66.6%
Culture -ve	48	28.3%	122	71.7%
Total	58	29%	142	71%

P value > 0.66 (not significant)

Table 5. Distribution of pathogenic agents of 30 culture +ve neonatal sepsis

Pathogenic agent	No.	Percentage %
Gram –ve	23	76.7%
• E.coli	11	36.7%
• Klebsiella	6	20.0%
• E.aerogenes	3	10.0%
• Proteus	2	6.6%
• Pseudomonas	1	3.3%

Pathogenic agent	**No.**	**Percentage%**
Gram +ve	7	23.3%
• Staph.	3	10.0%
• GBS	2	6.7%
• Pneumococcs	1	3.3%
• Listeria	1	3.3%
Total	30	100%

Table 6. Classification of (30) micro-organism causing sepsis according to the age of onset of the disease

Bacterial isolate	Early onset		Late onset	
	No.	%	No.	%
E.coli	4	13.3	7	23.3
Klebsiella	2	6.6	4	13.3
Staph.	0	0.0	3	10
E.aerogenes	1	3.3	2	6.6
GBS	2	6.6	0	0
Listeria	0	0	1	3.3
Proteus	1	3.3	1	3.3
Pneumococci	0	0	1	3.3
Pseudomonas	0	0	1	3.3
Total	10	33.3%	20	66.6%

P value < 0.001 (highly significant).

rupture of amniotic fluid membranes (more than 18 hours), was reported in 123/200 (61.5%). As shown in table (4) Patients have early onset disease were 58 (29%) and 142 (71%) have late onset. culture positive cases accounted for 10 (33.3%) of early disease compared to 20 (66.6%) in late onset disease. As shown in table (5) gram negative bacteria accounted for 23/30 (76.7%) while Gram positive bacteria were isolated from 7/30 (23.3%). As shown in table (6), In early onset disease *E.coli*, *Klebsiella*, staph. And GBS were the causes of 4 (13.3%), 2 (6.6%), 0(0.0%) and 2(6.6%) of cases respectively, compared to 7 (23.3%), 4 (13.3%),3(10%) and 0(0.0%) in late onset sepsis. Other individual organisms did not show statistically significant differences in proportion of culture positive cases between early and late onset.

As shown in table (7), 8 patients with late neonatal sepsis had prior hospitalization,2(25%) of late onset with *Klebsiela* sepsis, 2 (25%) with *E. aerogenes* sepsis and 3 (37.5%) with *E.coli* sepsis and one with staph. As shown in table (8) overall death among the studied patients was 56/200 (28%) in culture positive group, it was 4/10 (40%) in early onset and 10/20 (50%) in late onset sepsis, while among culture negative group 16/48 (33.33%) of early onset and 26/122 (21.31%) of late onset sepsis. The total number of death was 14/30, individual case fatality rate for different pathogenic agents was varied greatly ranging from 100% in case of Pseudomonas and proteus in late onset sepsis and GBS in early onset sepsis to zero in case of Pneumococcal, *E.aerogenes* and *listeria* sepsis. *E.coli* and *Klebsiella* are the leading fatal pathogens in early onset sepsis, with mortality of 2/4 (50%),1/2 (50%) respectively compared to Staph, *Klebsiella*, and *E. coli* in late onsetsepsis,2/3(66.6%),2/4 (50%) and 3/7 (42.8%) respectively as shown in table (9).

DISCUSSION

Neonatal sepsis, inspite of considerable progress in hygiene, introduction of newer effective antimicrobial agents and advanced technique in early diagnosis and treatment, remain one of the most important causes of mortality in this age group (Siegel and McCracken, 2005). The study showed that male babies are affected more frequently (60%) than female (male: female is 3:2), this result is similar to the studies done by Bennet (61%) and Samanci (58%) (Bennet and Eriksson, 2003; Samanci*etal.,* 1997). Premature rupture of amniotic membranes had been reported frequently in neonates with early onset and late onset sepsis (61.5%), such finding seems compatible data reported by Gladstone (1990-1994). Early onset sepses have occurred in 58 (29%) of cases, a figure is compatible with that reported by David J. in London (29.25%). However it is lower than data reported by Sanghavi in Australia (49%) and that reported by Al-Harthi (2000), at Saudi Arabia (36%). Gram – ve bacteria were the predominant isolate, both in early and late onset sepsis 23 (76.6%) as that reported by Tosson and Speer in Egypt {Gram-negative organisms were the predominant pathogens in Libya, Egypt, Jordan, and Iraq (65-90% of all sepsis cases)}. Other Gram ¯ve bacteria, like *Pseudomonas aeroginosa* appears as uncommon cause of sepsis with 1 case (3.3%) as a late onset disease, such incidence is lower than that reported by Al-Harthi at Saudi Arabia (11.47%) Al-Harthi (2000), and Gladstone I.M. in London (7.0%) (Gladstone, 1990-1994). Such variation in Pseudomonas sepsis incidence reflect the differences in the causative agents of nosocomial infection at different ICU, at our SCBU although Pseudomonas appears as uncommon cause of neonatal sepsis, it may need adequate further evaluation and follow up to control its spread, specially in view of its high mortality (Koutouby and Habibullah, 1995).In this study, staphylococcal infection was reported in 3 (10%), 2 cases as *S.aureus* and the other case as *S. epidermidis*. The main factor associated with staph. Infection was prolonged hospitalization. This incidence was nearly compatible with that reported by Mohammed in London (4.02%) Schat *et al.* (2000), while it is low in comparison to that reported by Koutouby and Habibullah (1995). in UAE (17 per cent %). such low incidence, mostly due to exclusion of all babies who were received prior antibiotics, or due to lack of use of central vascular line for total parentral nutrition in our unit .Over all death rate of 56 (28%) in this study is high in comparison to that reported by Battistio in USA (18.8%) and Schat in Stockholm (22%), such high mortality in our unit may

be related to the infectious process and other factors like most of infected neonates in our unit were preterm and transferred to us from other district hospitals, so their diagnosis will be late. Other important factor is that most of them were presentedwith serious complications (apnea, DIC, intra ventricular hemorrhage, such neonates died shortly after their admission inspite of usage of the available treatment and supportive measures.

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