Original Research Article

Bacterial sensitivity pattern of neonatal early onset sepsis in a tertiary care hospital in Assam

Devi D[1], Gedam DS[2]

[1]Dr. Dipti Devi, Ex. Associate Professor, Pediatrics, Tezpur Medical College, Assam, India, [2]Dr. D Sharad Gedam, Associate Professor, ABV Government autonomous Medical College, Vidisha, MP, India.

Corresponding Author: Dr. D. Sharad Gedam, Associate Professor, ABV Government Autonomous Medical College, Vidisha, MP, India, Email: sharad.gedam@gmail.com

……...

Abstract

Introduction: Current trend in Neonatal mortality rate (NMR) is stagnant for last few decades. Early onset sepsisis one of commonest causes of NMR. As clinical presentation is often nonspecific, a high degree of suspicion is required for early initiation of specific therapy. Choice of empiricalantibiotic is the cornerstone of specific therapy. Depending on the culture report it can be switched over to appropriate antibiotic. Prevalence of bacterial pathogen varies in different locality. So, every neonatal care set up should have a periodical review of the bacteriological profile of the locality**.** **Method**: A prospective cohort study was undertaken in the department of Pediatrics and Obstetrics of Tezpur Medical College and hospital, Assam to find out the bacteriological profile of culture proven early onset sepsis (EOS) during July 2016 to June 2017. **Results**: Out of 5960 hospital born babies, 298 babies fulfilled the inclusion and exclusion criteria. 15(5.03 %) babieswere with probable sepsis by clinical criteria and positive sepsis screen. Out of these, 7(46.66%) babies were culture positive. Gram negative organisms were 85.7% of isolates of which 3 (42.8%) were Actinobacterspp followed by klebseilla, E. Coli and Pseudomonus Aeroginosa. Methicillin resistant Staph aureus was the only gram-positive organism. There was no growth of group B streptococcus. Most of the organisms were resistant to common drugs. One of Actinobacter was resistant to all drugs including meropenam. **Conclusion**: We conclude that only local policy of rational antibiotic use can prevent the problem of drug resistance and reduce NMR due to sepsis.

Key words: Newborn, Early onset sepsis, Drug resistance

……...

Introduction

Neonatal septicaemia is a clinical syndrome characterised by signs and symptoms of infection with or without accompanying bacteraemia in the first month of life [1]. It is classified into early onset sepsis within 72 hour of life and late onset sepsis after 72 hour [1]. The varying microbiological pattern of septicemia and their high antibiotic resistance needs to be studied. Neonatal sepsis is associated with significant morbidity and mortality throughout the world [2].

Though sepsis is a cause of neonatal deaths in the developed countries the scenario is more serious in developing countries, where neonatal sepsis is responsible for 30-50% of neonatal mortality [3].

Incidence of Neonatal septicaemia in India is 30/1000 live births [4]. Neonatal sepsis is one of the commonest causes of neonatal mortality and morbidity specially in developing countries [6]. According to the National Neonatal Perinatal Database (NNPD), it is 30/1000 live birth in India [7]. Globally out of 130 million babies born in a year, 4 million die within one month [5].

Early onset sepsis is defined by infection occurring within 72 hours after birth [1]. The pathological organism gains access from the mother by transplacental route or ascending route from the genitourinary tract during delivery. According to NNPD, EOS contributes to 67% of neonatal sepsis [7].

Manuscript received: 8th July 2018
Reviewed: 18th July 2018
Author Corrected: 25th July 2018
Accepted for Publication: 31st July 2018

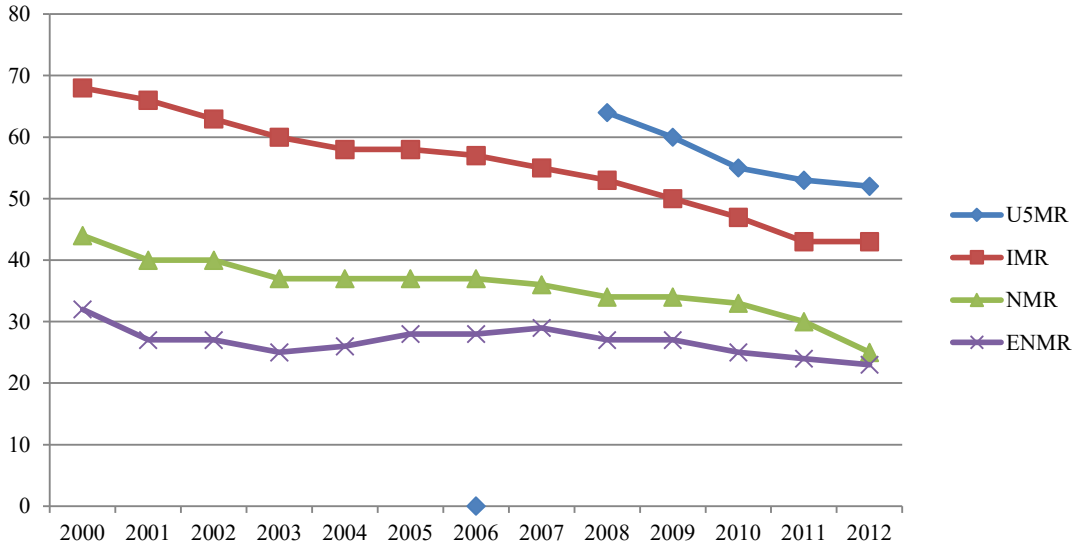

Fig-1: Trends of mortality rates in India (SRS statistical report 2000-2012) showing a stagnant status

Early diagnosis and prompt initiation of appropriate antibiotic is the cornerstone of management. However clinical presentation is nonspecific and early diagnosis is difficult [8]. Though blood culture is gold standard, it is costly, requires a well-equipped laboratory, time consuming and success rate is 40% only [8]. Irrational use of antibiotic results in drug resistance. So, choice of initial antibiotic in suspected sepsis requires periodic evaluation of local flora. With this objective, a study was undertaken to find out the bacteriological profile of proven EOS in a tertiary care hospital. This study was conducted to know the bacteriological profile of early and late onset neonatal septicaemia along with the antibiotic susceptibility patterns and thus help the clinician in the accurate diagnosis and treatment of neonatal septicaemia.

Materials and methods

A prospective, observational, cohort study was done in the department of Pediatrics and Obstetrics of Tezpur Medical College and Hospital, Assam during a period of one year from July 2016 to June 2017. Hospital born new borns with at least 2 of risk factors likeLBW, preterm, febrile illness in the mother within 2 weeks of delivery, 3 or more per vaginal examinations after rupture of membrane, foul smelling liquor, prolonged rupture of membrane, prolonged or difficult delivery or perinatal asphyxiawere included. Babies born at <28 weeks, with lethal congenital anomaly or antibiotic to the mother during labor were excluded from the study. Out of total 5960 babies born, 298(5.03%) babies were selected. The study was approved by hospital ethical society. Written informed consent was taken from the parents. Cord blood was collected and sent for sepsis screen including CRP (>6mg/L), TLC (<5000/cumm), ANC (<1500/cumm) and I/T ratio (>0.2) regarding abnormal. Neonates were followed for 72 hours. EOS was suspected in presence of symptoms like respiratory distress, lethargy etc and/ or positive sepsis screen. Blood culture was sent inoculating in Brain Heart Infusion Broth at the ratio of 1 in 10. Subcultures were inoculated on chocolate agar, 5% sheep blood agar and Mac Conkey Agar plates at 24 hrs, third day and 7th day respectively. No growth in 3 subcultures on 7th day was reported as culture negative. Broad spectrum antibiotic was started as per NICU protocol. Data was collected in pretested Performa.

Statistical analysis- Odds ratio and log odds ratio with chi square test of significance were used for statistical analysis of data statistical test of significance was defined as $p<0.05$.

Results

Out of 298 babies, 15(5.03%) were found with probable sepsis in presence of symptoms and positive sepsis screen. Of these, 66.6% were male, 53.3% were with LBW, 73.3% were term, 60% of primiparous mother, 53.3% of SVD, 46.7% with ROM 18-24 hrs, 46.7% with >3 VE, 33.3% MSL, 26.7% with prolonged labor, 13.3% with maternal fever and 13.3% with FSL. The most common clinical presentation was respiratory distress (33.3%). Blood culture was positive in 7(46.66%) cases of probable sepsis (Table 1, Figure 2)

Table-1: Culture sensitivity pattern.

	Diseased	Percentage
Culture positive	7	46.66
Culture negative	8	53.33
Total	**15**	**100.0**

Out of 15 patients, 7(46.66%) patients were culture positive and 8(53.33%) patients were culture negative.

Table- 2: Isolated organism.

	Isolates	No of cases	Percentage
1	Acinetobacter spp	3	42.8
2	Klebsiella pneumoniae	1	14.3
3	E.Coli	1	14.3
4	Pseudomonas aerogenosa	1	14.3
5	MRSA	1	14.3

Table No. 2 shows that maximum no. isolates shows acinetobacter spp. that is 42.8%, rest organisms were 14.3% each.

Table- 3: Showing the sensivity pattern of isolate

	Acinetobacter spp			Klebsiella pneumoniae	E.Coli	Pseudomonas aerogenosa	MRSA
Total	3			1	1	1	1
AK	NT	R	S	R	NT	R	NT
GEN	NT	NT	NT	NT	NT	NT	R
CX	NT	R	R	NT	NT	NT	R
CAZ	R	NT	R	R	R	R	NT
CPM	NT	R	NT	NT	NT	NT	NT
CXM	NT	R	R	NT	NT	NT	R
CIP	NT	NT	S	S	S	MS	NT
MRP	R	S	NT	S	S	NT	NT
IPM	R	NT	NT	NT	R	NT	NT
LE	NT	NT	NT	NT	S	NT	NT
LZ	NT	NT	NT	NT	NT	NT	S
OX	NT	NT	NT	NT	NT	NT	R
CTR	R	NT	NT	R	R	MS	NT
PIT	R	NT	NT	R	NT	S	NT
VA	NT	NT	NT	NT	NT	NT	S

AK-Amikacin, Gen-Gentamycin, Cx-Cefoxitin, CAZ-Cetazidime, CPM-Cefipime, CXM-Cefuroxime, CP-iprofloxacin, MRP-Meropenam, IPM- Imipenam, LE- Levofloxacin, LZ-Linezolid, OX-Oxacillin, CTR- Ceftraxone, PIT-Piperacillin Tazobactum, VA- Vancomycin, NT- Not tested.

Out of 7 isolations, 6 (85.7%) were gram negative organisms. Among these, acinebacterspp was the commonest organism (42.8%) followed by E coli, pseudomonas and klebsiella pneumonia. Staphylococcus aureus (MRSA) was the only gram positive organism. Group B Streptococococcus, which is common in west, was not found. Among 3 Acinebacterspp, 1 was resistant to all tested drugs, 1 was sensitive to meropenam and 1 was sensitive to amikacin and ciprofloxacin. Klebsiella pneumoniae was sensitive to ciprofloxacin and meropenam and was resistant to amikacin, ceftazidime, ceftriaxone and piperacillin tazobactum. E. Coli was sensitive to ciprofloxacin, meropenam and levofloxacin

and was resistant to ceftazidime, ceftriaxone and imipenam. Pseudomonasaerogenosa was sensitive to piperacillin tazobactum, moderately sensitive to ceftriaxone, and was resistant to amikacin, ceftazidime. MRSA was sensitive to vancomycin and linezolid and was resistant to gentamycin, cefoxitin, cefuroxime and oxacillin.

Discussion

Neonatal sepsis is a serious condition. Prompt treatment is required to reduce mortality and morbidity. Clinical presentation is nonspecific hindering early diagnosis. High index of suspicion is needed for early diagnosis and prompt treatment. On the other hand, increasing drug resistance is an upcoming threat as a result of irrational use of antibiotics. Periodic analysis of local bacteriological profile helps initiation of appropriate antibiotic till culture reports are available. There should be a local evidence-based protocol in every treatment facility for these sick neonates. It should be updated periodically.

We conducted this study in all suspected hospital born neonates with EOS. Cord blood sepsis screen positive and/or in presence of clinical presentation, blood was collected and sent for C/S and antibiotic was started. Blood culture was positive in 46.66% of EOS suspected babies which is in concordance with other studies (Table 4). Gram negative organisms were commonest (85.7%) comparable with other studies (Table 5). Acinobacterspp was the commonest organism isolated (42.8%). Most of the organisms were resistant to common drugs. One isolate was resistant to all antibiotics. This was because of emergence of multidrug resistant organisms. Irrational use of broad-spectrum antibiotics, over dependence on sepsis screen results in multidrug resistant bacteria. Antibiotic misuse and microbial resistance are an ever-increasing problem in the neonatal intensive care units of our country. Over the years, undisciplined use of broad-spectrum antibiotics, prolonged courses of antibiotics therapy, overdependence on sepsis screen for initiating, changing and stopping antibiotics and absence of culture facilities have resulted in increased incidence of extended spectrum beta-lactamase (ESBL), methicillin-resistant Staphylococci aureus (MRSA), vancomycin-resistant Enterococci, carbepenam-resistant Pseudomonas/Acinetobacter and multi-drug-resistant bacteria [9,10].

Table-4: Showing studies with blood culture

Sl. No	Studies	Sepsis positive	Blood Culture Positive	%
1	NNPD 2002[7]	2219	1248	56.2%
2	West et al [9]	420	181	43.1%
3	Betty chacko et al[10]	65	28	43.1%
4	Twinkle N Gandhi et al[11]	286	130	45.5%
5	Jan AZ et al[12]	700	378	54%
6	Present study	15	7	46.7%

Table-5: Showing studies with isolates grown

Organism Isolates	Nepal et al [13]	Bhat Y et al[14]	Sucilathangam G. et al[12]	Twinkle N Gandhi et al[11]	Present study
Acinetobacter spp	25.7%	14.4%	35.7%	7.69%	42.8%
Klebsiella pneumoniae	14.3%	31.4%	14.3%	31.5%	14.3%
E.Coli	4.3%	4.4%	-	14.6%	14.3%
Pseudomonas aerogenosa	2.9%	33.2%	7.1%	16.2%	14.3%
MRSA	38.2%	9.2%	14.3%	11.5%	14.3%

EOS is caused mainly by bacteria transmitted from mothers to neonates during the intrapartum period, these are the bacteria prevalent either in the maternal genital tract or in the area of delivery [15]. During labor, maternal risk factors include prolonged rupture of membranes, fever, vaginal colonization with group B streptococcus (GBS), and GBS bacteriuria [16]. A history of a previous infant with GBS infection is another identified maternal risk factor in subsequent

pregnancies [17]. In addition, adequacy of the maternal immune response is an important risk factor for neonatal sepsis. Maternal serum IgG antibodies against specific capsular polysaccharides of GBS have been shown to be protective against infection with the relevant GBS strain in their infants, and an increased risk for GBS EOS has been demonstrated in infants delivered to mothers with low titers [17]. Infant factors associated with early-onset sepsis in addition to the factors noted for the mother include prematurity/low birth weight, congenital anomalies, complicated or instrument-assisted delivery, and low APGAR scores (score of ≤6 at 5 min). Immaturity of the premature neonatal immune system, including low immunoglobulin levels related to decreased transplacental transfer of maternal IgG, also increases the risk of sepsis in preterm infants [18]. Barrier function of the skin and mucus membranes is diminished in premature infants and is additionally compromised in ill premature infants by multiple invasive procedures, including intravenous (i.v.) access and intubation. Poor or late prenatal care, low socioeconomic status of the mother, poor maternal nutrition, maternal substance abuse, male sex, and African American mother (higher rate of GBS colonization) are additional ethnic and social factors associated with neonatal sepsis [19]. Neonatal septicemia remains as an important and challenging problem even with modern and advanced diagnostics and drug therapy. Hospital data should be generated regularly about the spectrum of bacteria and their antibiotic susceptibility pattern to enable accurate diagnosis and empirical treatment.

Conclusion

Our study suggests that as only 46.66% of suspected EOS was blood culture positive with emergence of multidrug resistant organisms, periodic local formulation of rational antibiotic policies is urgently neededin each care facility to reduce multidrug resistant organisms and hence mortality and morbidity.

The susceptibility of the pathogens to the commonly used antibiotics was low and needs increased efforts to ensure rational use of antibiotics. A regular antibiotic susceptibility surveillance and periodic review of the antibiotic policy of the hospital will reduce the development of antibiotic resistance.

Funding: Nil, **Conflict of interest:** None initiated,
Perission from IRB: Yes

References

1. Mamatha P Samaga, Keerthi B J, Sini Joseph. Bacteriological study of early onset and late onset neonatal septicaemia in a tertiary care hospital in South India. International Journal of Contemporary Medical Research 2017;4(7):1478-1481.

2. Pawa AK, Ramji S, Rakish K, Thirupuram S. Neonatal nosocomial infections: profile and risk factors. India J Paediatr. 1997;34:297-302.

3. Agarwal R, Sarkar N, Deorary AK, Paul VK. Sepsis in Newborn. Indian J Pediatr. 2003;68:528-37.

4. Sankar MJ, Agarwal R, Deorari AK, Paul VK. Sepsis in the newborn. Indian J Pediatr. 2008 Mar;75(3):261-6.

5. Dadhich JP, Paul VK. State of India's Newborns, National Neonatology Forum and Saving Newborn Lives. New Delhi. Save the Children (US); 2004.

6. Stoll BJ. The global impact of neonatal infection. Clin Perinatol. 1997 Mar;24(1):1-21.

7. National Neonatal Perinatal Database. Report for year 2002-2003. National Neonatology Forum. India; 2005 Jan. www.newbornwhocc.org

8. Meharbansingh. Care of The Newborn. 7th Edition. Sagar Publishers; 2010. P.2-3.

9. Leung WS, Chu CM, Tsang KY, et al. Fulminant community- acquired Acinetobacter baumannii pneumonia as a distinct clinicalsyndrome. Chest. 2006 Jan; 129 (1):102-9. doi:10.1378/chest.129.1.102

10. Chacko B, Sohi I. Early onset neonatal sepsis. Indian J Pediatr. 2005 Jan;72(1):23-6.

11. Twinkle N Gandhi et al. Utility of c reactive protein as inflammatory marker in early diagnosis of neonatal septicaemia: a cross sectional study, national journal of medical research. 2012 Oct – Dec; Volume2 | Issue 4 |

12. Sucilathangam G et al. Diagnostic value of C-reactive protein and haematological markers in neonatal sepsis. Gomal J Med Sci. 2013; 11:212-215.

13. Hari PN et al. Bacteriological profile of neonatal septicemia cases and the antimicrobial resistance pattern in a tertiary care hospital of central Nepal. IJBAR. 2013; 04 (01)

14. Bhat Y R, Lewis LE, K E V.Bacterial isolates of early-onset neonatal sepsis and their antibiotic susceptibility pattern between 1998 and 2004: an audit from a center in India. Ital J Pediatr. 2011 Jul 11;37:32. doi: 10.1186/1824-7288-37-32.

15. Shah BA[1], Padbury JF. Neonatal sepsis: an old problem with new insights. Virulence. 2014 Jan 1; 5 (1): 170-8. doi: 10. 4161/viru. 26906. Epub 2013 Nov 1

16. Adair CE, Kowalsky L, Quon H, et al. Risk factors for early-onset group B streptococcal disease in neonates: a population-based case-control study. CMAJ. 2003 Aug 5;169(3):198-203.

17. Tita AT, Andrews WW. 2010. Diagnosis and management of clinical chorioamnionitis. Clin. Perinatol. 37:339–354. 10.1016/j.clp.2010.02.003

18. Arnon S, Litmanovitz I. Diagnostic tests in neonatal sepsis. CurrOpin Infect Dis. 2008 Jun;21(3):223-7. doi: 10. 1097/QCO.0b013e3282fa15dd.

19. Anderson-Berry A. 2012. Neonatal sepsis. *In* Medscape reference. Web MD LLC, New York, NY: http://emedicine.medscape.com/article/978352-overview

……..

How to cite this article?

Devi D, Gedam DS. Bacterial sensitivity pattern of neonatal early onset sepsis in a tertiary care hospital in Assam. Int J Pediatr Res.2018;5(8): 419-424.doi:10.17511/ijpr.2018.i08.06.

…….....