

Bacteriological profile of septicemia in post-neonatal age group and children at Tertiary Care Hospital, Gujarat

Hitesh Assudani¹, Jigar K. Gusani^{2,*}, Sanjay J. Mehta³

¹Assistant Professor, ²Assistant Professor, Gujarat Adani Institute of Medical Sciences, ³Professor & HOD, Dept. of Microbiology, CYSMC

***Corresponding Author:**

Email: jigar.gusani@gmail.com

Abstract

Introduction: Infections remain one of the major problems in pediatric intensive care unit and are leading cause not only of admission but also mortality in developing countries. Mortality from pediatric sepsis ranges from 9% to 35%.

Objective: To study the prevalence & bacteriological profile of septicemia in post neonatal (29 days to 1 year) age group and older children (> 1- 12 year).

Material and Methods: Venous blood was collected (2 ml in post neonatal and 5 ml in older children) and inoculation in blood culture bottle. Further processing was done by standard microbiological guidelines.

Results: In present study out of 84 clinically suspected 52 (61.90%) were males and 32 (38.10%) were females. Among 84 cases, 31 (36.90%) were post neonatal cases and 53 (63.10%) were older children. Out of 31 post neonatal cases, in 6 (19.35%) cases pathogen were isolated and among them 3 were *S.aureus* & 1(33.33%) was MRSA. Out of 53 older children, in 14 (26.42%) cases pathogen were isolated and among them 5 *S.aureus*, 3*E.coli*, 3*Klebsiella* spp. were isolated out of which 3(60%), 6 (50%) were MRSA & ESBL respectively.

Conclusion: Prevalence of septicemia is 9.83% in post neonatal age group and 22.95% in older children. Septicemia is more common in male age group. Most common clinical presentation in post neonatal age group and older children was fever of unknown origin.

Keywords: Pediatric Septicemia, Age & Gender wise distribution, Bacteriological profile, Associated factors, Clinical presentation

Introduction

Pediatric sepsis, like sepsis in adults, is generally considered to comprise of a spectrum of disorders that result from infection by bacteria, viruses, fungi, or parasites or the toxic products of these microorganisms.⁽¹⁾ Septicemia, a symptomatic bacteremia, is a common condition in children (<15 years) with a resultant high morbidity and mortality.⁽²⁾

Infections remain one of the major problems in pediatric intensive care unit and are the leading cause not only of admissions but also mortality in developing countries. Mortality from pediatric sepsis ranges from 9% to 35%.⁽¹⁾ Children with septicemia present with fever, difficulty in breathing, tachycardia, malaise, refusal of feeds or lethargy. It is a medical emergency that requires urgent rational.

Aims and Objectives

1. To identify the Prevalence of septicemia in post neonatal (29 days – 1 year) age group and older children (>1-12year)
2. To find out the age-wise, gender-wise distribution in cases of septicemia.
3. To find out common associated factors/ clinical symptoms in cases of septicemia.
4. To identify the common aerobic bacterial pathogens responsible for septicemia.

5. To determine Antibiotic susceptibility pattern of aerobic bacterial pathogens responsible for septicemia.
6. To identify Prevalence of MRSA in *S. aureus* isolates from cases of septicemia.
7. To identify Prevalence of ESBL in Gram Negative Bacilli.

Material and Methods

The study was conducted from July 2010 to August 2012 in the Department of Microbiology, at C U Shah Medical College and Hospital, Surendranagar, Gujarat.

The study was approved by Institutional Ethics Committee (Human Research). Total 84 Clinically suspected patients of sepsis from Neonatal and Pediatric intensive care unit were selected for the study.

History and Examination

A detailed history was taken and proforma was filled for each patient documenting age, sex, socioeconomic status, address, duration of illness along with type of delivery, artificial intervention, birth weight and any resuscitative procedures done.

Inclusion Criteria: Patient having respiratory distress, poor feeding, fever, hypothermia, signs of gastrointestinal or central nervous system involvement were included in this study.⁽³⁾

Exclusion Criteria: Patient with multiple congenital malformations and known chromosomal disorders.

Sample collection: venous blood was collected aseptically preferably before initiation of antibiotic therapy.

Amount of blood: For post neonatal age group: 2 ml blood was collected from peripheral vein with aseptic precaution.⁽³⁾ For older children: 5 ml of blood was collected from peripheral vein with aseptic precaution.⁽⁴⁾

It was immediately inoculated into blood culture bottles and processed as per conventional blood culture methods. Any growth of bacteria on media were identified by colony morphology, gram stain and standard biochemical tests.⁽⁴⁾

Antimicrobial susceptibility testing by disk diffusion method was performed for all isolates as per Clinical and Laboratory Standards Institute (CLSI) guidelines. MRSA screening by Cefoxitin disk & ESBL detection Screening and phenotypic confirmation tests were performed for all *E. coli*, *Klebsiella* spp. and *Proteus* spp. as per CLSI guidelines.⁽⁵⁾

Results

The study was conducted at the Department of Microbiology, C U Shah Medical College and Hospital, Surendranagar in Gujarat. Eighty four suspected cases of neonatal and pediatric septicemia of NICU and PICU (Department of Pediatrics) were included in study.

Results and observations made from the study are as follow.

Total number of patients were 84. Among them 31 were in post neonatal age group and 53 were pediatric age group. Age and gender wise distribution is shown in Table 1.

Table 1: Age and Gender Wise Distribution of all suspected cases

Age groups	Male	Percentage	Female	Percentage	Total
29 days-1 Year	19	61.29 %	12	38.71 %	31
>1-12 Years	33	62.26 %	20	37.74 %	53
	52		32		84

Table 2: Distribution as per associated factor/clinical presentation

Condition	29 Days-1 Year	>1-12 Year
Associated factors		
Preterm	03	00

Table 4: Prevalence of MRSA & ESBL

Age Groups	Total isolates	<i>S. aureus</i>	MRSA %	Gram Negative Isolates	Number of Isolates	ESBL %
Post neonates	06	03	01 (33.33 %)	<i>E.coli</i>	00	0
				<i>Klebsiella spp.</i>	00	0
>1 year to 12 year	14	05	03 (60.00 %)	<i>E.coli</i>	03	2 (66.66 %)
				<i>Klebsiella spp.</i>	03	1(33.33 %)

Low birth weight	00	00
Meconium aspiration	00	00
PROM	00	00
Perinatal asphyxia	00	00
Prolonged catheterisation	02	03
Clinical presentation		
Pneumonia	07	06
Fever With Jaundice	03	01
Fever with Neutrophilia	00	01
Fever of unknown origins	10	34
Poor feed	05	00
Respiratory distress	00	00
Fever with Neutropenia	00	00
Altered sensorium	01	08

(PROM – Premature Rupture of Membrane)

Among post neonatal age group in 6 (19.35%) cases bacteria were isolated among them 50% were gram positive and 50% were gram negative. Among older children in 14 (26.41%) cases bacteria were isolated among them 35.71% were gram positive cocci and 64.29% were gram negative bacilli.

Table 3: Organisms isolated in different age groups

Organism	29Days-1 Year (6)		>1-12 Year(14)	
	No.	%	No.	%
<i>S. aureus</i>	03	50.00%	05	35.71%
<i>E. coli</i>	00	00.00%	03	21.43%
<i>Klebsiella spp.</i>	00	00.00%	03	21.43%
<i>S. paratyphi A</i>	01	16.66%	01	07.14%
<i>Acinetobacter spp.</i>	01	16.67%	02	14.29%
Other Gram Negative bacilli	01	16.67%	00	00.00%

In present study among post neonatal age group *S. aureus* were most sensitive to Levofloxacin, Linezolid, Vancomycin followed by Ciprofloxacin, Gentamycin, and least sensitive to Penicillin G and Amoxycillin.

In present study among post neonatal age group *Acinetobacter spp.* was sensitive to Imipenem, Polymyxin B, Piperacillin-Tazobactam, Ampicillin-sulbactam, Cotrimoxazole, Gentamycin, Chloramphenicol. Other gram negative bacilli was sensitive only to Polymyxin B. *S. paratyphi A* was sensitive to Imipenem, polymyxin B, Piperacillin-Tazobactam, Ampicillin-sulbactam, Ciprofloxacin, Amoxycillin.

Discussion

Table 5 shows that in present study prevalence of post neonatal and pediatric septicemia is higher in males. This is also observed by Meremikwu MM et al.⁽⁶⁾ Male predominance may be due to Gender biased care for male babies in our society.⁽¹⁰⁾

Table 5: Age and Gender wise comparison

Neonates (0-28days)				
Author	City/Country	Year	Male	Female
Post neonates (29days-1year)				
Meremikwu MM et al ⁽⁶⁾	Calabar/Nigeria	2005	55.95%	44.05%
Present study*	S'nagar/ India	2012	61.29%	38.71%
Older children (>1year to 12 years)				
Meremikwu MM et al ⁽⁶⁾	Calabar/ Nigeria	2005	52.40%	47.60%
Present study*	S'nagar/ India	2012	62.26%	37.74%

Table 6 shows that in present study prevalence of post neonatal septicemia is 19.35% and gram positive and gram negative isolates are equal in number. While study done by Tsering DC et al⁽⁸⁾ shows prevalence is 9.82% and gram positive isolates predominate.

In present study in post neonatal age group 6 (19.35%) specimen yielded positive isolates and 25 (80.65%) yielded no isolates. These results are higher as compared to study by Tsering DC et al.⁽⁸⁾ In present study in older children 14 (26.41%) specimen yielded positive isolates and 39 (73.59%) yielded no isolates. These results are higher than Hasson S et al⁽⁹⁾ and lower than Tsering et al.⁽⁸⁾

Table 6: Comparison of positive isolates

Study series	City/Country	Year	Positive (%)	Gram negative (%)	Gram positive (%)
Post neonates (29days-1year)					
Zaidi F et al ⁽⁷⁾	Karachi/Pakistan	2009		57.40%	40.20%
Tsering DC et al ⁽⁸⁾	Sikkim/India	2011	09.82%	27.27%	72.73%
Present study*	S'nagar/India	2012	19.35%	50%	50%
Older children (>1 year to 12 years)					
Tsering DC et al ⁽⁸⁾	Sikkim/India	2011	37.50%	83.33%	16.67%
Hasson S et al ⁽⁹⁾	-	-	19.40%	32.00%	68.00%
Present study*	S'nagar/India	2012	26.41%	64.29%	35.71%

The results of studies in relation to microbial isolates by different authors are variable as prevalence of bacterial isolate varies from place to place, hygiene of mother, mode of delivery and different geographical area. Negative cultures can be attributed to Non-bacterial growth, presence of viral agents, fastidious organism, anaerobic etiology, ratio of volume of amount of blood collected and liquid broth and prior antibiotic therapy.^(10,11,12)

Conclusion

Prevalence of septicemia is 19.35% in post neonates (29 days – 1 year) and 22.95% in older children (> 1 - 12 years). Prevalence of septicemia is higher in males compared to females in both age groups.

Most common clinical presentation was fever of unknown origin 50% and 78.57% in post neonates and older children respectively. Common bacterial species isolated were *S. aureus* 50% and 35.71% in post neonates and older children respectively. All Gram positive isolates were sensitive to Chloramphenicol,

Linezolid and Cotrimoxazole. And gram negative isolates toward Imipenem, Piperacillin-Tazobactam, Ampicillin-Sulbactam and Cotrimoxazole. Prevalence of MRSA was 33.33% in post neonates and 60% in older children. Prevalence of ESBL in older children was 66.66% (*E. coli*) and 33.33% (*Klebsiella spp.*).

References

1. Santhanam S, Steele RW. Pediatric Sepsis. Cited on 09-06-2012 Avail from: URL: <http://www.emedicine.medscape.com/article/972449-overview>.
2. Nwadioha SI, Nwokedi EO, Kashibu E, Odimayo MS, Okwori EE. A review of bacterial isolates in blood cultures of children with suspected septicemia in a Nigerian tertiary Hospital. African Journal of Microbiology Research 2010; Vol 4(4):222-5.
3. Aletayeb SM, Khosravi AD, Dehdashtian M, Kompani F, Mortazavi SM, Aramesh RM. Identification of bacterial agents and antimicrobial susceptibility of neonatal sepsis: A 54-month study in a tertiary hospital. African Journal of Microbiology Research 2011; Vol. 5(5):528-31.
4. Cecilia CM, Mary AC, Elizabeth EG, Jonathan GL, Joanne JL, Cecille YA. Etiology of neonatal sepsis in five

- urban hospitals in the Philippines. *PIDSP Journal* 2011;Vol 12:75-85.
5. Clinical laboratory standards institute. Performance standard for antimicrobial susceptibility testing; seventeenth informational supplement M100-S17, vol 27 No.1. Clinical laboratory standards institute. Wayne PA. USA 2007.
 6. Meremikwu MM, Nwachukwu CE, Asuquo AE, Okebe JU, Utsalo SJ. Bacterial isolates from blood cultures of children with suspected septicemia in Calabar Nigeria. *BMC infectious diseases*.2005;5:110-4.
 7. Zaidi AKM, Thaver SN, Ali SA, Khan TA. Pathogen associated with sepsis in newborns and young infant in developing countries. *Pediatric Inf Dis J* 2009;28:13-8.
 8. Tsering D, Chanchal L, Pal R. Bacteriological profile of septicemia and risk factors in neonates and infants in Sikkim. *Journal global infectious disease* 2001;3(1):42-5.
 9. Hasson SO, Naher HS, Aimrzoq JM. Gram positive bacteremia in febrile children under two years of age in Babylon province. [Cited 2012 June 6]. Available from URL: <http://WWW.uobabylon.edu.iq/uobcoleges/fleshare/articles/gram.pdf>.
 10. Ahmed AN, Caowdhury MA, Hoque M, Darmstadt GL. Clinical and bacteriological profile of neonatal septicemia in a tertiary level Pediatric hospital in Bangladesh. *Indian Pediatric* 2002;39:1034-9.
 11. Shaw CK, Shaw P, Thapalia A. Neonatal sepsis bacterial isolates and antibiotic susceptibility pattern at a NICU in a tertiary care hospital in western Nepal: A retrospective analysis. *Kathmandu University Medical Journal* 2007;5(2):153-60.
 12. Qureshi M, Aziz F. Prevalence of microbial isolates in blood cultures and their antimicrobial susceptibility profiles. *Biomedica* Jul-Dec 2011;27:136-9.