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Research Article

MODIFIED CARBA NP TEST FOR THE DETECTION OF CARBAPENEMASE PRODUCING ESCHERICHIA COLI SPECIES

Dr. Ravi Vashistha[1], Dr Dipika Soni[2], Dr. Sapna Chauhan[3]

[1]Assistant ProfessorrIn Microbiology Department at Muzaffarnagar Medical College, Muzaffarnagar
[2]JR-2 In Microbiology Department at Muzaffarnagar Medical College, Muzaffarnagar, UP, India
[3]Professor & HOD In Microbiology Department at Muzaffarnagar Medical College, Muzaffarnagar, UP

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Corresponding Author:

Dr. Ravi Vashistha
Assistant ProfessorrIn Microbiology Department at Muzaffarnagar Medical College, Muzaffarnagar.

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ABSTRACT

Background: The emergence of carbapenem-resistant *Escherichia coli* has become a major public health concern due to the production of carbapenemase enzymes, particularly metallo-β-lactamases (MBLs). These enzymes confer resistance to a broad spectrum of β-lactam antibiotics, limiting therapeutic options and contributing to increased morbidity and mortality. Early detection of MBL-producing isolates is essential for effective antimicrobial stewardship and infection control.
Aim: To detect carbapenemase-producing *Escherichia coli* isolates using the Modified Carba NP Test and to determine the prevalence of MBL-producing strains among clinical samples.
Materials and Methods: This prospective observational hospital-based study was conducted in the Department of Microbiology, Muzaffarnagar Medical College and Hospital, over a period of 11 months from April 2025 to February 2026. A total of 100 clinical samples, including urine, blood, sputum, pus, and pleural fluid specimens, were processed. Isolation and identification of *E. coli* were performed using standard microbiological techniques. Antibiotic susceptibility testing was carried out by the Kirby–Bauer disc diffusion method according to CLSI guidelines. Carbapenem-resistant isolates were further screened for carbapenemase production using the Modified Carba NP Test.
Results: Out of 100 clinical isolates processed, 50 *E. coli* isolates demonstrated resistance to carbapenem antibiotics. Among these carbapenem-resistant isolates, 28 (56%) were confirmed as metallo-β-lactamase producers by the Modified Carba NP Test. Urine samples constituted the highest proportion of specimens (34.1%), followed by pus (20.6%), sputum (19.5%), blood (17.6%), and pleural fluid (8.2%). The MBL-producing isolates exhibited multidrug-resistant patterns, significantly limiting available treatment options.
Conclusion: The study revealed a considerable prevalence of MBL-producing carbapenem-resistant *E. coli* among clinical isolates. The Modified Carba NP Test proved to be a useful and reliable phenotypic method for the rapid detection of carbapenemase-producing strains. Routine screening, continuous surveillance, and strict antibiotic stewardship practices are essential to control the spread of these highly resistant pathogens and improve patient outcomes.

Keywords*: Escherichia coli, Metallo-β-lactamase, Carbapenemase, Modified Carba NP Test, Carbapenem Resistance, Antimicrobial Resistance.*

INTRODUCTION

Metallo beta-lactamases (MBLs) are a group of enzymes produced by certain Gram-negative bacteria that confer resistance to a wide range of beta-lactam antibiotics, including carbapenems. These enzymes require zinc ions for their activity and are capable of hydrolysing many clinically important antibiotics, making infections difficult to treat. The emergence and spread of MBL-producing organisms such as *Escherichia coli* represent a serious threat to public health and hospital infection control. Early detection and surveillance of MBL-producing strains are therefore essential to guide appropriate antibiotic therapy and limit their dissemination.

AIM AND OBJECTIVES

- To detect the presence of Metallo beta-lactamase-producing E.Coli among clinical isolates.
- To identify carbapenem-resistant isolates, performing tests for MBL production, and analysing the prevalence of MBL-producing E.Coli in clinical samples.

MATERIALS AND METHODS

- **TYPE OF STUDY:** Prospective Observational hospital based study
- **NUMBER OF SAMPLES BEING PROCESSED: 100** samples
- **PLACE AND DURATION OF STUDY:** Department of Microbiology, Muzaffarnagar Medical College & Hospital over a period of 11 months from April 2025 to February 2026.
- **INCLUSION CRITERIA:** Clinical samples such as urine, blood, sputum, and wound swabs were collected from patients in a Muzaffarnagar medical college.
- **EXCLUSION CRITERIA:** Including all sample in Lab except stool sample.
- **SAMPLE PROCESSING**: The isolates were cultured on appropriate media and identified using standard microbiological techniques. Antibiotic susceptibility testing was performed using the Kirby–Bauer disc diffusion method according to CLSI guidelines. Carbapenem-resistant isolates were further screened for MBL production using modified Carba NP test. The results were recorded and analysed to determine the prevalence of MBL-producing strains

RESULTS

Out of the total 100 bacterial isolates obtained, a 50 isolates (E.Coli) showed resistance to carbapenem antibiotics. Among these resistant isolates, 28 were confirmed as MBL producers through Modified Carba NP testing. These strains exhibited multidrug resistance patterns, limiting treatment options.

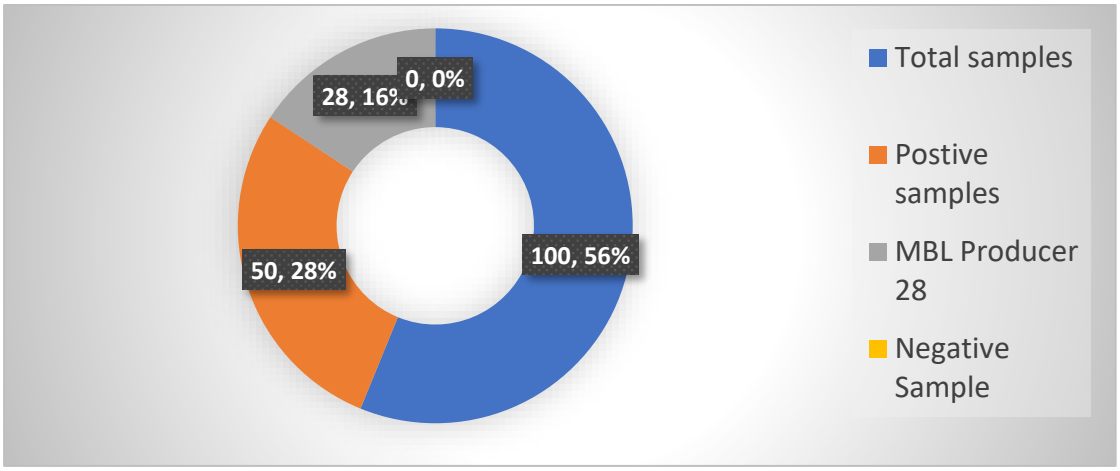

Figure:1

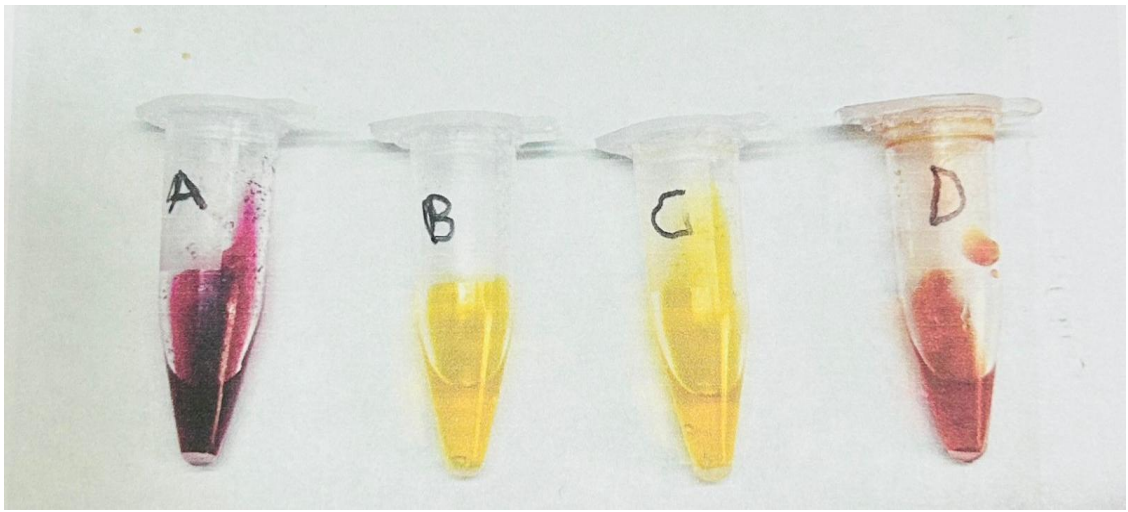

Figure: 02

MODIFIED CARBA NP TEST

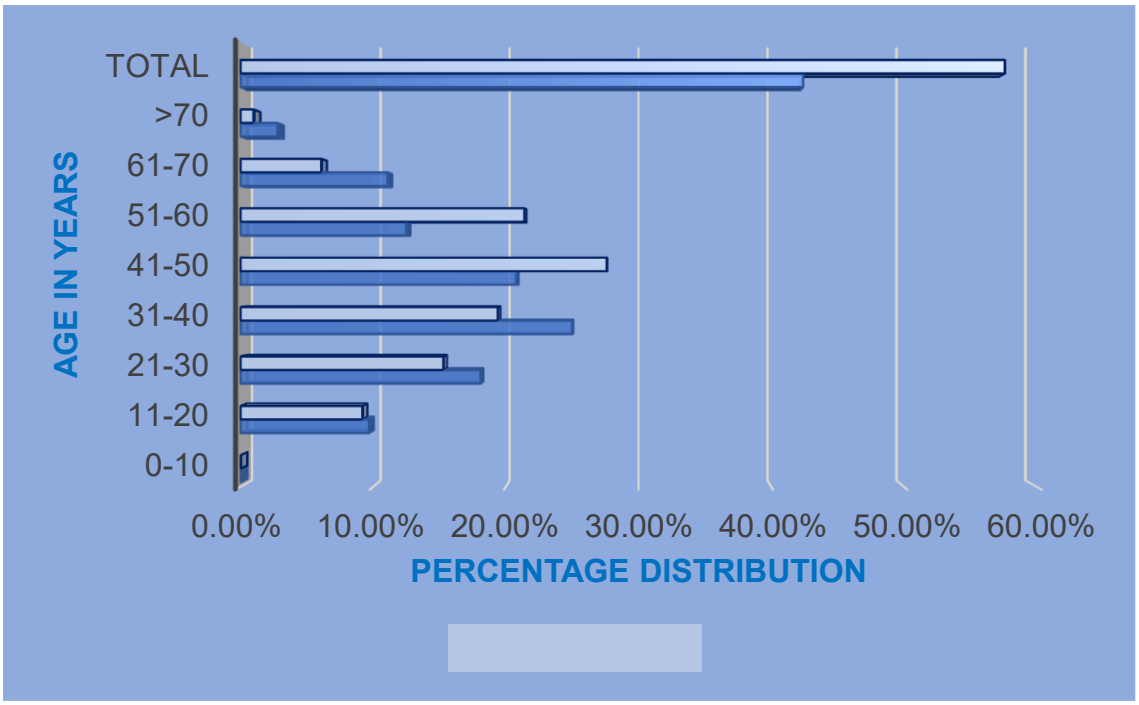

Fig 3: Age and gender wise distribution of patients

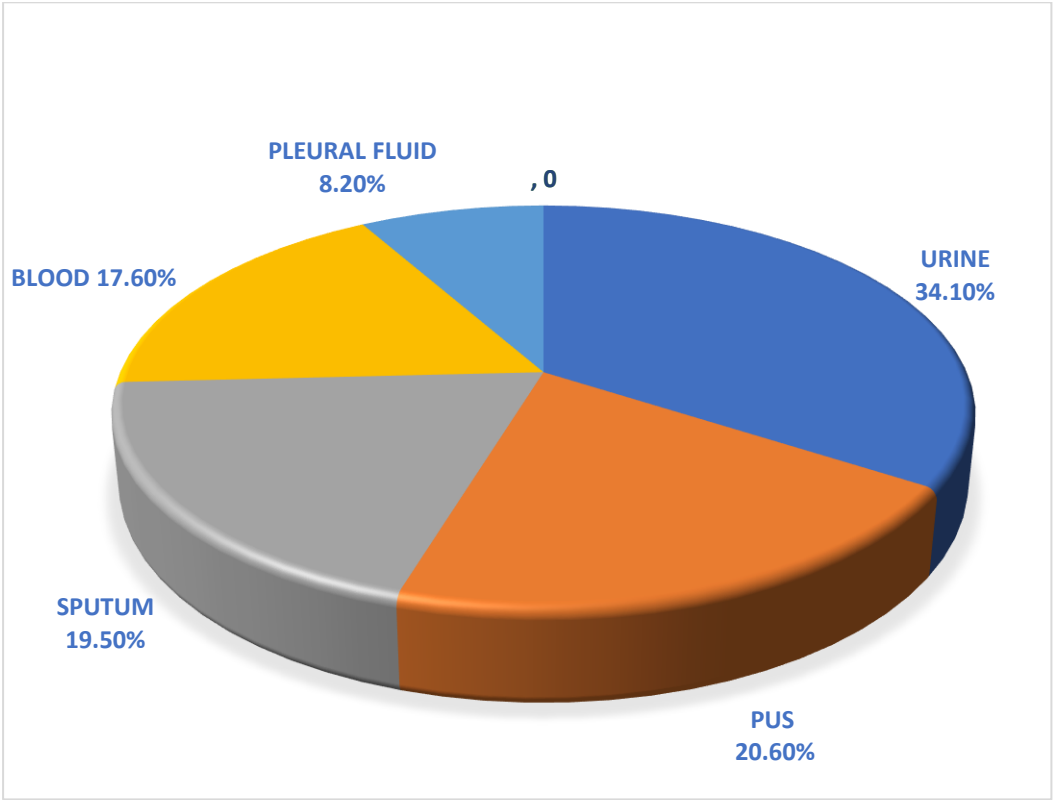

Fig 4: Distribution of Samples Majority of the Samples was Urine(34.1%) followed by Pus (20.6%), and least number was pleural fluid (8.2%) followed by Blood (17.6%).

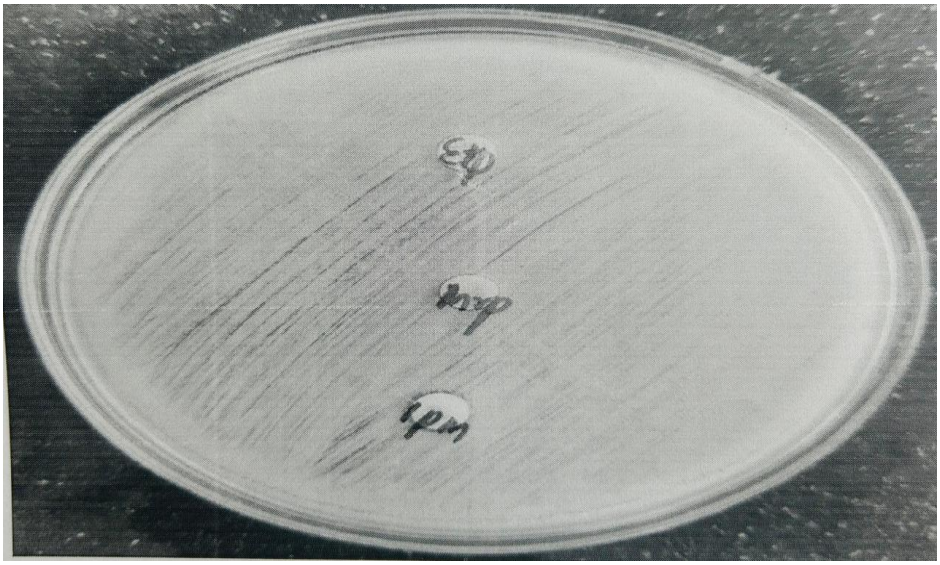

Figure 5: RESISTANCE SHOWING TO MEROPENEM, IMIPENEM,IRTAPENEM

Table 1. Distribution of Clinical Samples

Sample Type	Number	Percentage
Urine	34	34.1%
Pus	21	20.6%
Sputum	20	19.5%
Blood	18	17.6%
Pleural Fluid	8	8.2%

DISCUSSION

- The study highlights the increasing occurrence of metallo-beta-lactamase-producing bacteria in clinical settings.
- Early detection through routine screening methods is essential for effective infection control and appropriate antibiotic therapy.
- Continuous monitoring and strict antibiotic stewardship programs are necessary to prevent the spread of these highly resistant pathogens.

CONCLUSION

The Modified Carba NP Test is a rapid, economical, and reliable phenotypic method for detecting carbapenemase-producing E. coli. A high prevalence of MBL-producing isolates was observed in the present study, highlighting the need for routine screening, antimicrobial stewardship, and infection control measures.

LIMITATIONS

The study was conducted at a single center with a relatively small sample size. Molecular characterization of carbapenemase genes was not performed.

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