e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(8); 1213-1218

Original Research Article

Microbial profile of Neonatal Septicemia in Eastern Maharashtra: Retrospective Study

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Received: 25-05-2024 / Revised: 23-06-2024 / Accepted: 26-07-2024

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Conflict of interest: Nil

Abstract:

Background: Neonatal septicemia is a serious cause of morbidity and mortality among neonates. Either EOS (early onset sepsis) or LOS (late onset septicemia) if not treated with proper sensitive antibiotics in proper duration.

Method: 292 neonates admitted to the NICU were studied. Blood specimens were drawn aseptically before starting any antibiotic therapy and inculcated in Bact. Alert/PPF plus blood culture bottles, which are incubated at 37 degree C aerobically in BacT Alert 3D 120 automated conventional methods and were identified by microbiological techniques. Antimicrobial susceptibility testing was performed by Kirby Bauer disc diffusion method.

Results: Out of 292 neonates admitted to NICU, 196 (67%) were found to be positive, of which 134 (68.3%) were gram-positive, 56 (28.5%) were gram-negative, and 6 (3%) were candida infection. Staphylococcus aureus and Klebesiella pneumonia were the commonest isolates.

Conclusion: The present pragmatic study of gram-positive, gram-negative, and candidiasis will certainly help the pediatrician to treat neonatal sepsis efficiently to prevent morbidity and mortality.

Keywords: early onset of sepsis (EOS), late onset of sepsis (LOS), Kirby Bauer disc, NICU, antibiotic susceptibility pattern.

Introduction

The neonatal sepsis refers to a clinical syndrome characterized by systemic signs and symptoms of infection, accompanied by bacteremia in the first 28 days of life. Globally, neonatal sepsis is responsible for 22–33% of neonatal deaths [1]. Sepsis is a potentially life-threatening condition resulting from an extreme systemic immune response of the body to fight against infection. This invasive infection, frequently bacterial, and isolation of bacteria from the blood stream. The therapy is often associated with an incontinent increase in antibiotic administration leading to the development of antibiotic resistance [2].

Neonatal sepsis is categorized into either early-onset neonatal sepsis (EOS) or late-onset (LOS). EOS is defined by bacteremia or meningitis occurring in newborns less than 3 days old. EOS could be a vertically transmitted infection that usually occurs as an ascending infection from the mother's cervix. Group B streptococcus (GBS) is the leading cause of EOS, followed by E. coli and Listeria monocytogenes [3]. Prematurity or low birth weight, birth asphyxia, prolonged rupture of membranes, and traumatic delivery are major risk factors that contribute to the incidence of EOS and LOS, which is defined as sepsis in infants during 4-90 days of life and could be caused by either vertically or horizontally transmitted infections. The most important microorganisms involved in LOS include Coagulase negative staphylococci (CoNS) and Enterobacter spp. E. Coli. Pseudomonas aeruginosa, Klebsiella pneumoniae, S. aureus, Candida albicans [4]. Hence, an attempt was made to evaluate both EOS and LOS, and appropriate (sensitive) antibiotics were ruled out to combat the severity of neonatal sepsis.

Material and Method

292 blood cultures were studied in the microbiology department of Indira Gandhi Government Medical College hospital, Nagpur, Maharashtra-440018.

Method: Blood specimens from the 292 neonates were drawn aseptically before starting any antibiotic therapy and inoculated in BacT Alert/PF Plus

blood culture bottles (Biometrix India), which were incubated at 37^{O} C aerobically in BacT Alert 3D 120 automated blood culture system for 5 days. Growths, if detected, were then subcultured on5% sheep blood agar, MacConkey's agar and antimicrobial susceptibility testing performed by the Kirby Bauer Disc Diffusion method as per CLSI (Clinical and Laboratory Standards Institute) recommendations. Out of 292 blood culture studies, 196 blood culture growths were detected and studied.

Duration of study: August 2007 to September 2009

Statistical analysis: Classification of microorganisms isolated from blood culture were classified as gram-positive isolates, gram-negative isolates, and yeast and studied with percentage. The statistical analysis was carried out in SPSS software. The gender of neonates was 2:1.

Observation and Results

Table 1: Classification of Microorganisms Isolated from Blood Culture

- 34 (68.3%) gram positive: among then 104 (53%) were Staphylococcus aureus, 21 (10%) CoNS, 9 (4.59%) Enterococcus spp.
- 56 (28.5%) Gram Negative had 7 (3.57%) E. coli, 26 (13.2%) Klebsiella pneumoniae, 10 (5%) Acinetobacter spp., 4 (2%) Citrobater spp., 9 (4.59%) Pseudomonas aeruginosa
- Yeast had 6 (3%) Candida spp.

Table 2: Study of antibiotic sensitivity patterns of gram positive isolates was 134:

- 104 (53%) Staphylococcus aureus had 104 (100%) Linezolid, Pristinomycin, Vancomycin, and least 13 (12.5%) was Ampicillin.
- 21 (100%) CoNS: It had 100% sensitivity to Linezolid, Pristinomycin, and Vancomycin.
- 9 (4.59%) Enterococcus spp. had 100% Linezolid, Pristinomycin, 88.8% Vancomyon, and least 2 (22.2%) Amikacin.

Table 3: Antibiotics sensitivity pattern of gram Negative isolates were 56:

- 26 (46.2%) K. pnemoniae had 100% Imipenem, and least 6 (23%), 7 were Gentamicin, Cotrimoxazole, and 2 (7.69%) Cefoperazone.
- 7 (12.5%) E. coli had Imipenem, Levofloxacin, had 100% sensitivity, and least 1 (14%) had Amikacin, Gentamicin, and cotrimoxazole.
- 4 (7%) were Citrabacter spp.: It had Levoflozacin, Ceftazidime, Imipenem, and Piperacillin-tazobactem were 100 sensitive, and the least were 1 (11.1%) Cefotaxime.
- 9 (16%) were Pseudomonas aeruginosa; the highest sensitive were 7 (77.7%) Imipenem, Aztreonam, Piperacillin-tazabactam.
- 10 (17.8%) were Acinetobacter spp. had the highest sensitive were 7 (70%) Imipenem and Piperacillin-tazobactam.

Table 1: Classification of Microorganism isolated from Blood culture (Total samples: 196)

Sl. No	Microorganisms	No. of isolates	Percentage (%)
[A]	Gram positive isolates	134	68.3%
(1)	Staphylococcus aureus	104	53%
(2)	CoNS	21	10%
(3)	Enterococcus spp.	9	4.59%
[B]	Gram Negative Isolates	56	28.5%
(1)	E.coli	7	3.5%
(2)	Klebsilla pneumonia	26	13.2%
(3)	Acinetobacter spp	10	5.1%
(4)	Citrobacter spp.	4	2%
(5)	Pseudomonas aeruginosa	9	4.5%
[C]	Yeast- Candida spp	6	3%

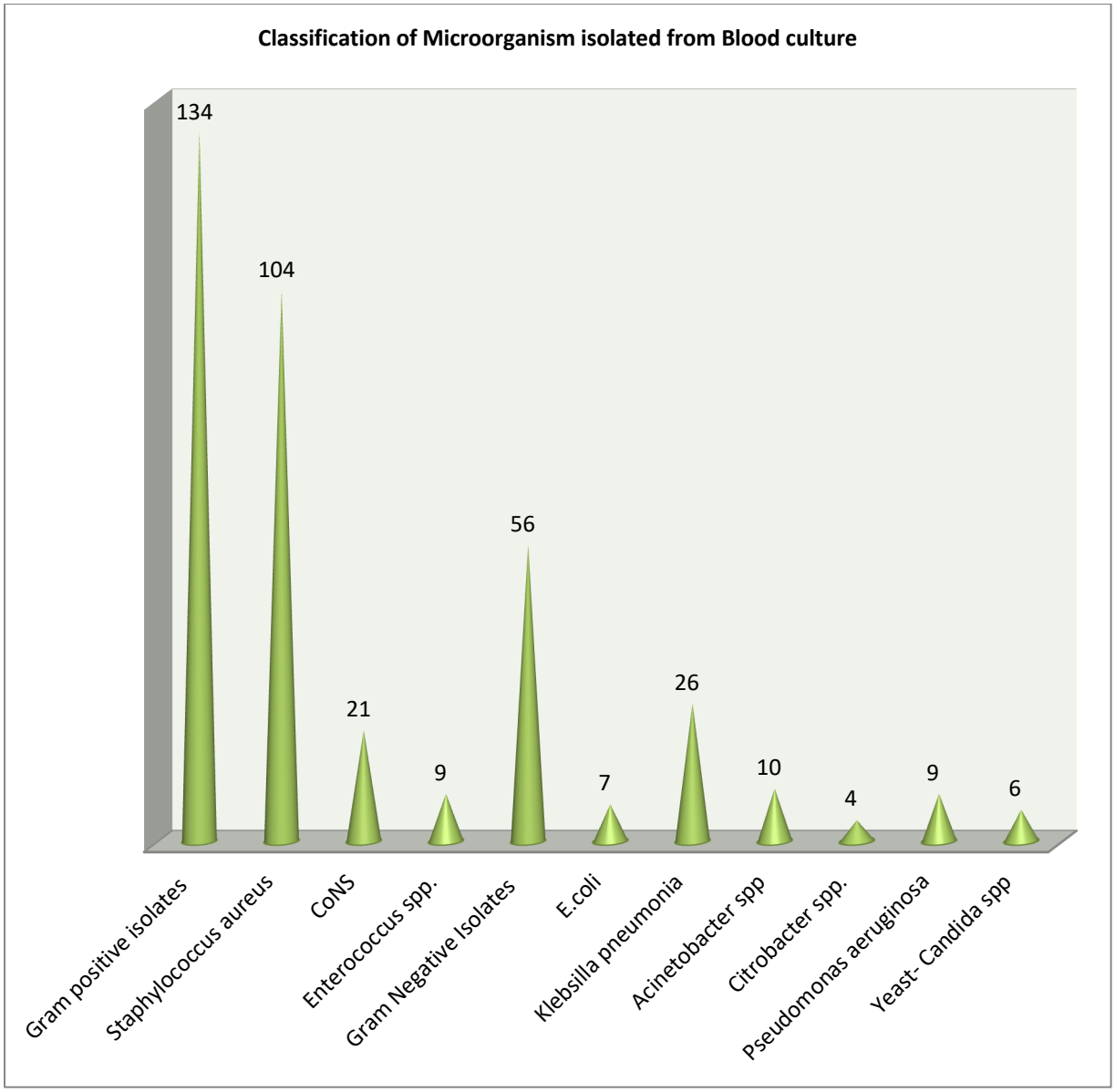

Figure 1: Classification of Microorganism isolated from Blood culture

Table 2: Antibiotic sensitivity patterns of the gram positive isolates (Total No of blood culture: 134)

Drugs	Staphylooccus aureus (104)	CoNS (21)	Enterococcus spp.(9)
Erythromycin	37 (35%)	4 (19%)	4 (44%)
Clindamycin	51 (49%)	17 (80%)	5 (55%)
Ciprofloxacin	74 (71.1%)	13 (61.9%)	4 (44%)
Oflaxacin	75 (72.1%)	14 (66.6%)	4 (44%)
Levofloxacin	73 (70.1%)	16 (76%)	2 (22%)
Amikacin	39 (37.5%)	16 (76%)	NT
Gentamicin	33 (31.7%)	14 (66.6%)	9 (100%)
Cefoxitin	94 (90.3%)	17 (80%)	4 (44%)
Cefotaxime	39 (37.5%)	12 (57%)	4 (44%)
Cotrimoxazole	31 (29.8%)	8 (38%)	0
Ampicillin	13 (12.5%)	6 (28.5%)	0
Linezolid	104 (100%)	21 (100%)	9 (100%)
Pristinomycin	104 (100%)	21 (100%)	9 (100%)
Vancomycin	104 (100%)	21 (100%)	9 (100%)

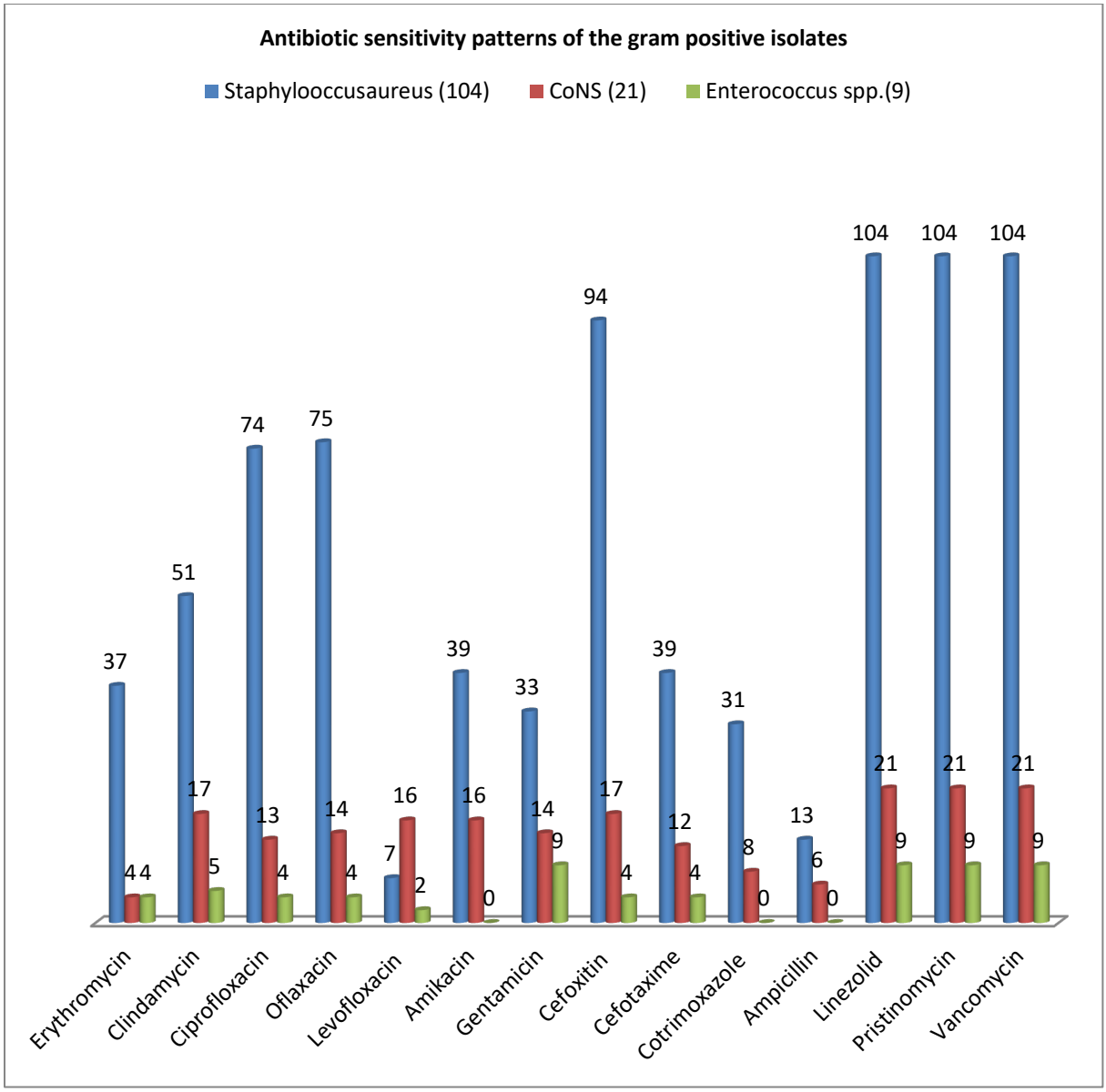

Figure 2: Antibiotic sensitivity patterns of the gram positive isolates

Table 3: Antibiotics sensitivity pattern of Gram negative isolates (Total No of isolates: 56)

Drugs	Klebsiella pneumoniae (26)	E.coli (7)	Citrobacter spp (4)	Pseudomonas aeruginosa (9)	Acinetobacter spp (10)
Amikacin	8 (30.7%)	1 (14.2%)	2 (50%)	3 (33.3%)	2 (20%)
Gentamicin	6 (23.7%)	1 (14.2%)	2 (50%)	2 (22.2%)	2 (20%)
Ampicillin- sulbactam	9 (34.6%)	2 (28.5%)	2 (50%)	NT	NT
Amoxclav	15 (57.6%)	4 (57.1%)	2 (50%)	NT	NT
Ciprofloxacin	17 (65.3%)	4 (57.1%)	2 (50%)	3 (33.3%)	4 (40%)
Levofloxacin	18 (69.2%)	7 (100%)	4 (100%)	4 (44.4%)	4 (40%)
Ceftriaxone	19 (73%)	4 (57.1%)	2 (50%)	4 (44.4%)	2 (20%)
Cefoperazone	2 (7.69%)	2 (28.5%)	1 (25%)	3 (33.3%)	3 (30%)
Ceftazidime	21 (80.7%)	6 (85.7%)	4 (100%)	1 (11.1%)	2 (20%)
Cefotaxime	20 (76.9%)	4 (59.1%)	3 (75%)	1 (11.1%)	2 (20%)
Cefepime	7 (26.9%)	4 (57.1%)	3 (75%)	5 (55.5%)	4 (40%)
Imipenem	26 (100%)	7 (100%)	4 (100%)	7 (77.7%)	7 (70%)
Cotrimoxazole	6 (23.7%)	1 (14.2%)	1 (25%)	NT	NT
Aztreonam	NT	NT	NT	7 (77.7%)	5 (50%)
Piperacillin- tazobactam	18 (69.2%)	4 (57.1%)	4 (100%)	7 (77.7%)	7 (70%)

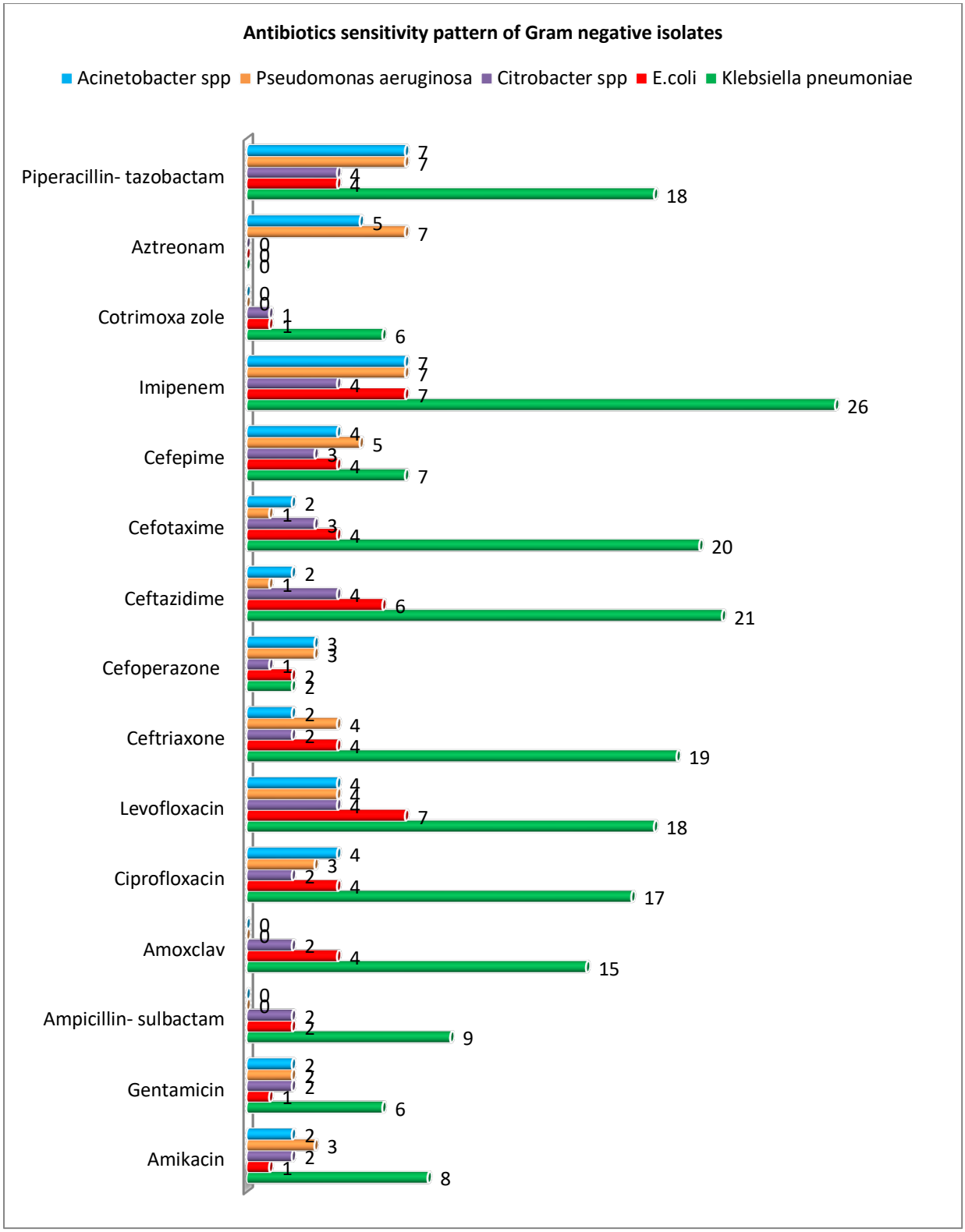

Figure 3: Antibiotics sensitivity pattern of Gram negative isolates

Discussion

Present microbial profile of Neonatal sepsis in Eastern Maharashtra. Out of 196 blood cultures, 134 (68.3%) were gram-positive isolates.

Among them, 104 (53%) were S. aureus, 21 (10%) CoNS, 9 (4.59%) Enterococcus spp., 56 (28.5%) Gram-negative isolates, Consists: 7 (3.5%) E. coli, 26 (13.2%) Klebsiella pneumoniae, 10 (5.1%) Acinetobacter spp., 4 (2%) Citrobacter spp., 9 (4.5%) P. aeruginosa, yeast had 4 (3%) Candida spp. (Table 1). In antibiotic sensitive patterns of Linezolid, Pristinomycin, and Vancomycin had 100% sensitivity (Table 2). In antibiotic sensitivity pattern of

gram-negative isolates: Imipenem 100% in K. pneumoniae, E. coli, Citrobacter spp. , and Levofloxacin 100% sensitivity in E. coli, Citrobacter spp. (Table 3). Gram negative isolates had more sensitive drugs than gram positive isolates. These are more or less in agreement with previous studies [5,6,7].

It is reported that, if the venipuncture site had been carefully cleansed, the growth of coagulase negative staphylococci (CoNS) in the blood culture of a specimen of premature neonates indicated bacteremia rather than skin in the vast majority of cases [8]. It is also confirmed that two amino glycosides, Amikacin and Gentamicin, have sensitivity for both gram positive and gram negative organisms [9].

The culture positivity rate was 68.3%. Though blood culture is the confirmatory test for septicemia, it is negative in a significant number of newborns showing clinical features of septicemia, Klebesilla spp. remains the most important pathogen in the infancy of our country [10]. Causing septicemia in infants is the selective pressure of antimicrobial agents so that; the resistant microorganisms tend to colonize and proliferate in neonates [11]. In the present study, Klebesiella with resistance to many antimicrobial agents was found to be the most frequent causative agent of septicemia [12].

Summary and Conclusion

The present study of the microbial profile of neonates with septicemia in Eastern Maharashtra highlights the variable nature of antibiotic susceptibility patterns in time and location around different geographical areas. These findings suggest that neonatal septicemia cannot be tackled with antibiotic therapy alone, but overall neonatal care has to be improved.

The emergence of multidrug resistant organisms also points to the importance of antibiotic policies for the neonatal intensive care unit. The high incidence of nosocomial pathogens underscores the need for an effective infection policy to prevent nosocomial transmission in neonates. Emphasis on preventing or minimizing the risk factors for septicemia will help to achieve reduction in its incidence. In addition, treating the neonates symptomatically for the conditions associated with high mortality in neonatal septicemia is mandatory.

Limitation of Study: Owing to tertiary location of the research center, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

This research work has been approved by the ethical committee of Indira Gandhi Government Medical College and Hospital, Nagpur, Maharashtra-440018.

References

1. Chaurasia S, Sivanadan S: Neonatal sepsis in South Asia: huge burden and spiraling antimicrobial resistance BM J. 2019, 364; 5314.
2. Shane AL, Sanchez PJ: Neonatal sepsis Lancet 2017, 390; 1770-1780.
3. Popescu CR, Cavanagh MMM: Neonatal sepsis in low income countries: lepidemiology, diagnosis, and prevention. Expert Rev. Anti. Infect Ther. 2020, 18; 443-452.
4. Murthy S, Godinho MD: Risk factors of neonatal sepsis in India; A systemic review and meta-analysis, PlOS One 2019, 14(4); e0215683.
5. Zaidi AK, Huskins WC: Hospital acquired neonatal infections in developing countries Lancet 2005, 365 (9465); 1175-1188.
6. Jajoo M, Manchanda V: Alarming rates of anti-microbial resistance and fungal sepsis in outborn neonates in North India, Plos. One 2018, 13(6); e180705.
7. Desia DKJ, Male K DSS: Neonatal septicemia; Bacterial isolates and their antibiotic susceptibility patterns NTIRM 2010, 1 (3); 12-15.
8. Hammerberg O., Blalkowska Hobrzanska H: Epidemiology and antibacterial susceptibility pattern of bloodstream infections Pak. J. of Biol. Science 2018, 11; 422-7.
9. Kaistha N, Mehta M: Neonatal septicemia isolates and resistant patterns in a tertiary care hospital in North India J. infect Dev. ctries. 2010, 4 (1); 55-77.
10. Iregbu KC, Elegba OY: Bacteriological profile of neonatal septicemia in a tertiary care hospital in Nigeria: Afr. Health Science 2006, 6 (3); 151-4.
11. Gupta P, Murali MV, Farida MMA: Clinical profile of klebsielta septicemia in neonates, Ind. J. of Pediatrics 1993, 60; 565-72.
12. Singh M: Care of the newborn, 4th edition, New Delhi sagar publication 1991, 168-74.