

Neonatal Sepsis: An Etiological Study

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Abstract

Objective: A periodic review of neonatal sepsis to assess any change in the infecting organism.

Method: A prospective study was conducted at FIWIC and ASH, Karachi. The babies suspected to have or developed sepsis any time during hospitalization were investigated to establish the diagnosis and isolate the causative organism. Blood culture was taken at the time of admission or when sepsis "as suspected."

Results: Out of 109 episodes of blood culture proven sepsis 68 presented as early onset (within 48 hours of birth) and 41 as late onset sepsis (after 48 hours of birth). In early onset group Gram -ve and Gram +ve organisms were almost equal, i.e. 33 and 35 respectively. Among the gram -ve organism most of the cases were due to Klebsiella sp, and Enterococcus was the commonest Gram +ve organism. In late onset group majority of infections were due to gram +ve organisms, i.e. 30 out of 41. Staph. aureus and Staph. epidermidis were commonest. The organisms were least sensitive to Ampicillin (<20%) and highly sensitive to Amikacin (90% to 100%), Cefotaxime was also seen as a good choice of antibiotic with sensitivity of (84% - 89%).

Conclusion: Gram +ve organisms were the main cause of neonatal sepsis. Klebsiella sp. is still the commonest organism causing early onset sepsis. The data must be periodically reviewed and antibiotic policy revised accordingly (JPMA 50:91,2000).

Introduction

Sepsis is the leading cause of mortality and morbidity in neonates¹. Organisms causing sepsis vary from place to place and they also keep changing with time in the same area.

Developed countries witnessed a gradual change in the bacterial spectrum causing neonatal sepsis, from Gram -ve dominance & Group B Streptococci in 1960s to a total Gram +ve dominance in the late 1970s^{2,3}. Similar changes in the pattern of neonatal sepsis have been observed in other parts of the world⁴, Group B streptococci are uncommon pathogens in many areas of the world. Some unusual organisms are seen in other areas e.g. Listeria Monocytogenes predominate in Spain and some other countries⁵. Gram -ve Enteric bacilli especially Salmonella species is common in Latin America and S. Agalactiae in Israel^{6,7}.

Information available from Pakistan is limited. Studies carried out in Karachi during mid and late "1980s" show a striking high preponderance of Gram -ve organisms (70-75%) causing neonatal sepsis. Group B Streptococcus was not reported⁸⁻¹⁰,

A periodic review of neonatal sepsis is important as it may help in detecting any change in the infecting organism. A prospective study was done at two different hospitals of Karachi to determine the Microbiological Etiology of Neonatal Sepsis.

Material and Methods

The study was conducted from March 1992 to September 1994 at Habib Medical Center (HMC) and Abbasi Shaheed Hospital (ASH). Habib Medical Center is a private Hospital taking care of middle income group population, it is situated in District Central of Karachi. In addition to an Obstetric unit

with approx. 600 deliveries per year, it has a Neonatal Intensive Care Unit (NICU) with facility of Ventilation. This NICU takes care of both babies born within the hospital and outside referral from other Maternity units in Karachi. Abbasi Shaheed Hospital is a public hospital run under Karachi Metropolitan Corporation and takes care of poor population of the city. Though it has a Neonatal Unit but does not have ventilation facility. Patients of both the hospitals were included in the study to get a wider spectrum of socioeconomic status.

All the neonates admitted to either Neonatal Unit at Abbasi Shaheed Hospital (ASH) or NECU at Habib Medical Center were enrolled for the study. A detailed history including time of rupture of membranes, instrumental delivery or maternal pyrexia at the time of delivery was obtained from the parents or attendants of the babies. These babies were examined daily for the signs of sepsis such as a poor feeding, lethargy, fever and respiratory distress. The babies suspected to have or develop sepsis any time during hospitalization were investigated to establish the diagnosis and isolate the causative organisms. A total of 267 babies were investigated, 156 from HMC and 111 from ASH. Two milliliters of blood was obtained from a peripheral vein using aseptic technique and sent to Habib Medical Center laboratory for culture and sensitivity. Liquid Thioglycolate USP (OXOID) media was used for blood culture and 2 ml of blood was added to 20 ml of medium. Inoculated bottles were incubated at thirty-six degrees centigrade for 7 days and examined for growth.

The results obtained used for the appropriate management of these cases, were computerized and analyzed with the help of computer program EPI-info version 6.02 from CDD/ WHO.

Results

Blood culture was positive in a total of 120 babies, of which 11 were excluded from the study due to clinical improvement within less than 24 hours as the Organisms isolated, were presumed to be contaminant. No growth was obtained from other body fluids such as CSF or urine. Hence total of 109 cases were included into the study and analyzed. Of these 69 (63%) were male and 40 (37%) were female. Thirty nine (36 %) weighed more than 2.5 kg and 68 (64%) <2.5 kg. Mean gestational age was 36 ± 4 weeks. Twenty two (20%) babies were born in the hospital (all of them in HMC) and rest were admitted from outside. History of early ruptured membranes, instrumental delivery or maternal pyrexia was present in 28 (26%) of the babies.

The results of blood culture are shown in the table.

Table. Microorganisms isolated from neonates with clinical signs of sepsis.

Bacteria	Early onset sepsis	Late onset sepsis	Total	OR (95%CI)	p-value
	N (%)	N (%)	N (%)		
Gram +ve	35 (32)	30 (27)	60 (65)	0.39 (0.1-9.7)	<0.04
Staph. aureus	6	12	18	4.3 (1.3-14)	<0.01
Staph. epidermidis	6	13	19		
Staph. pneumoniae	4	0	4		
BHS group B	2	0	2		
Enterococcus spp.	17 (16)	5	22	2.6 (0.9-7.7)	<0.06
Gram -ve	33 (30)	11 (10)	44	2.6 (1-6.5)	<0.04
Klebsiella	24 (22)	7	31	2.6 (0.9-7.7)	<0.06
E. Coli	4	2	6		
Pseudomonas spp	0	2	2		
Serratia spp	1	0	1		
salmonella	3	0	3		
E. Cloacae	1	0	1		

Isolates from 65 (608) babies Gram +ve organisms were more common than Gram -ve organisms. Gram -ve organisms were more commonly isolated From babies with early onset sepsis, i.e. those presenting within 48 hours of birth (OR 2.6, 95% C.I. 1-6.5). Among the Gram +ve organisms, Staph aureus, Staph epidermidis and enterococcus species were the commonest. Enterococcus species were more commonly isolated from babies with early onset sepsis (OR 2.6, 95% C.I. 0.9-7.7). Whereas Staph. aureus were more commonly isolated from babies with late onset sepsis (OR 4.3, 95% C.I. 1.3-14). Among Gram -ve organisms, Klebsiella species, E.coli and Pseudomonas were the commonest. Kiebsiclia species were more commonly isolated from babies with early onset sepsis (OR 2.6, 95 % C.I. 0.9-7.7).

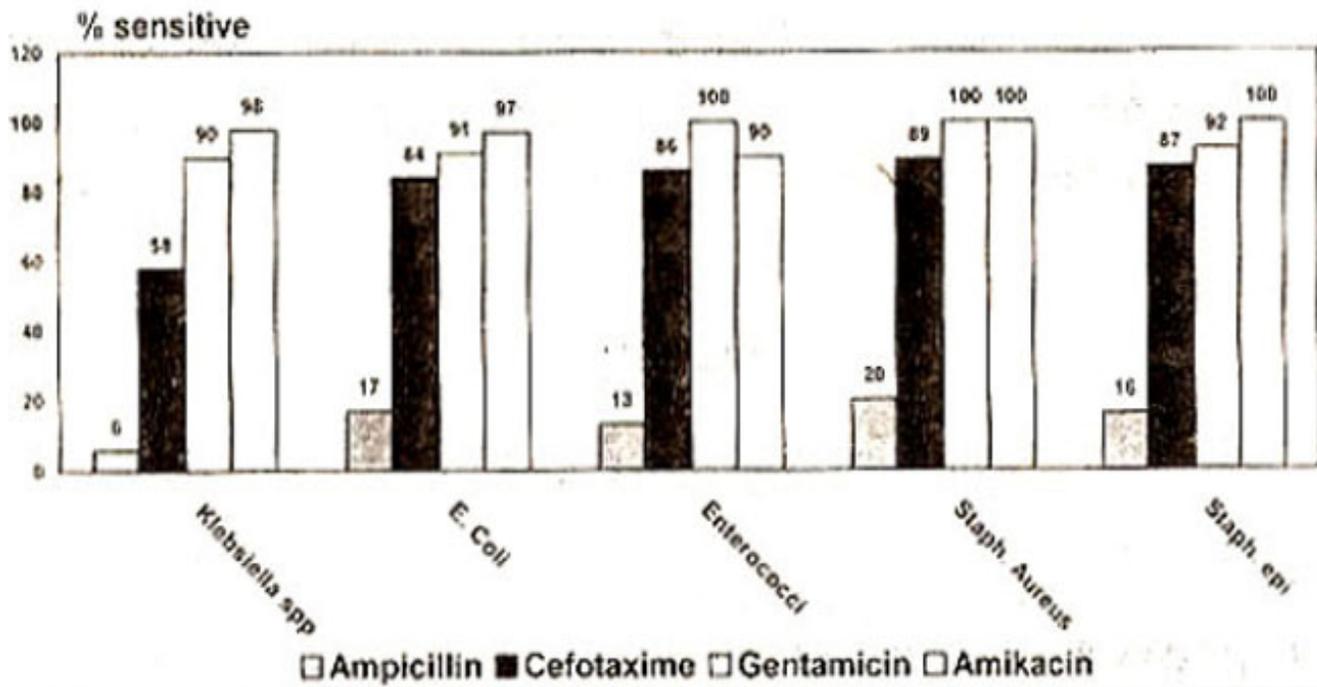


Figure. Antibiotic sensitivity of bacterial isolates from neonates with sepsis

The figure shows the antibiotic sensitivity of these organisms. The organisms were least sensitive to ampicillin (<20%) and highly sensitive to amikacin (90-100%). Cefotaxime was also seen as a good choice of antibiotic with a sensitivity of 84 to 89%.

Discussion

This study shows that Gram -ve organisms are not as common as reported in literature^{8,9}. In contrast to western data, group B streptococcus (GBS), which is one of the commonest organism with a very high mortality¹⁰, was not isolated in any study carried out in Pakistan⁸⁻¹⁰ except one¹⁵, when the incidence of GBS was reported to be 18%.

In this study the frequency of Gram -ve and Gram +ve organisms was almost equal in early onset sepsis but in late onset sepsis the organisms were predominantly Gram -ve. There was no difference in the pattern of isolates among inborn and outborn babies.

Among Gram -ve organisms, most of the cases of early sepsis were due to Klebsiella Sp. In fact Klebsiella alone was responsible for 30 % of total cases. Among Gram -ve organisms, Enterococcus was responsible for almost 50% of cases of early sepsis but significant number of Staph aureus and Staph. epidermidis were also isolated. In late onset sepsis majority of organisms were Gram -ve, the contribution of Coagulase +ve and Coagulase -ve Staphylococcus being 25 out of 30. i.e., 83%.

This change in pattern of organisms causing sepsis from total Gram -ve to predominantly Gram ±ve is due to prolonged and improved intensive care facilities that are now available in Karachi, invasive procedures, long lines/Central Catheters and Parenteral nutrition. Sepsis from -V. cannula can occur even if there is no phlebitis at the infusion site when the risk is 2-5%, with parenteral nutrition the risk is 6-25%¹⁶. The opportunistic organisms most frequently isolated were Staph. epidermidis. Bacteroides and Candida^{16,17}. Staph. epidermidis is one of the principal Gram -ve organisms causing major sepsis in those receiving intravenous Lipid therapy¹⁸. A very large cohort of 7861 VLBW (401-1500 G) neonates from 12 National Institutes of Child Health and human development (NICU ID) show that

73% of infection were caused by Gram -ve organisms with coagulase -ve Staphylococci. alone accounting for 55 % of cases¹⁹. Staph. aureus is also a common and serious infection in sick babies receiving intensive care and specially those on ventilators and having umbilical artery catheter^{20,21}. Staph. epidermidis spreads more rapidly than Staph. aureus and also develops a higher level of antibiotic resistance compared to Staph. aureus²².

Enterococcus can cause serious infection in newborns. The incidence of the organisms causing sepsis has increased three folds²³. It can cause both early and late onset sepsis although it tends to be more common in older infants^{23,24}. Ampicillin is not a drug of choice for empirical use without combination with Gentamicin or Amikacin. Combination of Cefotaxime and Amikacin may even be better, The Staph. group of organism was 100% sensitive to Gentamicin. However if Staphylococcus is isolated Cloxacillin should be added.

The study shows that Gram +ve organisms are a more common cause of neonatal sepsis. Klebsiella and Enterococcus sp. are more common in early onset sepsis. Staphylococcus (coagulase -ve and coagulase -ve) are the predominant organism in late onset sepsis. Cefotaxime and Gentamicin should be empirical therapy for neonatal sepsis. The data must be periodically reviewed and antibiotic policy revised in light of the current data.

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