Volume : 2 | Issue : 9 | September 2013 • ISSN No 2277 - 8179

Research Paper

Medical Science

KEYWORDS : Bacterial Pathogens, Neonatal Septicemia

Bacteriological Study of Neonatal Septicemia

Dr. Khatri Himanshu Surendrakumar	Associate Professor, Microbiology Department, P. D. U. Govt. Medical College, Rajkot
Dr. Pattani Manish Hasmukhray	Associate Professor, Microbiology Department, P. D. U. Govt. Medical College, Rajkot
Dr. Goswami Yogeshanand Shambhupuri	Professor and Head, Microbiology Department, P. D. U. Govt. Medical College, Rajkot
Dr. Antala Sejul Kantilal	Assistant Professor, Microbiology Department, P. D. U. Govt. Medical College, Rajkot

ABSTRACT

This study is undertaken to determine bacteriological pathogens responsible for neonatal septicemia. Blood samples from 105 clinically suspected septicemia cases of neonates were collected. These cases were confirmed by blood culture examination. Antibiotic sensitivity was determined by disc diffusion technique. Out of 72 positive blood culture samples prevalence of Gram negative bacteria was 58.33 % and Gram positive bacteria was 41.66 %. Percentage of detection of Klebsiella pneumoniae was higher among Gram negative bacteria i.e. 25% and Stapphylococcus epidermidis among Gram positive bacteria i.e.20.83%. This study suggests neonatal sepsis was most common during 3-7 days of life. Cefotaxime and Amikacin combinations were found effective drugs for gram positive and gram negative bacterial pathogens.

INTRODUCTION

Neonatal Septicemia is a clinical syndrome manifested by acute invasion of micro – organisms and their active multiplication in the blood stream, that has been documented by positive blood culture during the first month of life.[1] It is one of the four leading causes of neonatal mortality in our country. Neonatal septicemia is the commonest cause of neonatal mortality in the developing countries like India[2], So prompt recognition of micro- organisms through blood culture and appropriate antimicrobial therapy with the help of other laboratory investigations and supportive care are the key determinants for positive outcome in this serious pediatric emergency. The term "neonatal septicemia" used broadly in the clinical context encompasses diagnosis of many conditions lie meningitis, pneumonia and urinary tract infection with septicemia. The clinical diagnosis is therefore only presumptive.[3] Neonates particularly those born prematurely are compromised hosts. During the first month of life, they are subjected to infections by a unique list of pathogens including coagulase positive and negative staphylococci, coliform organisms, group B streptococci. Impaired localization of normal microbial flora by these pathogens commonly lead to septicemia.[4] The fulminent nature of this illness makes it imperative to review the relative frequency of various bacteria responsible for this serious condition and also see the sensitivity pattern of such microorganisms to the currently used antibiotics so as to evolve rational methods of treatment.[5] The reported incidence of neonatal septicemia in developed countries varies from 1 to 10 per 1000 live birth. It is difficult to assess the true incidence in our country because of two reasons: first the data from community setting is not available and second even in hospitals the diagnosis is often not based on microbiological studies but on clinical grounds alone. Reported incidence of neonatal sepsis in hospital born infants in India is in range of 11.00 – 24.50 per 1000 live births.[3] Changing patterns of bacterial etiology from region to region and also from time to time has made it necessary for the microbiologist to know the present pattern of organisms at a given time so that the initiation of therapy is directed at most likely microorganisms and their sensitivities to various antibiotics. The purpose of the study is to find out the prevalence rate of microorganisms involved in causing neonatal septicemia in our hospital set up, order of frequency of predisposing factors for causing septicemia in neonates, evaluation of antibiotic susceptibility patterns of isolated organisms and to analyze the data of septicemia in relation to age and sex. Neonatal septicemia is one of the major factors contributing to the high perinatal and neonatal mortality and morbidity.[6] Hospital based Indian studies suggest that the predominant etiological agents of newborn sepsis are Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae and Staphylococcus epidermidis.[7] Coagulase negative Staphylococcus is a significant bacterial pathogen in high risk new born infants.[8] Higher incidence of neonatal septicemia is found in home deliveries and teaching hospitals as compared to deliveries in private nursing homes.[7] The gold standard method for the diagnosis of septicemia has been the isolation of bacterial pathogens from blood culture.[9] Neonatal mortality rates were observed to be 43% in 1991 and 40% in 1996 which is actually showing a decreasing trend.[10] Etiology of neonatal sepsis depends on maternal, hospital, environmental and host defense factors.[11]

MATERIALS & METHODS

This study was carried out in the Guru Gobind Singh Hospital and Shree M.P. Shah Medical College Jamnagar. One hundred and five clinically suspected cases of neonatal septicemia were studied. Blood samples were collected in whom septicemia was suspected usually before antibacterial agents were given. Blood samples were collected with disposable syringe and needle under strict asepsis. Usually samples were collected from peripheral vein when this was not feasible then it was collected from the femoral vein. Skin was painted with tincture iodine followed by spirit and allowed to dry. Then approximately 2 ml of blood was collected and immediately transferred to a 20 ml of Brain Heart Infusion (BHI) broth which was used as blood culture medium. Blood culture bottle was incubated at 37^0 C. under aerobic conditions for 18-24 hours. Subcultures were made on MacConkey's medium, Blood agar and Brain Heart Infusion Agar (BHIA) plates. Samples were declared negative only when 96 hours of incubation with daily subcultures were negative. Organisms were identified from their colony characteristics, appearance in stained smears, motility tests, sugar fermentation tests and their bio-chemical reactions. Antibiotic sensitivity was determined by disc diffusion technique.

OBSERVATIONS & RESULTS

A total of 105 blood culture samples from clinically suspected cases of neonatal septicemia were processed. Among them 72 cases were blood culture positive and 33 cases were blood culture negative.

Volume : 2 | Issue : 9 | September 2013 • ISSN No 2277 - 8179

Table–1: Bacterial isolates in relation with early and late sepsis.

Bacterial Pathogen	No. of isolates	Percentage (%)	Early sepsis < 3 days of age		Late sepsis > 3 days of age	
			No. of cases	Percentage (%)	No. of cases	Percentage (%)
Gram Negative Bacteria						
Klebsiella pneumoniae	18	25.00	3	4.16	15	20.83
Pseudomonas aeruginosa	9	12.50	2	2.77	7	9.72
Escherichia coli	7	9.72	6	8.33	1	1.38
Proteus mirabilis	4	5.55	1	1.38	3	4.16
Salmonella typhi	2	2.77	1	1.38	1	1.38
Citrobacter	2	2.77	1	1.38	1	1.38
Total	42	58.33	14	19.4	28	38.93
Gram Positive Bacteria						
Staphylococcus epidermidis	15	20.83	1	1.38	14	19.44
Staphylococcus aureus	11	15.27	2	2.77	9	12.50
Enterococci	4	5.55	2	2.77	2	2.77
Total	30	41.66	5	6.92	25	34.74

Predominant bacterial pathogen was Klebsiella pneumoniae among gram negative bacteria found in 18 isolates with the percentage of 25, whereas Staphylococcus epidermidis among gram positive bacteria found in 15 isolates with the percentage of 20.83. In late sepsis 15 isolates were Klebsiella pneumoniae with percentage of 20.83 whereas in early sepsis 6 isolates were Escherichia coli with percentage of 8.33.

Table–2: Antibiotic sensitivity pattern of Gram negative bacteria

Antibiotic Disc/Strength	Klebsiella pneumoniae		Pseudomonas aeruginosa		Escherichia coli		Proteus mirabilis		Salmonella typhi		Citrobacter	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Ampicillin/Sulbactum 20 µg	11	61.1	3	33.3	3	42.8	2	50	2	100	0	0
Co-trimoxazole 25 µg	5	27.7	0	0	2	28.5	2	50	1	50	2	100
Cefotaxime 30 µg	12	66.6	4	44.4	5	71.4	2	50	0	0	1	50
Piperacillin 100 µg	7	38.8	6	66.6	1	14.2	2	50	0	0	0	0
Chloramphenicol 30 µg	5	27.7	2	22.2	2	28.5	2	50	0	0	0	0
Ciprofloxacin 5 µg	11	61.1	2	22.2	2	28.5	2	50	1	50	1	50
Ceftizoxime 30 µg	8	44.4	2	22.2	1	14.2	2	50	1	50	1	50
Tetracycline 30 µg	6	33.3	0	0	2	28.5	2	50	0	0	0	0
Ofloxacin 5 µg	11	61.1	3	33.3	2	28.5	2	50	1	50	1	50
Gentamycin 10 µg	12	66.6	3	33.3	5	71.4	1	25	0	0	0	0
Amikacin 30 µg	11	61.1	6	66.6	6	85.7	3	75	2	100	2	100
Pefloxacin 10 µg	9	50.0	2	22.2	3	42.8	3	75	0	0	1	50

Gentamycin and Cefotaxime both were effective against Klebsiella pneumoniae in 12 isolates with 66.6 %. Amikacin and Piperacillin both were effective against Pseudomonas aeruginosa in 6 isolates with 66.6 %. Escherichia coli were sensitive to Amikacin (85.7%) Gentamycin (71.4%) and Cefotaxime (71.4%).Amikacin (75%) and Pefloxacin(75%) were effective to Proteus mirabilis. Salmonella typhi shows 100 % sensitivity to Amikacin and Ampicillin/Sulbactum.

Table–3: Antibiotic sensitivity pattern of Gram positive bacteria

Antibiotic Disc/ Strength	Staphylococcus epidermidis		Staphylococcus aureus		Enterococci	
	No.	%	No.	%	No.	%
Ampicillin/Sulbactum 20 µg	11	73.3	4	36.3	0	0
Co-trimoxazole 25 µg	3	20.0	2	18.2	0	0
Cephalexin 30 µg	1	6.6	0	0	0	0
Tetracycline 100 µg	2	13.3	2	18.2	0	0
Cefotaxime 30 µg	4	26.6	3	27.8	2	50
Ciprofloxacin 5 µg	5	33.3	2	18.2	1	25
Pefloxacin 10 µg	3	20.0	4	36.3	1	25
Ofloxacin 5 µg	3	20.0	4	36.3	1	25
Cloxacilin 1 µg	4	26.6	2	18.2	1	25
Roxythromycin 15 µg	5	33.3	2	18.2	1	25
Lincomycin 2 µg	9	60.0	1	9.1	1	25
Gentamycin 10 µg	8	53.3	6	54.5	2	50

Staphylococcus epidermidis were sensitive to Ampicillin/Sulbactum (73.3%). Gentamycin (54.5%) was effective for Staphylococcus aureus . Enterococci were sensitive to Gentamycin (50%) and Cefotaxime (50%).

DISCUSSION & CONCLUSION:

The most difficult tasks faced by neonatologist is to differentiate between septicemic and non-septicemic cases , this situation is complicated by clinical conditions like birth asphyxia, hypoglycemia, hypothermia and intracranial hemorrhage. For definite diagnosis of septicemia causative microbes are required to be isolated from blood culture which takes minimum time of 48 hours. It also provides correct guideline to institute rational antibiotic therapy. Present study is undertaken to determine antibiotic resistance and sensitivity pattern of bacterial pathogens to various antibiotics in use. Pattern of bacterial pathogens responsible for neonatal sepsis is changing depending on place, prevailing practice and time.[6] In the present study Klebsiella pneumoniae was the most frequently encountered bacterial pathogen causing neonatal sepsis. Most of the studies in India in neonatal septicemia have demonstrated maximum isolation of Gram negative bacteria, which is co-related to the present study. More than 50% of neonatal septicemia occur after the age of two days.[12] The reason for late sepsis in nursery is due to neonates who are low birth weight, premature and more expose to external instrumentation. Neonatal sepsis is twice as frequent in the male neonates as compared to female.[13] Most of the times neonatal sepsis manifest with non specific and vague clinical features like poor feeding , lethargy and pyrexia. [14] Bhakoo had observed Gentamycin as an effective drug against 80 % of the Klebsiella.[15] In present study Gentamycin and Cefotaxime effective against 66.6% of Klebsiella pneumoniae. Amikacin

and Piperacillin were effective against 66.6% of Pseudomonas aeruginosa. Gentamycin is effective for gram positive and gram negative bacterial pathogens. Escherichia coli were sensitive to Amikacin in 85.7% of isolates. Amikacin & Pefloxacin were effective in 75% of Proteus mirabilis. Staphylococcus epidermidis were sensitive to Ampicillin/Sulbactum (73.3%), Staphylococcus aureus were sensitive to Gentamycin (54.5%) and Enterococci were sensitive to Cefotaxime and Gentamycin in 50% isolates.

REFERENCE

1. Martin R. J., Fanaraff A. A. et al. Neonatal septicemia, Behrman's neonatal perinatal medicine 3rd edition (1983) 650-656. | 2. M.Singh,DeorariA.K.,PaulV.K.et al. Perinatal mortality in a hospital. Indian J.Med.1991-94(B)1-5. | 3. Vinod K. Paul et al. Neonatal sepsis, Medical emergencies in children 2nd edition1993,115-118. | 4. Kenneth M.Boyer et al. Current therapy in Padi.Infe.Dise.2nd edition259-264. | 5. O. N. Bhakoo, K. C. Aggarwal, C. Mohini, Mahajan et al. Indi. Padi. Nov. 1968, Vol. 5, 518-523. | 6. Anita Chandana, M. Nayaraj Rao, M. Shrinivas et al. Rapid diagnostic test in neonatal septicemia. Ind. Journ. Pediatrics 1988, 85, 947-953. | 7. Meharbansingh Perinatal infection care of newborn 4th edition. 1996 : 154. | 8. H. David Wilson, Hoinz F Eichenwald et al. | Sepsis neonatorum. The pedicle of N. Am. 1974. | 9. Siddharth Ramji et al. Rapid diagnosis of neonatal septicemia. Ind. Paed. 1989, 111-113. | 10. N. B. Mathur, Neonatal sepsis, Ind. Ped. Aug.-96:663. | 11. Vinod K. Paul and Meharban Singh, neonatal sepsis. Textbook on medical emergencies in children. 115-132. | 12. Boo N. Y., Chor C. Y. et al. Six year trend of neonatal septicemia in large Malayasian maternity hospital. Ped. Children health. 1994, Feb. 36. | 13. Ayengar V. Vani, S. N. Madhulika, Neonatal sepsis due to vertical transmission. Ind. J. Ped. 1991, 58, 661. | 14. G. P. Mondal, Maya Raghwan, B. Vishna et al. Neonatal septicemia among in born and out born babies in neonatal hospital. 1991. Ind. J. Ped. 58, 529-533. | 15. Bhakoo O. N. Neonatal bacterial infections at chandigadh. Ind. J. Pedi. 1980, 47, 419-424.