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Original Article

Bacteriological Profile and Antimicrobial Susceptibility Pattern of Isolates from Sterile Body Fluids in a Tertiary Care Hospital

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ABSTRACT

Background: Body fluids such as cerebrospinal, pleural, peritoneal, pericardial, and synovial fluids are normally sterile. Infections of these sites lead to significant morbidity and mortality. Early bacteriological identification and antimicrobial susceptibility profiling are essential for effective patient management. **Aim**: To determine the bacteriological profile and antimicrobial susceptibility pattern of isolates from sterile body fluids at a tertiary-care hospital.
Materials and Methods: This retrospective laboratory-based observational study was conducted in the Department of Microbiology, Government Mohan Kumaramangalam Medical College Hospital (GMKMCH), Salem, Tamil Nadu, from June 2020 to March 2021. Four hundred sixty-five body-fluid samples were processed by standard microbiological procedures. Antimicrobial susceptibility testing was performed by the Kirby–Bauer di sk-diffusion method and interpreted as per CLSI 2020 guidelines. **Results**: Of 465 samples, 99 (21.3 %) showed growth. Pseudomonas aeruginosa (24.2 %) was the most common isolate, followed by Klebsiella spp. (23.2 %), Acinetobacter spp. (17.2 %), and Staphylococcus aureus (17.2 %). MRSA prevalence was 23.5 %. Gram-negative isolates exhibited highest sensitivity to carbapenems and piperacillin–tazobactam, while Gram-positives were 100 % sensitive to linezolid and vancomycin. **Conclusion**: Gram-negative bacilli predominated among isolates from sterile body fluids. Continuous surveillance of local antimicrobial trends is vital for guiding empirical therapy and antibiotic-stewardship policies.

Keywords: *Sterile body fluids, bacteriological profile, antimicrobial susceptibility, MRSA, gram negative.*

INTRODUCTION

Body fluids play a substantial role in transporting nutrients, regulating body temperature, and aiding respiration (Abdinia et al.). Normally sterile fluids such as cerebrospinal, pleural, peritoneal, synovial, and pericardial fluid can become infected by microorganisms—bacteria, fungi, viruses, or parasites—leading to severe morbidity and mortality (Deb et al.; Hasbun et al.). Early detection and identification of pathogens are essential for proper management and reduced hospital stay (Sujatha et al.). Common pathogens include Escherichia coli, Klebsiella spp., Haemophilus influenzae, Staphylococcus aureus, Neisseria meningitidis, Pseudomonas spp., and Acinetobacter spp. Because these infections are medical emergencies, regular monitoring of local antibiograms is essential for effective empirical therapy and public-health antibiotic policies.

MATERIALS AND METHODS

Study Design and Duration: This cross-sectional study was conducted in the Department of Microbiology, Government Mohan Kumaramangalam Medical College Hospital (GMKMCH), Salem, Tamilnadu from June 2020 to April 2021. **Sample Collection:** A total of 465 sterile body fluid samples including cerebrospinal, pleural, peritoneal, synovial, and pericardial fluids were collected using strict aseptic precautions and transported within two hours. **Culture and Identification:** Samples were inoculated on Blood agar, MacConkey agar, and Chocolate agar plates and incubated at

37°C for 24–48 hours. Bacterial identification was performed using Gram staining, colony morphology, and standard biochemical reactions such as oxidase, indole, citrate, urease and triple sugar iron test. **Antimicrobial Susceptibility:** Antibiotic sensitivity testing was carried out using the Kirby–Bauer disk diffusion technique on Mueller–Hinton agar as per CLSI 2020 guidelines.

Quality Control: Reference ATCC strains—E. coli 25922, Staphylococcus aureus 25923, and Pseudomonas aeruginosa 27853 were employed as ATCC.
Data Analysis: Data were analyzed using Microsoft Excel 2021 and presented as percentages.

Ethics: Institutional Ethical Committee approval was obtained prior to commencement of the study. Ethical clearance was obtained from the Institutional Ethics Committee.

Inclusion criteria included all body-fluid samples received from admitted patients with suspected infection, irrespective of age or sex. **Exclusion criteria** excluded blood samples, patients with recent antibiotic therapy (within two weeks), contaminated samples, and samples delayed beyond two hours after collection.

Each specimen was examined microscopically (Gram stain) and cultured on blood agar, MacConkey agar, and chocolate agar. Bacterial identification was performed by stan biochemical tests (Collee et al.). Susceptibility testing was performed using the Kirby–Bauer disk-diffusion method on Mueller-Hinton agar and interpreted as per CLSI 2020 guidelines.

Out of 465 processed samples, 99 (21.3%) exhibited bacterial growth. Gram-negative organisms predominated, particularly Pseudomonas aeruginosa, Klebsiella species, Acinetobacter species, and Escherichia coli. Gram-positive isolates included Staphylococcus aureus and coagulase-negative Staphylococci (CONS). Lactose-fermenting isolates demonstrated excellent sensitivity to β-lactam/β-lactamase inhibitor combinations and carbapenems, whereas non-fermenting isolates exhibited varying resistance patterns.

Table 1 & Figure 1: Growth pattern of body fluids

Sample type	Total number of samples	Growth (%)	No Growth (%)
Pleural fluid	218	45 (21%)	173 (79%)
Ascitic fluid	146	41(28%)	105 (72%)
Cerebrospinal fluid	79	08 (10%)	71 (90%)
Synovial fluid	12	04 (33%)	08 (67%)
Pericardial fluid	08	00 (00%)	08 (100%)
Bile	02	01 (50%)	01 (50%)
Total	**465**	**99 (21%)**	**366 (79%)**

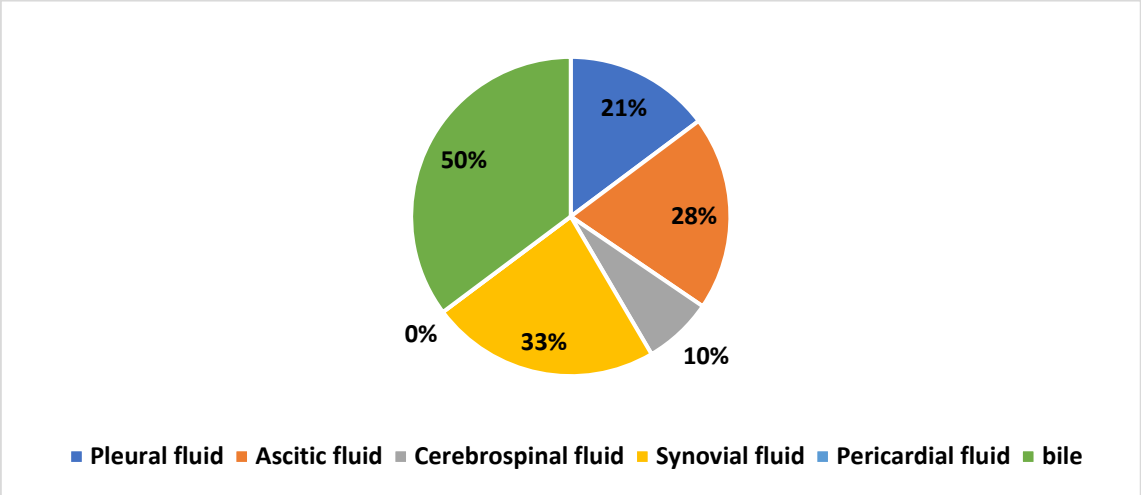


Table 2 & Figure 2: Bacterialogical profile of different body fluid samples

Organisms	Total 465(99)	Pleural fluid 218 (45)	Ascitic fluid 146 (41)	Cerebrospinal fluid 79 (08)	Synovial fluid 12 (04)	Pericardial fluid 08 (00)	Bile 02 (01)
Klebsiella spp	23	09	11	02	-	-	01
E.coli	08	01	05	02	-	-	-
Pseudomonas spp	24	16	08	-	-	-	-

Acinetobacter spp	17	09	05	03	-	-	-
Citrobacter spp	02	02	-	-	-	-	-
Staph aureus	17	06	06	01	04	-	-
CONS	07	02	05	-	-	-	-
Streptococcus spp	01	-	01	-	-	-	-

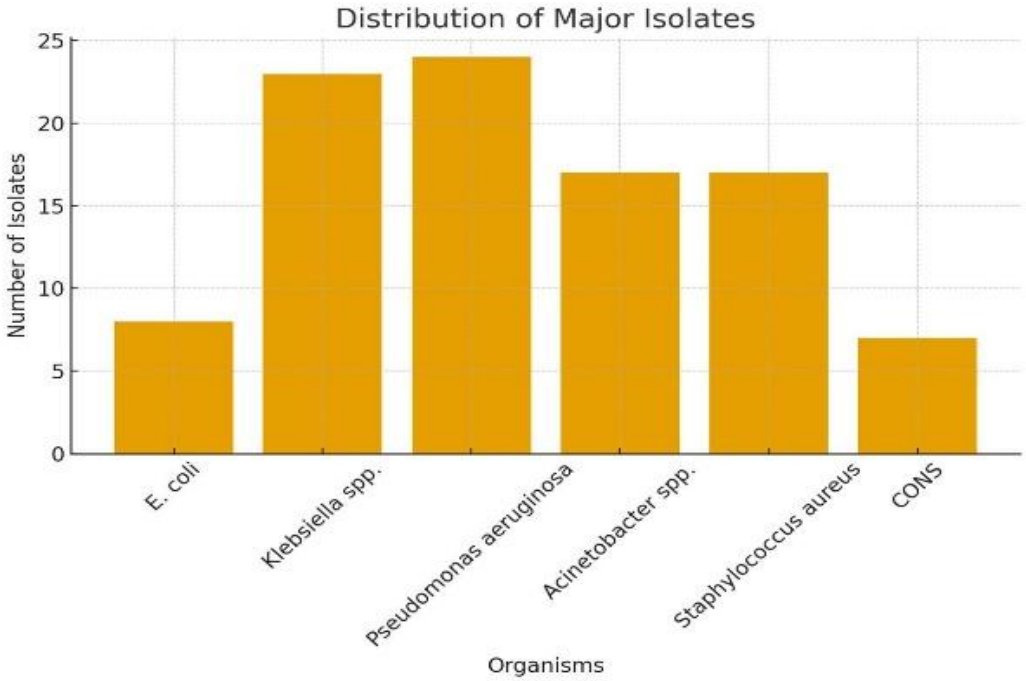


Table 3: Antibiotic susceptibility pattern of Gram negative bacteria (GNB). (N = 33)

Antibiotics	**Klebsiellaspp n=23**	**E. coli n = 8**	**Citrobacterspp n = 2**
Ampicillin	5%	7%	18%
Amoxycillin clavulanic acid	42%	47%	62%
Amikacin	74%	85%	92%
Gentamicin	72%	84%	90%
Ciprofloxacin	26%	27%	33%
Ceftriaxone	33%	35%	46%
Cefotaxime	36%	34%	48%
Piperacillin Tazobactam	98%	100%	100%
Cefoperazonesulbactam	96%	98%	100%
Imepenem	100%	100%	100%
Meropenem	100%	100%	100%
Cotrimoxazole	33%	50%	70%
Doxycycline	96%	100%	100%

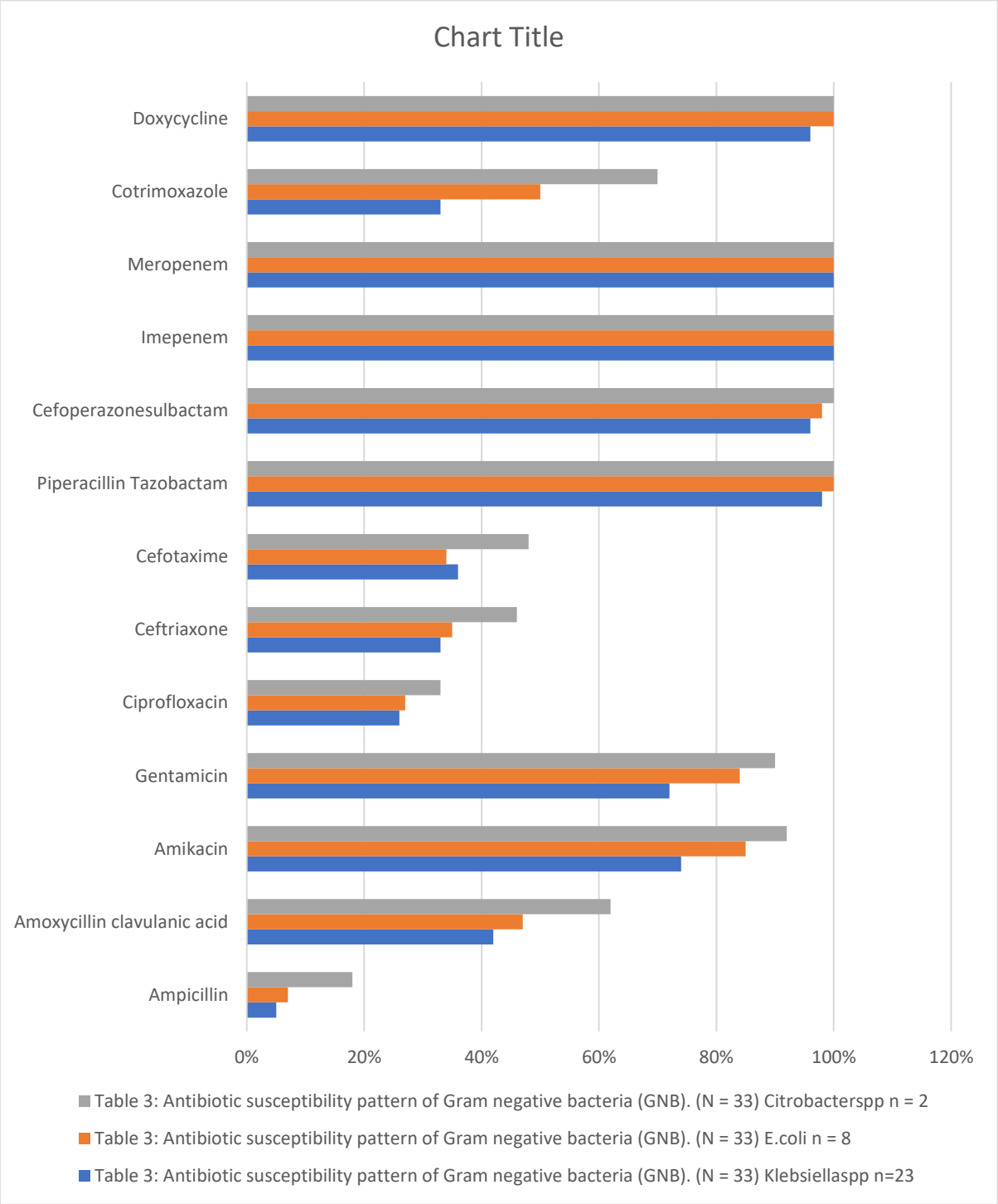


Table 4: Antibiotic susceptibility pattern of Non Fermenting Gram negative bacteria (NFGNB). (N = 41)

Antibiotics	**Pseudomonas spp n = 24**	**Acinetobacterspp n = 17**
Ampicillin	ND	5%
Amoxycillin clavulanic acid	ND	30%
Amikacin	96%	94%
Gentamicin	83%	76%
Ciprofloxacin	50%	53%
Ceftriaxone	ND	32%
Cefotaxime	ND	32%
Ceftazidime	28%	30%
Piperacillin Tazobactam	92%	88%
Cefoperazonesulbactam	88%	82%

Imepenem	96%	96%
Meropenem	94%	94%
Cotrimoxazole	ND	62%

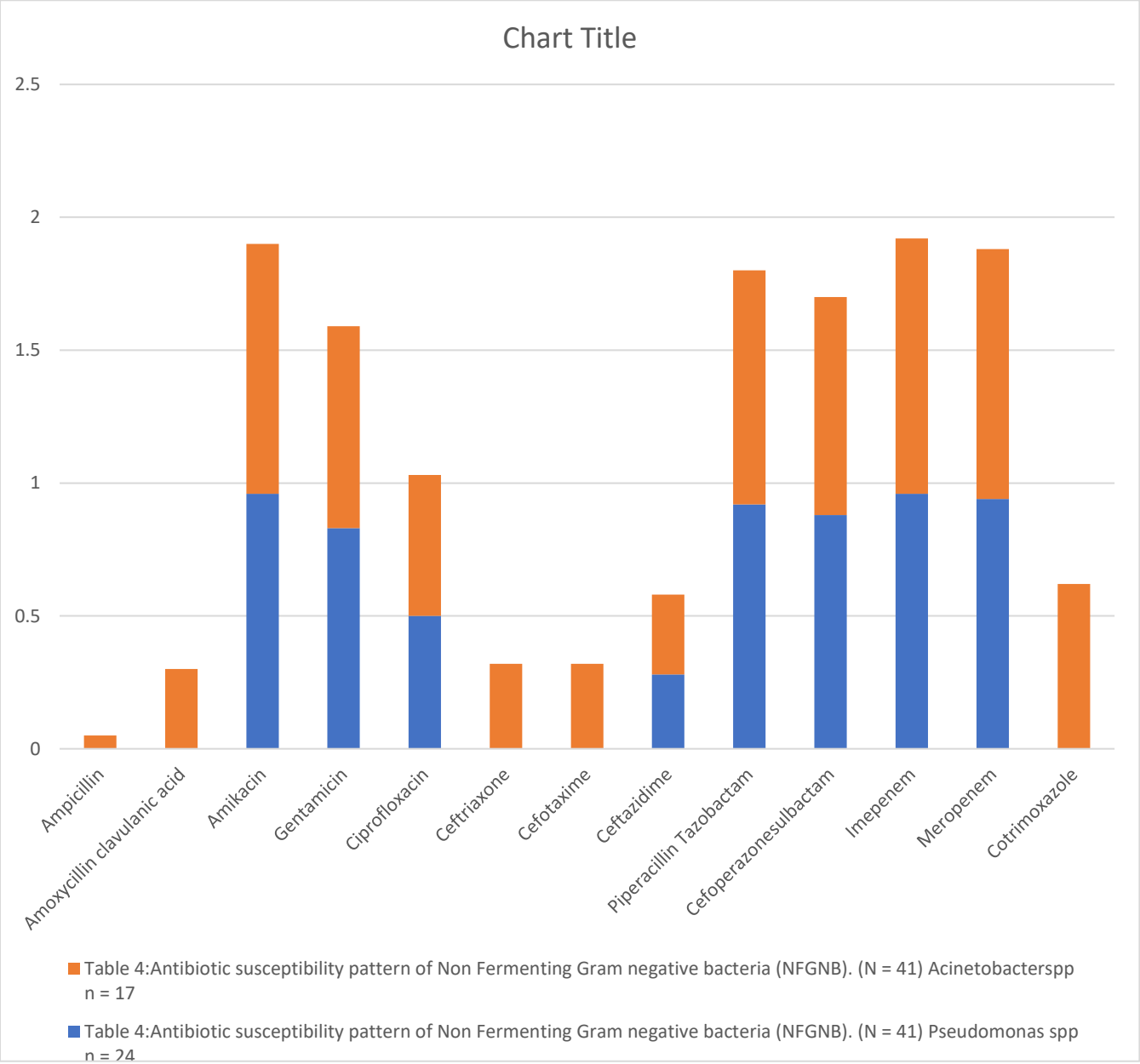
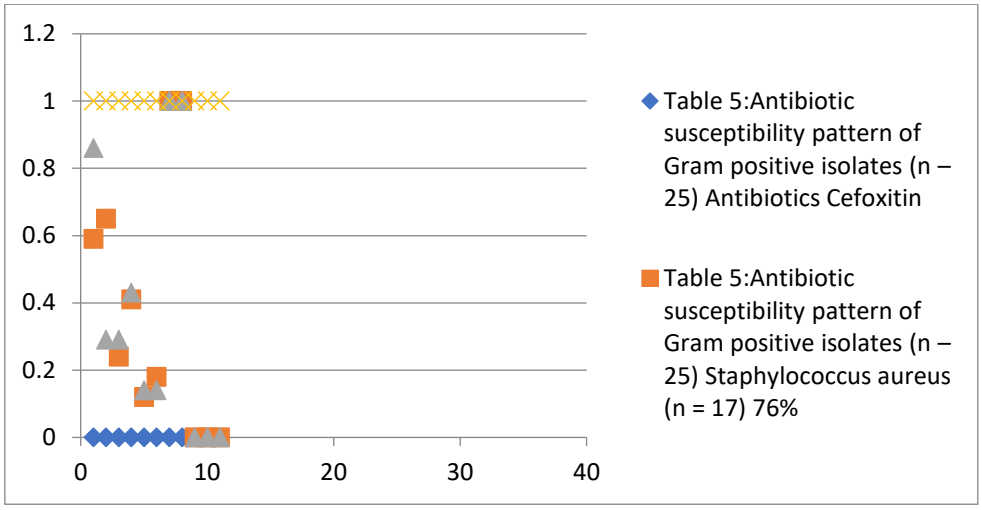


Table 5 & Figure 5: Antibiotic susceptibility pattern of Gram-positive isolates (n – 25)

Antibiotics	Staphylococcus aureus (n = 17)	CONS (n = 7)	Streptococcus spp (n = 1)
Cefoxitin	76%	100%	ND
Gentamicin	59%	86%	100%
Ciprofloxacin	65%	29%	100%
Cotrimaxazole	24%	29%	100%
Doxycycline	41%	43%	100%
Erythromycin	12%	14%	100%
Clindamycin	18%	14%	100%
Vancomycin	100%	100%	100%
Linezolid	100%	100%	100%
Ampicillin	-	-	100%
Amoxyclav	-	-	100%
Cefotaxime	-	-	100%



DISCUSSION

The overall culture positivity rate of 21.3 % was consistent with studies by Sharma et al., Harshika et al., and Vishalakshi et al., who reported positivity between 20–30 %. Pseudomonas aeruginosa was the predominant isolate, aligning with findings of Harshika et al. and Sharma et al. Klebsiella spp. and Acinetobacter spp. were next most frequent, similar to reports by Vishalakshi et al. and Abdinia et al. S. aureus and CONS isolation patterns correlated with Sujatha et al. and Deb et al. All Gram-positive isolates remained 100 % sensitive to vancomycin and linezolid. Carbapenems and piperacillin-tazobactam retained the highest activity among Gram-negative isolates. These trends emphasize the need for ongoing surveillance to guide empirical antimicrobial therapy.

CONCLUSION

Gram-negative bacteria remain the predominant pathogen among sterile body-fluid isolates, with Pseudomonas aeruginosa being the most common organism. Carbapenems and β-lactam/β-lactamase inhibitor combinations remain effective empirical treatment options while resistance to cephalosporins and fluroquinolones is rising. Continuous surveillance of local bacteriological profiles and antimicrobial patterns is essential for rational antibiotic therapy and stewardship

Ethical Clearance

Obtained from Institutional Ethics Committee, GMKMCH, Salem.

Acknowledgement

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