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A STUDY OF SUSCEPTIBILITY PATTERN OF MEROPENEM AND IMIPENEM IN RESPECT TO GRAM NEGATIVE BACILLI ISOLATES FROM VARIOUS CLINICAL SAMPLES AT TERTIARY CARE CENTRE IN WESTERN RAJASTHAN OF INDIA

Clinical Microbiology

Dr Mohammed Imran PG Resident, Department of Microbiology, Dr S.N. Medical College, Jodhpur, Rajasthan, India. * Corresponding Author

Dr Divya Agrawal PG Resident, Department of Microbiology, Dr S.N. Medical College, Jodhpur, Rajasthan, India.

Dr R.S.Parihar Senior Professor, Department of Microbiology, Dr S.N. Medical College, Jodhpur, Rajasthan, India.

Dr Mukesh Sharama Assistant Professor, Department of Microbiology, Dr S.N. Medical College, Jodhpur, Rajasthan, India.

ABSTRACT

Aim: To study the susceptibility amongst Gram negative bacteria against imipenem and meropenem. **Study Design:** Prospective, non-randomized, descriptive study. **Place and Duration of Study:** Department of Microbiology, Umaid hospital, Jodhpur from 1stJuly 2025 to 30 September 2025(3 months). **Methodology:** 259 culture samples received, bacteria isolated and their susceptibilities to imipenem and meropenem were compared. Organisms were recognized by the microbiological techniques according to the current standards and susceptibility testing was done according to the guidelines of Clinical and Laboratory Standards Institute (CLSI) 2026 by using Kirby Bauer Disc diffusion method. **Results:** E.coli (38.9%), Acinetobacter (14.2%), Klebsiella (9.6%), Pseudomonas (7.3%), Proteus (1.54%) and Citrobacter species (1.15%) were isolated. **Conclusion:** The imipenem is highly resistant in all the bacteria as compared to meropenem.

KEYWORDS

Meropenem , Imipenem, Gram Negative Bacilli, Antibiotic Stewardship

INTRODUCTION

Carbapenem drugs are the most valuable drugs for treating multi-drug resistant Gram-negative bacteria MDR-GNB infections and have been used for the past 10 years. However, there has been a significant growth of carbapenem-resistant organisms that cause severe damage to public health.[1,2]

These carbapenems, which include meropenem, ertapenem, and imipenem, are β-lactam antibiotics that possess a β-lactam ring and have a wide range of activity and great usefulness. These antibiotics are used as a last line of defense for treating infections caused by MDR-GNBs as well as organisms that produce extended-spectrum β-lactamases, which are used to screen carbapenem resistance in laboratories, and develop resistance either through gene transfer or mutations.[3,4]

Gram-negative bacteria, especially Enterobacteriaceae, are communal sources of both community-acquired and hospital-acquired infections, comprising urinary tract, bloodstream, and lower respiratory tract infections. These bacteria can gain genes encoding numerous antibiotic resistance mechanisms, containing ESBLs, AmpCs, and carbapenemases. β-Lactam drugs are regularly the key therapeutic choice for serious infections, and carbapenem, in particular, are frequently considered agents of last remedy[5]

The carbapenems exhibit an overall broader antimicrobial spectrumin vitroas compared to penicillins, cephalosporins, and β-lactam/β-lactamase inhibitor combinations.[6]

Both meropenem and imipenem are highly resistant to hy drolysis by most clinically important beta-lactamases, plas mid- or chromosomally mediated, of S aureus, E coli, Enterobacter species, Citrobacter freundii, Proteus species, Serratia marcescens, Klebsiella species, P aeruginosa and Bacteroides fragilis [7,8,9,10,11].

MATERIALS & METHODS

This study was carried out during the period of july 2025 to sep 2025. Clinical samples were collected from indoor & out door patient's specimen such as wound swab, pus, drain fluid, urine, sputum, pleural fluid,ET tip culture,tracheal secretions were included in this study. Samples were collected under aseptic conditions after obtaining informed oral consent from the patients. Primary isolation of clinical isolates samples were inoculated on Blood Agar, MacConkey agar, Thioglycollate broth and incubated at 37°C for 24 hrs. Growth observed next day. Pure colonies of GNB which grown on MacConkey agar will be used for identification and Antibiotic sensitivity test. Organisms were recognized by the microbiological techniques according to the current standards and susceptibility testing was done according to the guidelines of Clinical and Laboratory Standards Institute (CLSI) 2026 by using Kirby Bauer Disc diffusion method.

RESULT

A total of 259 clinical samples were processed during the study period, out of which Gram-negative bacilli were isolated and analyzed for antibiotic susceptibility. The most frequently isolated organism was E. coli (38.9%), followed by Acinetobacter spp. (14.2%), Klebsiella spp. (9.6%), Pseudomonas spp. (7.3%), Proteus spp. (1.54%), and Citrobacter spp. (1.15%).

Out of the 259 GNB isolates obtained from diverse clinical specimens,209 (80%) exhibited resistance to imipenem and 183 (71%) exhibited resistance to meropenem by the disc diffusion method.

Antibiotic susceptibility testing revealed a higher resistance pattern to imipenem across most isolates, whereas meropenem showed comparatively better sensitivity against Gram-negative bacilli.

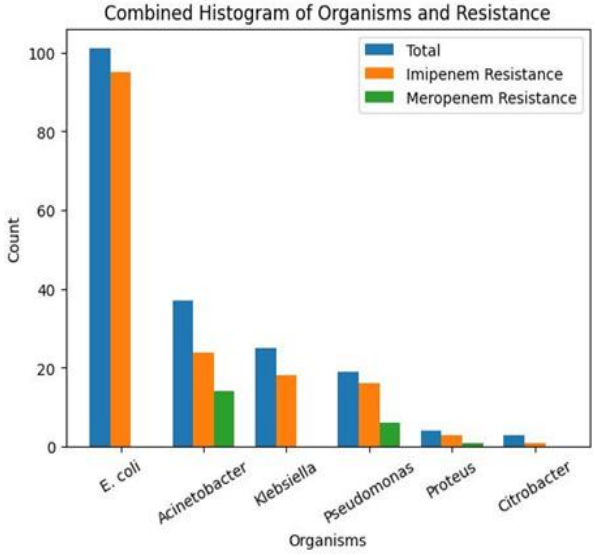

Fig 1. Resistance in Gram Negative Bacteria Against Imipenem and Meropenem Disc Diffusion.

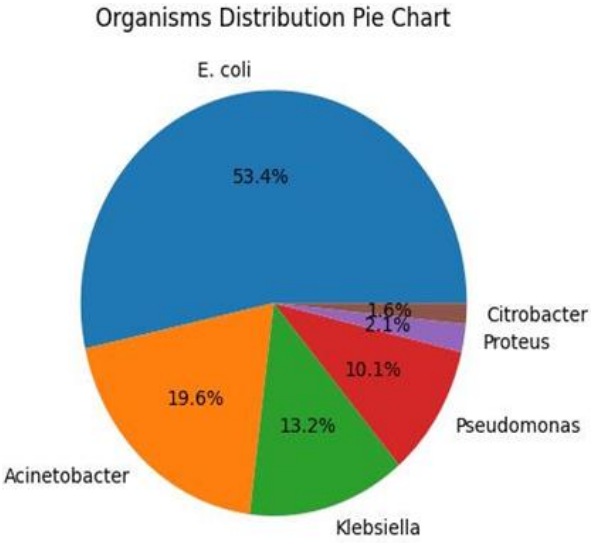

Fig 2. Frequency of Gram Negative Bacteria

Sample type	Number	Percentage(%)
Urine	128	49.61%
Blood	24	9.30
CSF	5	1.94
ET Tip	26	10.08
Fluid	6	2.3
Pus	25	9.69
Stool	3	1.16
Tracheal swab	16	6.20
Vaginal Swab	26	10.08
Total	259	100

Fig 3. Clinical Sample Wise Distribution

DISCUSSION

Carbapenems are considered the last line of therapy for infections caused by multidrug-resistant Gram-negative bacteria. However, the emergence of resistance to these agents is a growing concern worldwide.

In the present study, E. coli was the predominant isolate, which is consistent with its known role as a common pathogen in both community and hospital-acquired infections. The presence of non-fermenters like Acinetobacter and Pseudomonas further highlights the burden of nosocomial infections.

A significant finding of this study is the higher resistance observed against imipenem compared to meropenem. This may be due to increased usage of imipenem in clinical practice, leading to selective pressure and resistance development. Mechanisms such as carbapenemase production, efflux pumps, and porin loss may contribute to this resistance.

Out of the 259 GNB isolates obtained from diverse clinical specimens,209 (80%) exhibited resistance to imipenem and 183 (71%) exhibited resistance to meropenem by the disc diffusion method which is in comparison with the study of Chnandel et al[14]., out of 469 who reported 76.97 % resistance to Imipenam and 79.74% Meropenam in Enterobacteriaceae Also, in Chakraborty et al[15] out of 178 samples 27.5% are Imipenam Resistant and 28.1% Meropenem reistance., Also in N.kumari et al[16]., out of 101 samples 22.1% are Imipenam resistant and 22.1% Meropenem resistant.

These findings are in line with global trends showing rising carbapenem resistance, emphasizing the need for strict antibiotic stewardship and regular surveillance.

Total Sample Positive (GNB Growth)	Imipenem Resistant	Meropenem Resistant	Author
469	361 (76.97%)	374 (79.74%)	Chandel et al., 2014
178	49 (27.5%)	50(28.1%)	Chakraborty et al., 2025
101	18 (22.1%)	18 (22.1%)	N. Kumari et al., 2022

CONCLUSION

The study concludes that imipenem shows higher resistance among Gram-negative bacilli isolates compared to meropenem. Meropenem remains relatively more effective and may be preferred in the treatment of infections caused by these organisms.

Continuous monitoring of antimicrobial susceptibility patterns and rational use of antibiotics are essential to control the spread of carbapenem-resistant organisms and improve patient outcomes.

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