



A retrospective study to analyse antibiotic resistance pattern amongst IPD patients in a tertiary care hospital of eastern INDIA, KOLKATA

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Abstract:

Introduction: Antimicrobial resistance has become a recognized "worldwide menace." As indicated in a newly issued report from the World Health Organization, it was revealed that around 700,000 individuals succumb annually as a result of infections that do not respond to drugs. So the aim of this study was antibiotic resistance pattern amongst IPD patients in a tertiary care hospital.

Methodology: In this study we included 1090 total cases. Among all 322 cases were positive growth rests were negative. Positive cases were further proceed to culture and sensitivity test. This study was conducted in Department of Microbiology at ESIC Medical College and Hospital, Joka, Kolkata. The duration of study was over a period of two year.

Result: We noted that the highest number of cases were associated with urine, followed by pus, ET, blood, sputum, vaginal swab, wound, and CSF. Among the 322 cases of positive growth, 68 were attributed to gram-positive bacteria, with the remainder being gram-negative. Escherichia coli was the most prevalent pathogen, followed by MRSA, Klebsiella spp., ACB complex, Pseudomonas, Enterococcus, MRCONS, CONS, and other gram-negative bacteria.

Conclusion: It can be concluded that utilization of antibiogram studies can assist in the appropriate selection of antibiotics for treatment, monitoring local patterns of antibiotic resistance, and pinpointing opportunities for enhancing antimicrobial stewardship and educational efforts.

Keywords: *Antimicrobial resistance, antimicrobial stewardship, MDRO*

Introduction:

Antimicrobial resistance has become a recognized "worldwide menace." As indicated in a newly issued report from the World Health Organization, it was revealed that around 700,000 individuals succumb annually as a result of infections that do not respond to drugs.¹ Multidrug-resistant organisms (MDROs) give rise to a diverse range of clinical infections, thereby imposing a substantial load on healthcare systems. This burden manifests through prolonged patient hospitalizations, elevated healthcare costs, heightened morbidity, and increased mortality rates.² The emergence of antimicrobial resistance is a dynamic process, and effectively controlling it necessitates regular and up-to-date evaluations of the susceptibility patterns of pathogens to antimicrobials.³ The resistance patterns exhibited by various microorganisms differ across different regions of the world, a phenomenon significantly influenced by the judicious use of antimicrobials in those areas. The utilization of antimicrobial agents tends to be less regulated in developing nations such as India.⁴ This is partly attributed to the unrestricted availability of antibiotics as over-the-counter medications, a lack of awareness regarding antibiotic resistance among healthcare professionals, uncontrolled employment of antibiotics in other sectors such as animal sciences, and a scarcity of research focusing on microbial surveillance and patterns of antibiotic resistance across a diverse range of infections. Regularly monitoring the local trends in antibiotic resistance is crucial as it enables the timely identification of

shifts in susceptibility. Additionally, this practice serves as a foundation for making decisions related to empirical therapy, formulary selections, and strategies for infection control.⁵Continuously updating the data on antimicrobial resistance patterns across different parts of the world can play a pivotal role in preventing the emergence of "superbugs." Consequently, studies examining antibiotic resistance have the potential to furnish guidelines for appropriately tailored empirical antimicrobial treatment, especially in countries grappling with a substantial burden of drug resistance.

Material & Methods

Study Population:- In this study we included 1090 total cases. Among all 322 cases were positive growth rests were negative.

Study Area:- This study was conducted in Department of Microbiology at ESIC Medical College and Hospital, Joka, Kolkata.

Study Duration: The duration of study was over a period of two year.

Data collection:- All Sample were collected aseptically and transported to Microbiology laboratory for culture and susceptibility testing. Culture was done on Blood Agar and MacConkey Agar and Antimicrobial susceptibility testing was done by using CLSI guidelines.

Data Analysis:- Data was analysed by using Microsoft excel.

Result:

In this study, we incorporated a total of 1090 IPD cases. Out of these cases, 768 exhibited negative growth, while 322 displayed positive growth. We noted that the highest number of cases were associated with urine, followed by pus, ET, blood, sputum, vaginal swab, wound, and CSF. Among the 322 cases of positive growth, 68 were attributed to gram-positive bacteria, with the remainder being gram-negative. Escherichia coli was the most prevalent pathogen, followed by MRSA, Klebsiella spp., ACB complex, Pseudomonas, Enterococcus, MRCONS, CONS, and other gram-negative bacteria.

Our investigation delved into the resistance and susceptibility patterns of individual organisms. Regarding Staphylococcus spp., penicillin exhibited complete resistance, followed by oxacillin, Ciprofloxacin, and other antibiotics. For Enterococcus spp., we identified resistance to ciprofloxacin, levofloxacin, and erythromycin. Escherichia coli displayed resistance to cefuroxime and ceftriaxone, in addition to ciprofloxacin. Similarly, Klebsiella spp. demonstrated resistance patterns against cefuroxime, ceftriaxone, and ciprofloxacin. Notably, Acinetobacter spp. displayed a more pronounced resistant pattern. Colistin demonstrated intermediate effectiveness in Acinetobacter spp., while amikacin and gentamycin displayed resistance in the majority of pseudomonas spp. cases.

Table :1Distribution of cases according to growth

POSITIVE GROWTH	322
NEGATIVE GROWTH	768
TOTAL	1090

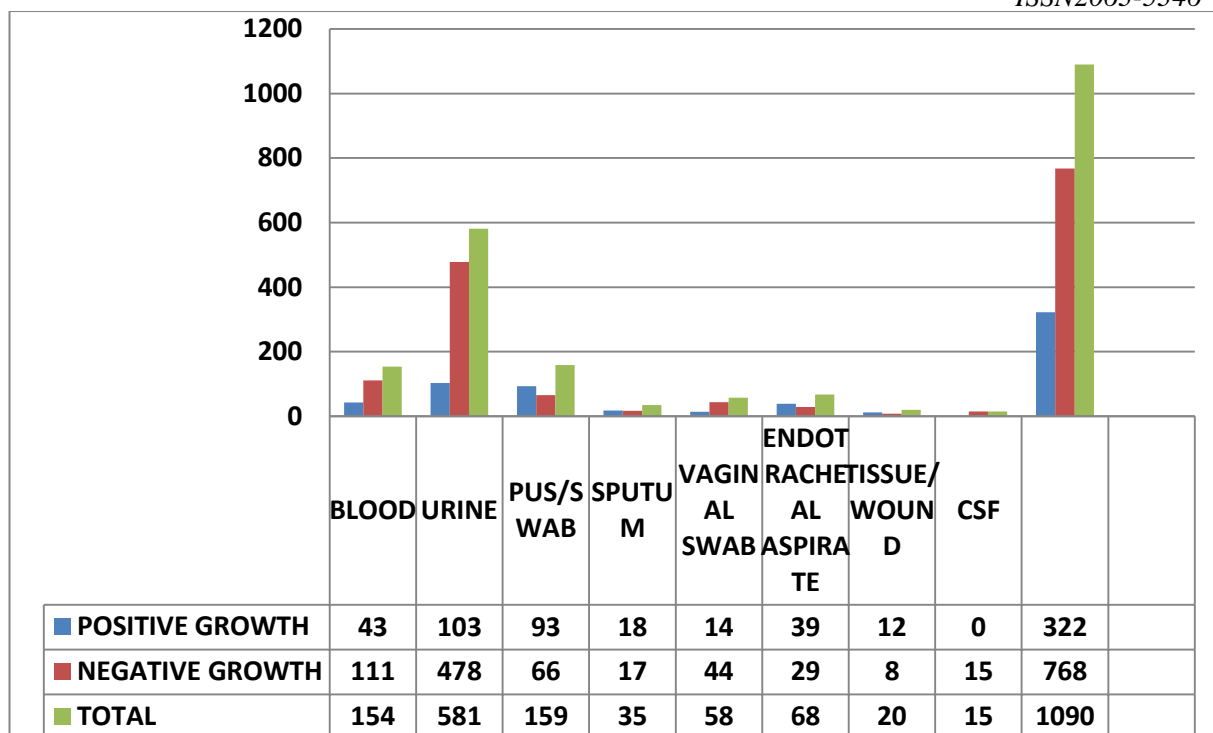


Chart:1 Distribution of cases according to samples

Table:2 Distribution of cases according to isolated organisms

Isolated organism	No.
MRSA	52
MRCONS	12
CONS	4
ACB complex	39
Enterococcus spp	27
Escherichia coli	85
Klebsiellaspp	47
Pseudomonas	30
Other gram negative bacteria	26
	322

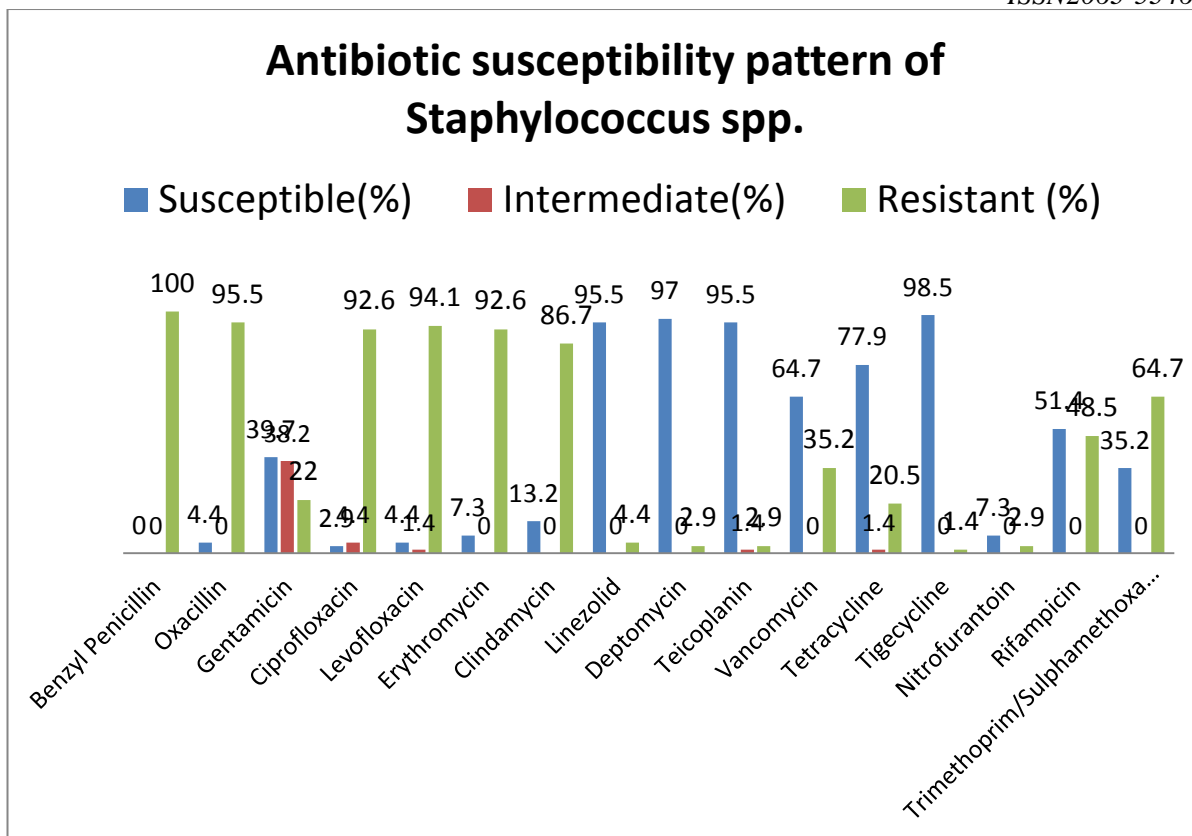


Chart :2 Antibiotic pattern of Staphylococcus spp.

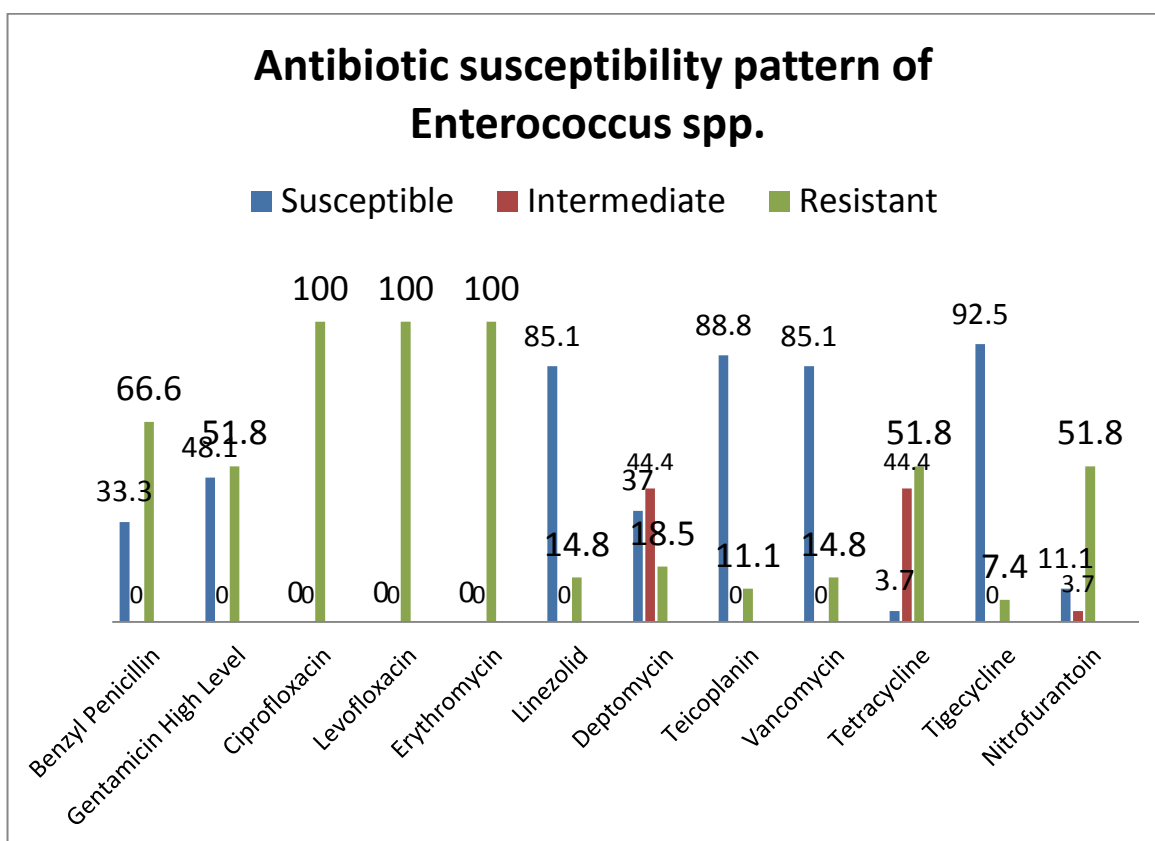


Chart :3 Antibiotic susceptibility pattern of Enterococcus spp

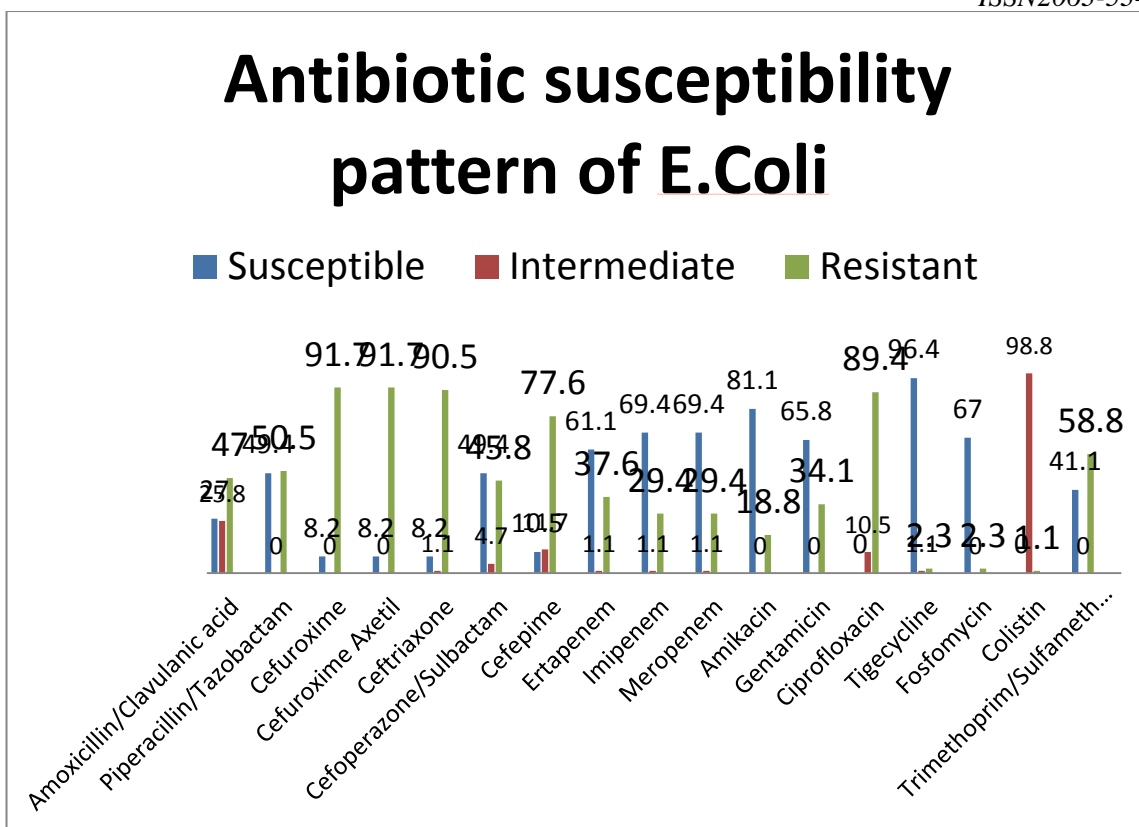


Chart:4 Antibiotic susceptibility pattern of Escherichia coli

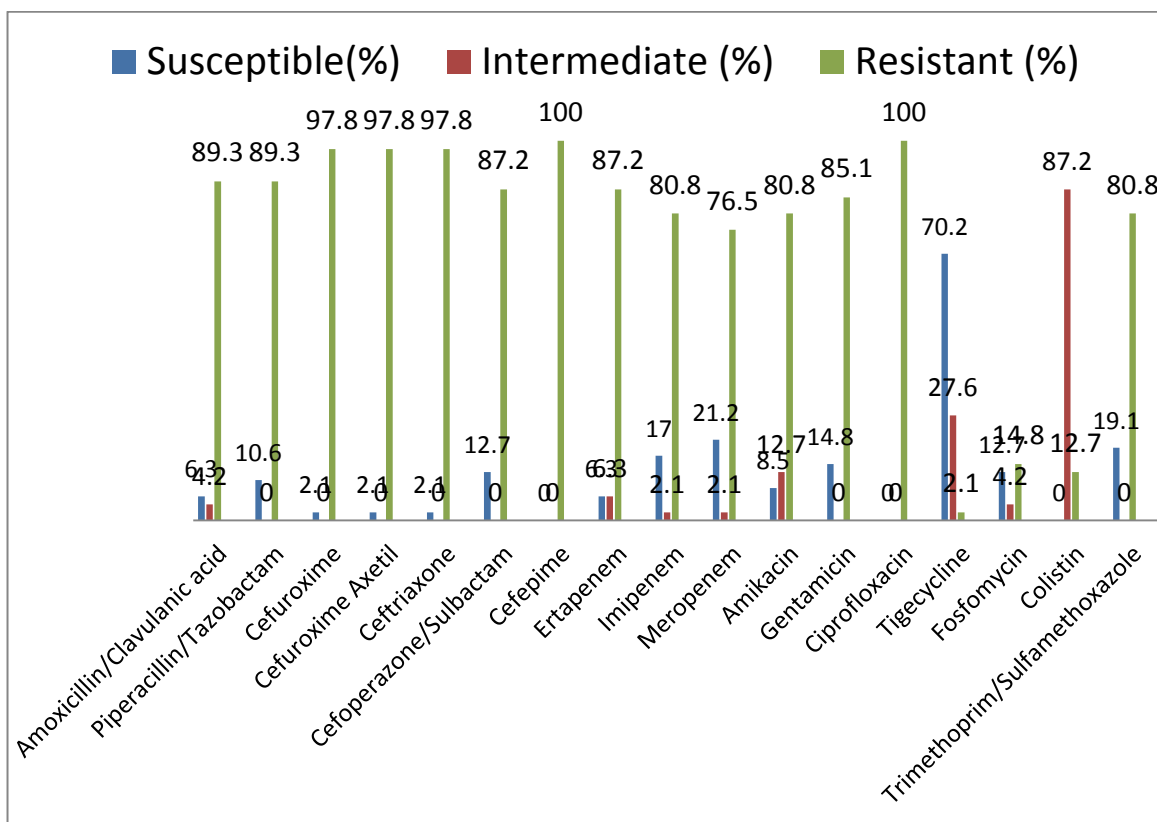


Chart:5 Antibiotic susceptibility pattern of Klebsiella spp

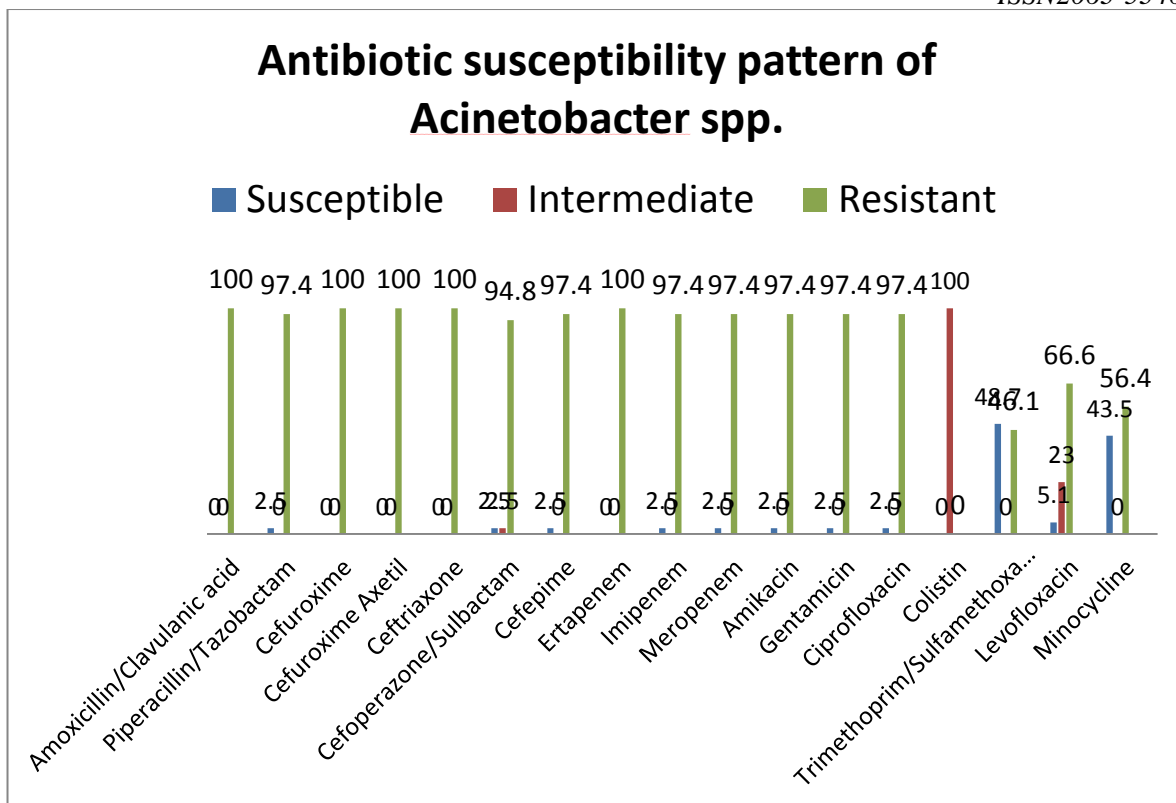


Chart: 6 Antibiotic susceptibility pattern of *Acinetobacter* spp.

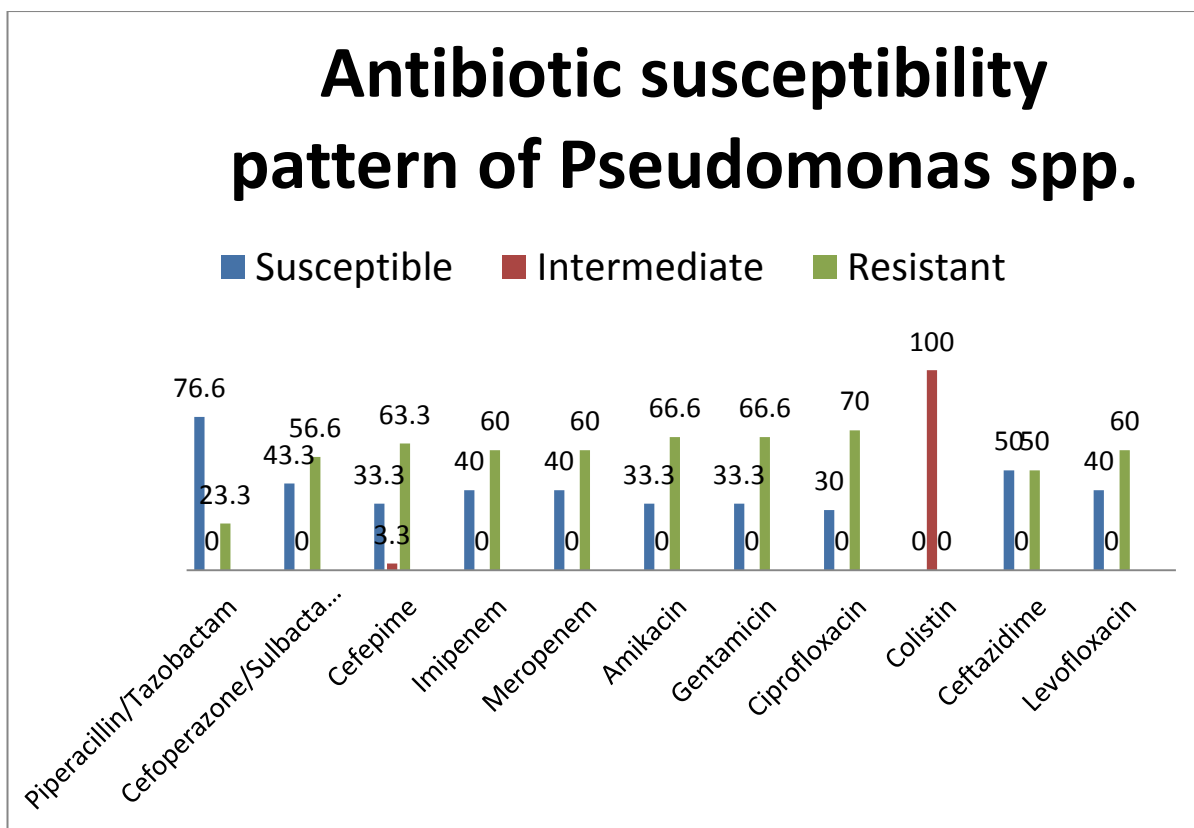


Chart: 7 Antibiotic susceptibility pattern of *Pseudomonas* spp.

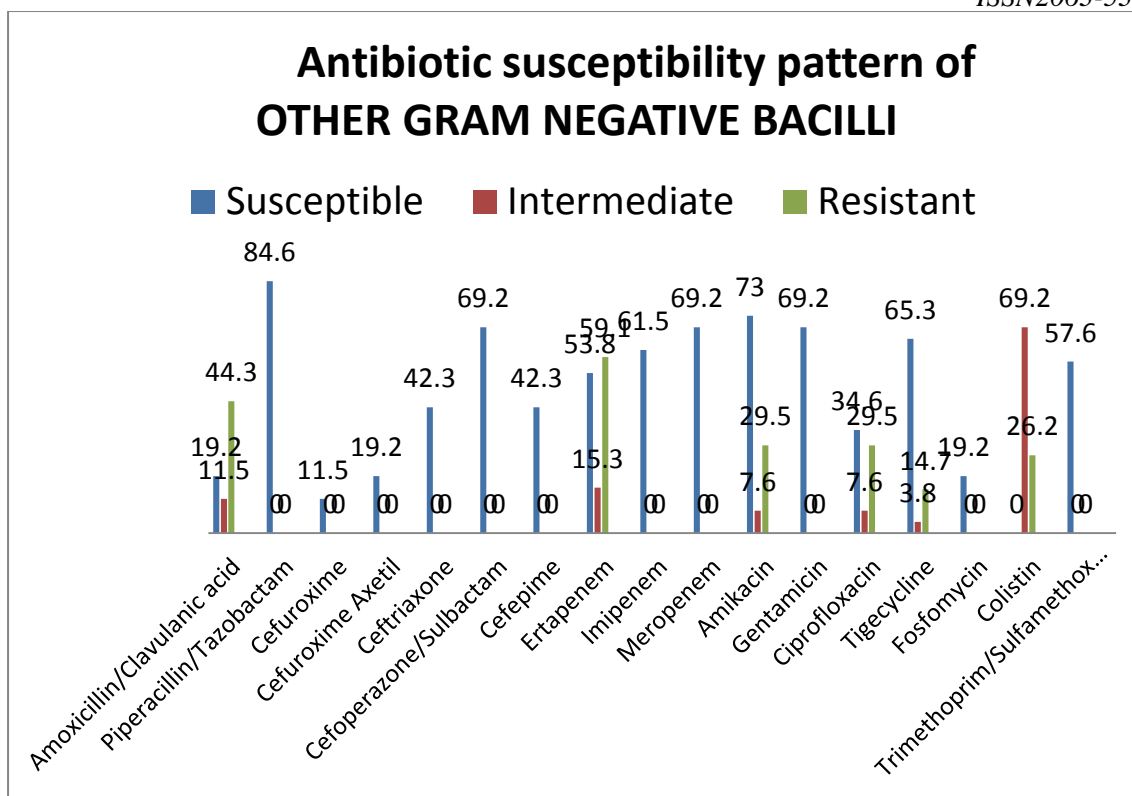


Chart:8 Antibiotic susceptibility pattern of Other gram negative bacilli

Discussion

Antimicrobial resistance (AMR) stands as a worldwide public health challenge, demanding collaborative efforts across various domains to address it effectively. The lack of comprehensive data on prevalence rates due to inadequate or absent antimicrobial surveillance systems, coupled with limited resources for conducting antimicrobial susceptibility testing, underscores the global significance of AMR **6**. Existing literature underscores the prevalence of multidrug resistance in both gram-negative and gram-positive bacterial pathogens, which contribute to common infections, regardless of their origin in community or hospital settings **6,7**. Embracing the One Health paradigm, which emphasizes holistic considerations and actions at the interfaces of animals, humans, and ecosystems, becomes crucial for tackling this issue. Policymakers and stakeholders should offer wholehearted support to this approach. Consequently, this study seeks to assess the antibiotic resistance patterns of pathogens obtained from cases of IPD.

This study encompassed a total of 1090 cases of IPD. Among these cases, 768 presented negative growth, while 322 showed positive growth. Notably, urine cases constituted the highest number, followed by pus, ET, blood, sputum, vaginal swab, wound, and CSF. Among the 322 cases of positive growth, 68 were attributed to gram-positive bacteria, with the remaining cases being gram-negative. The prevailing pathogen was *Escherichia coli*, succeeded by *MRSA*, *Klebsiella* spp., *ACB* complex, *Pseudomonas*, *Enterococcus*, *MRCONS*, *CONS*, and other gram-negative bacteria. Our investigation centered on examining the resistance and susceptibility patterns of individual organisms. *Staphylococcus* spp. displayed complete resistance to penicillin, followed by oxacillin, Ciprofloxacin, and other antibiotics. Resistance to ciprofloxacin, levofloxacin, and erythromycin was identified in *Enterococcus* spp. *Escherichia coli* exhibited resistance to cefuroxime, ceftriaxone, and ciprofloxacin. Similarly, *Klebsiella* spp. demonstrated resistance to cefuroxime, ceftriaxone, and ciprofloxacin. Notably, *Acinetobacter* spp. exhibited a more pronounced resistance pattern. Colistin displayed intermediate effectiveness in *Acinetobacter* spp., while amikacin and gentamycin showed resistance in the majority of *pseudomonas* spp. cases.

Other studies have noted a higher prevalence of blood and urine specimens among female patients. The most frequently isolated bacterium was *S. aureus*, trailed by *E. coli*, *E. agglomerans*, *K. pneumoniae*, MR-CONS, and *K. oxytoca*.⁸

Another finding indicated that ampicillin displayed the lowest efficacy, followed by penicillin, cotrimoxazole, oxacillin, erythromycin, nalidixic acid, cefuroxime, and tetracycline. Conversely, the most effective antibiotics were norfloxacin, imipenem, and clindamycin (28.6%). The presence of multidrug-resistant strains was notable among IPD specimens, underscoring the need for a comprehensive assessment of antibiotic susceptibility patterns for nosocomial pathogens. The prevalence of gram-negative HAI and carbapenem-resistant pathogens has been documented globally ^{9,10}, with cases on a steady rise, posing challenges to the cost-effective management of HAIs. In light of this, the implementation of antimicrobial stewardship programs ^{11,12} is imperative.

Hospital-acquired infections (HAIs) present significant safety concerns for both healthcare providers and patients ¹². These infections typically arise post hospitalization and become evident within 48–72 hours of admission. Although our study's retrospective nature made it challenging to definitively classify infections as hospital-acquired, we aimed to glean insights into the levels of bacterial resistance in IPD cases.

Conclusion

In summary, our investigation has unveiled the percentage of antibiotic resistance among commonly isolated bacteria and underscored the significance of regular monitoring of antibiotic resistance trends within medical facilities. The utilization of antibiogram studies can assist in the appropriate selection of antibiotics for treatment, monitoring local patterns of antibiotic resistance, and pinpointing opportunities for enhancing antimicrobial stewardship and educational efforts.

Consequently, there is a need for additional research to establish the prevalence of bacteria producing ESBL and carbapenemase enzymes, with the aim of reconfiguring empirical therapy approaches. This is essential because having access to data on the susceptibility of common bacterial strains to antimicrobials is a critical factor in making informed decisions and rapidly identifying antimicrobial resistance at the hospital level.

Furthermore, the identification of specific hospital departments and clinics grappling with significant antibiotic resistance burdens can offer valuable insights for devising effective strategies for preventing infections. It's important to note that our study did not establish this aspect.

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