ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 15, Issue, 06, pp.24868-24870, June, 2023
DOI: https://doi.org/10.24941/ijcr.45482.06.2023

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

TO STUDY ANTIBIOGRAM OF GRAM NEGATIVE SEPTICEMIA IN NEONATES & OBG PATIENTS ATTENDING MATERNAL & CHILD CARE HOSPITAL AT WESTERN RAJASTHAN

Dr. Richa Agrawal*[1], Dr. Pinky Bhagat[2], Dr. Kapil Choyal[2], Dr. Bhawini Vijaywargiya[2], Dr. Ritu Dhoundiyal[3] and Dr. R. S. Parihar[4]

[1]Assistant Professor, Department of Microbiology, Dr. S.N. Medical College, Jodhpur; [2]Post Graduate Student, Department of Microbiology, Dr. S. N. Medical College, Jodhpur; [3]Senior Demonstrator, Department of Microbiology, Dr. S. N. Medical College, Jodhpur; [4]Senior Professor, Department of Microbiology, Dr. S. N. Medical College, Jodhpur

ARTICLE INFO

Article History:
Received 14th March, 2023
Received in revised form
03rd April, 2023
Accepted 17th May, 2023
Published online 23rd June, 2023

Key words:
Septicemia, GNB, Neonates, Obstetric, Drug Resistance.

**Corresponding Author:*
Dr. Richa Agrawal

ABSTRACT

Background: Neonatal sepsis is a clinical syndrome of bacteremia with systemic signs and symptoms of infection in the first 4 weeks of life[1]. Most common micro-organisms causing neonatal bacteremia are *Escherichia coli, Klebsiellapneumoniae*, *Staphylococcus aureus*, and *Group B streptococci*[3] *etc*. Bacteremia in Obstetric patients is also a major health concern leading to ICU admission &leades to maternal mortality worldwide [9]. ***Objective:*** This study was done to analyse gram negative bacteremia and their drug susceptibility pattern among neonates and obstetric patients so that timely appropriate antibiotics therapy be initiated. ***Methods:*** This retrospective study was conducted in the Maternal and Child tertiary care hospital from 1 October 2022 to 31 December 2022. Total of 471 suspected case of septicemia were included. Out of 471 patients, 369 (78.34%) patients were pediatrics and 102(21.65%) OBG patients. Blood was collected from suspected cases of bacteremia in Automated blood culture bottles & incubated by automated blood culture system (BD Bactec machine) for 7 days. Positive flagged bottles were processed & species were identified as per standard laboratory protocol. Antimicrobial susceptibility testing was done by Kirby bauer disk diffusion method as per CLSI guideline 2022. ***Result:*** 43 (9.12%) bottles were culture positive for gram negative bacteria. Most common GNB isolated were Acinetobacter species (37.20%), Pseudomonas aeruginosa (23.25%), Escherichia coli (18.60%), Klebsiellapneumoniae (16.27%) and showed resistance to Ampicillin (100%) Amoxicillin-clavulanate (93.02%), Ceftriaxone (76.74%), Ceftazidime (76.74%). They were sensitive to Meropenem (100%), Imipenem (88.38%), Amikacin (95.35%), Gentamicin (74.52%). ***Conclusion:*** Acinetobacter were the most common isolated pathogen. Routine surveillance of Antimicrobial profile and Antibiotic sensitivity is required to prevent emergence of drug resistance among bacteria.

Citation: ***Dr. Richa Agrawal, Dr. Pinky Bhagat, Dr. Kapil Choyal, Dr. Bhawini Vijaywargiya, Dr. Ritu Dhoundiyal and Dr. R. S. Parihar.*** **2023.** "To study antibiogram of gram negative septicemia in neonates & obg patients attending maternal & child care hospital at Western Rajasthan*". International Journal of Current Research*, 15, (06), 24868-24870.

INTRODUCTION

Neonatal sepsis is a clinical syndrome of bacteremia characterized by systemic signs and symptoms of infection in the first 4 weeks of life (Greenhalgh, 2017). This can be divided into two main classes depending on the onset of symptoms related to sepsis. Early onset sepsis (EOS) usually presents within the first 72 hours of life. Late onset sepsis (LOS) usually presents after 72 hours of life (Ansari, 2015). Most common micro-organisms causing neonatal bacteremia are *Escherichia coli, Klebsiellapneumoniae*, *Staphylococcus aureus*, and *Group B streptococci* (Black, 2013) *etc*. Various risk factors associated with neonatal septicemia are low birth weight, prematurity, premature rupture of membrane, preterm labour, birth asphyxia and some ritual practices for umbilical cord care leading to high morbidity and mortality in neonates (Lawn, 2005 and Upadhyay, 2012). Due to exposure to unhygienic conditions in low socio-economic conditions or rural background, delivery at home by untrained dais, contributes to high risk of septicemia in neonates (Jitta, 2008 and Chi, 2018).

According to WHO, 1.6 million neonatal death occurs per year worldwide amongst them 40% of all neonatal death occurs in the developing countries (Sawhney, 2015). Due to difficulties in the early diagnosis of neonatal sepsis and the potentially devastating outcomes, empirical antibiotic treatment is usually initiated when sepsis is suspected. However, this empirical therapy is often inappropriate, with unnecessary broad-spectrum antibiotics and a prolonged duration of treatment contributing to an increasing number of multidrug-resistant microorganisms in NICUs (Lawn, 2005). Bacteremia in Obstetric patients is a major health concern leading to intensive care unit admission and one of the leading causes of maternal mortality worldwide (Moaddab, 2016). Increased susceptibility for certain illnesses in obstetric patients is due to the unique physiological, immunologic, and metabolic changes in pregnancy that complicates management. This may go undiagnosed until there is significant clinical deterioration. Timely recognition, adequate source control, and appropriate antimicrobial therapy are responsible for good outcomes in obstetric patients with sepsis. This study was done retrospectively to analyze gram negative bacteremia and their drug

susceptibility pattern among neonates and obstetric patients so that timely appropriate antibiotics therapy can be initiated.

MATERIALS AND METHODS

This retrospective study was conducted in the Maternal and Child tertiary care hospital at Western Rajasthan, India from 1 October 2022 to 31 December 2022.

Study population: A total of 471 patients with suspected case of septicemia were included in the study. Out of 471 patients, 369 (78.34%) patients belongs to pediatrics category and 102(21.65%) belongs to OBG patients.

Sampling procedure and processing: Blood was collected from suspected cases of bacteremia by maintaining strict aseptic precaution in blood culture bottles and sent immediately to Microbiology laboratory. Blood specimens were incubated using automated blood culture system (BD Bactec machine) for 7 days.

Positive or negative cultures bottles were determined by BDBactec automated machine. Blood cultures were considered negative only after 7 days of incubation. Positive flagged bottles were subcultured on blood agar and MacConkey agar plates, and incubated aerobically at 37 ^{0}C and conventional biochemical reactions were carried out as per standard laboratory protocol to isolate and identify the pathogen. Antimicrobial susceptibility testing was done by Kirby bauer disk diffusion method on Mueller Hinton Agar and zone size interpreted as per Clinical Laboratory Standard Institute (CLSI) guidline (Clinical and Laboratory Standard Institute, 2022).

Antibiotics disks (Himedia, India) used were: Ampicillin (AMP) 10ug, Amoxicillin-clavulanate (AMC) 20/10ug, Gentamicin (GEN) 10ug, Piperacillin-tazobactam (PIT) 100/10ug, Ceftriaxone (CTX) 30 ug, Ciprofloxacin (CIP) 5ug, Cefepime (CPM) 30 ug, Ciprofloxacin (CIP) 5 ug, Imipenem (IPM) 10 ug, Aztreonam (AT) 20 ug, Cotrimoxazole (COT) 1.25/23.75ug, Amikacin (AK) 30 ug, Ceftazidime (CAZ) 30 ug.

RESULTS

Total 471 Blood culture bottles were received in study time period. Out of this, 43 (9.12%) bottles were culture positive for gram negative bacteria (GNB). Out of 471 blood culture bottles, 369 bottles were from pediatrics patients in which 36 (9.75%) GNB were isolated and 102 bottles were from OBG patients amongst them 7 (6.86%) GNB were isolated as showed in Table 1. Among 36 culture positive pediatrics patients 21 (58.33%) were male & 15 (41.66%) were female. As showed in Table 2, Most common GNB isolated were Acinetobacter species (37.20%) followed by Pseudomonas aeruginosa (23.25%), Escherichia coli (18.60%), Klebsiellapneumoniae (16.27%) and Citrobacterspecies(4.65%). Gram negative bacteria showed maximum resistance to Ampicillin (100%) followed by Amoxicillin-clavulanate (93.02%), Ceftriaxone (76.74%), Ceftazidime (76.74%),

Table 1. Distribution of Samples

	Total	Culture Positive (GNB)
Pediatrics	369	36 (9.75%)
Gynecology	102	7 (6.86%)
Total	471	43 (9.12%)

Table 2. Distribution of Gram negative isolates (GNB) in blood culture sample

	Pediatrics	Gynecology	Total
Escherichia coli	05	03	08 (18.60%)
Klebsiellapneumoniae	06	01	07 (16.27%)
Citrobacter species	01	01	02 (4.65%)
Pseudomonas aeruginosa	09	01	10 (23.25%)
Acinetobacter species	15	01	16 (37.20%)
Grand Total	36	07	43 (100%)

Table 3. Antibiotic Resistance profile of GNB isolates from Blood culture sample

Drugs	Escherichia coli (n=8)	Klebsiella Pneumonia (n=7)	Citrobacter species (n=2)	Pseudomonas aeruginosa (n=10)	Acinetobacter species (n=16)	Total GNB (n=43)
Ampicillin (10µg)	8 (100%)	7 (100%)	2 (100%)	10 (100%)	16(100%)	43 (100%)
Gentamicin (10µg)	3(37.5%)	3 (42.85%)	1 (50%)	0	4 (25%)	11(25.48%)
Amikacin (30µg)	2 (25%)	0	O	0	0	2 (4.65%)
Ciprofloxacin (5µg)	6 (75%)	2 (28.57%)	1 (50%)	5 (50%)	13 (81.25%)	27 (62.79%)
Ceftriaxone (30µg)	7 (87.50%)	6 (85.71%)	1 (50%)	6 (60%)	13 (81.25%)	33 (76.74%)
Cefotaxime (30µg)	5 (62.50%)	4 (57.14%)	1 (50%)	5 (50%)	14 (87.50%)	29 (67.44%)
Cefepime (30µg)	5 (62.50%)	2 (28.57%)	1 (50%)	3 (30%)	11 (68.75%)	22 (51.16%)
Ceftazidime (30µg)	7 (87.50%)	6 (85.71%)	1 (50%)	5 (50%)	14 (87.50%)	33 (76.74%)
PiperacillinTazobactam (100/10 µg)	1 (12.50%)	1 (14.28%)	0	2 (20%)	7 (43.75%)	11 (25.58%)
Azotreonam (30µg)	3 (37.5%)	3 (42.85%)	0	7 (70%)	16 (100%)	29 (67.44%)
Imipenem (10µg)	1 (12.5%)	0	1 (50%)	1 (10%)	2 (12.5%)	5 (11.62%)
Meropenem (10µg)	0	0	0	0	0	0
Amoxicillin-clavulanate (20/10µg)	5 (62.5%)	7 (100%)	2 (100%)	10 (100%)	16 (100%)	40 (93.02%)

Ciprofloxacin (62.79%), cefotaxime (67.44%) and Aztreonam (67.44%). Among GNB isolates Acinetobacterspecies, Escherichia coli, Klebsiellapneumoniae were detected multidrug resistant. They were found sensitive to Meropenem (100%), followed by Imipenem (88.38%), Amikacin (95.35%), Gentamicin (74.52%), and Piperacillin-Tazobactam(74.42%).

DISCUSSION

Septicemia is the major cause of morbidity & mortality in Infant. In this study, Blood culture positivity of GNB isolates was 9.12% which is similar to the study done by Mudzikati *et al*. (2015) Morkel G*et al*. (Morkel, 2014) & Nordberg, V *et al* (2021) with positivity rate of 9.8%, 11% &14% respectively. Difference in higher or lower rate of blood culture positivity might be due to different population type & sample size. In this study, Bacteremia in Neonates were more common

in male (58.33%) than female (41.66%) which is concordant with the study done by Shamahy HA *et al* (Al-Shamahy 2012) (male (60.8%) and (39.2%) females). This could be because of more preference is given to male child than female child in our Indian society and also further study is required regarding immunity status of male & female Child. In this study, Acinetobacter species (37.20%) were most commonly isolated followed by Pseudomonas aeruginosa (23.25%), Escherichia coli (18.60%), Klebsiellapneumoniae (16.27%) and Citrobacter species (4.65%). This correlates with the findings of Nazir A *et al* (2019) & Mahich S *et al* (Mahich. 2021) study. They found maximum sepsis caused by Acinetobacter species with 13.7% and 22.7% respectively. Present study findings does not correlates with the study done by Joshi SG *et al* (Joshi, 2000) & Aurangzeb B *et al* (Aurangzeb, 2003). In Joshi SG *et al* study, predominant GNB were Pseudomonas aeruginosa (38.3%) followed by Klebsiellapneumoniae (30.4%), Escherichia coli (15.6%) and Acinetobacter sp. (7.8%). Aurangzeb B *et al* presented with Escherichia coli (E. coli) commonest organism with (77.1%) followed by Pseudomonas aeruginosa (8.9%) & Klebsiellapneumoniae (8.9%).

Etiological agent of bacteremia in neonates and gynecology patients might change depending upon the study population type, study design, different treatment pattern in hospitals etc. Acinetobacter is emerging multidrug resistance nosocomial pathogen found predominant isolates causing bacteremia in Neonates and in OBG patients in our hospital setting. Probably this could be because of inappropriate infection control practices in ICUs & Wards. That's why periodic training & health education of hospital staff is required to prevent as well as to implement hospital infection control practices within the institute. Also periodic surveillance of Antibiogram profile is needed to know most common circulating pathogen of our hospital as these varies from institution to institution. In our study most of the GNB isolates were resistant to Ampicillin (100%), Amoxicillin (93.02%) and Third generation Cephalosporin (76.74%) and were sensitive to Aminoglycosides (95.35%) and Meropenem (100%) which correlates with the Muley *et al* (Muley, 2015) study where GNB isolates were sensitive to Aminoglycosides (70%) & Carbapenem (100%). In present study GNB isolates were Multidrug resistant could be because of irrational and unnecessary use of antibiotics, as our settings is a tertiary care hospital most of the patients were referred from periphery & already they have been treated with so many antibiotics. That's why routine antibiotic sensitivity should been done and treatment should either be escalated or deescalated as per microbiology AST report. This will help in preventing unnecessary exposure of antibiotic to bacteria and thus lesser development of MDR bugs.

CONCLUSION

Acinetobacter species were the most common bacteria causing bacteremia in our set up. GNB isolates in this study showed high degree of drug resistance to commonly used antibiotics. Bacteremia in neonates & OBG patients due to MDR pathogen leads to high morbidity & mortality as very limited option are available for treatment. Therefore, routine surveillance of Antimicrobial profile and Antibiotic sensitivity is required to update our knowledge regarding current circulating strain of hospital & this will help in preventing emergence of drug resistance among bacteria.

Conflicts of Interest: There is no conflicts of Interest.

Source of Funding: NIL.

REFERENCES

Al-Shamahy HA, Sabrah AA, Al-Robasi AB, Naser SM. Types of Bacteria associated with Neonatal Sepsis in Al-Thawra University Hospital, Sana'a, Yemen, and their Antimicrobial Profile. *Sultan Qaboos Univ Med J.* 2012 Feb;12(1):48-54.

Ansari, S., *et al*., Neonatal septicemia in Nepal: early-onset versus lateonset, in *International Journal of pediatrics* 2015

Aurangzeb B, Hameed A. Neonatal sepsis in hospital-born babies: bacterial isolates and antibiotic susceptibility patterns. *J Coll Physicians Surg Pak.* 2003 Nov;13(11):629-32. PMID: 14700488.

Black RE, *et al*. Maternal and child undernutrition and overweight in lowincome and middle-income countries. Lancet. 2013; 382(9890):427–51.

Chi PC, Urdal H. The evolving role of traditional birth attendants in maternal health in post-confict Africa: a qualitative study of Burundi and northern Uganda. SAGE open medicine. 2018;6:2050312117753631.

Clinical and Laboratory Standard Institute. Performance Standards for Antimicrobial Susceptibility Testing; Thirty Two Edition Informational Supplement, Clinical and Laboratory Standards Institute; M100-S23, February, 2022.

Greenhalgh DG. Sepsis in the burn patient: a diferent problem than sepsis in the general population. *Burns Trauma.* 2017;5(1):23.

Jitta J, Kyaddondo D. Situation analysis of newborn health in Uganda. Kampala Uganda: Ministry of Health, The Republic of Uganda; 2008.

Joshi SG, Ghole VS, Niphadkar KB. Neonatal gram-negative bacteremia. *Indian J Pediatr.* 2000 Jan;67(1):27-32.

Lawn J. E., Cousens S., Zupan J. 4 Million neonatal deaths: when? Where? Why? The Lancet. 2005; 365(9462):891–900. doi: 10.1016/S0140-6736(05)710485.

Mahich, S., Angurana, S.K., Suthar, R. *et al.* Acinetobacter Sepsis Among Out-born Neonates Admitted to Neonatal Unit in Pediatric Emergency of a Tertiary Care Hospital in North India. *Indian J Pediatr* 88, 127–133 (2021)

Moaddab, A., Dildy, G. A., Brown, H. L., Bateni, Z. H., Belfort, M. A., Sangi Haghpeykar, H., & amp; Clark, S. L. (2016). Health care disparity and state specific pregnancy-related mortality in the United States, 2005-2014. Obstetrics & amp; Gynecology, 128, 869-875.

Morkel G, Bekker A, Marais BJ, Kirsten G, van Wyk J, Dramowski A. Bloodstream infections and antimicrobial resistance patterns in a South African neonatal intensive care unit. PaediatrInt Child Health. 2014 May;34(2):108-14. doi: 10.1179/2046905513Y. 0000000082. Epub 2013 Dec 6. PMID: 24621234.

Mudzikati, L. & Dramowski, A. 2015. Neonatal septicaemia: prevalence and antimicrobial susceptibility patterns of common pathogens at Princess Marina Hospital, Botswana. Southern *African Journal of Infectious Diseases,* 30(3):96-101.

N. Sawhney, P. Shinu, and VA. Singh, "Bacteriological Profle and Antibiotic Susceptibility Pattern of Neonatal Septicaemia in a Tertiary Care Hospital," *International Journal of Current Microbiology and Applied Sciences,* vol. 4, no. 10, pp. 977–984, 2015.

Nazir A. Multidrug-resistant Acinetobacter septicemia in neonates: A study from a teaching hospital of Northern India. J Lab Physicians 2019;11:23-8.

Nordberg, V., Iversen, A., Tidell, A. *et al.* A decade of neonatal sepsis caused by gram-negative bacilli—a retrospective matched cohort study. *Eur J ClinMicrobiol Infect Dis* 40, 1803–1813 (2021).

Upadhyay R. P., Singh B., Rai S. K., Anand K. Role of cultural beliefs in influencing selected newborn care practices in rural Haryana. *Journal of Tropical Pediatrics.* 2012; 58(5):406–408.

V. A. Muley, D. P. Ghadage, and A. V. Bhore, "Bacteriological profile of neonatal septicemia in a tertiary care hospital from Western India," *Journal of Global Infectious Diseases,* vol.7, no. 2, pp.75–77, 2015.

****