ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 09 | September - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A STUDY OF ANTIBIOTIC RESISTANCE AND SENSITIVITY PATTERNS IN NOSOCOMIAL INFECTIONS IN A TERTIARY CARE CENTER IN CENTRAL INDIA

General Medicine

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ABSTRACT

Background: Nosocomial infections (Nis), also known as hospital-acquired infections (HAIs), are infections acquired during hospital stays, with no evidence of their presence at the time of admission. The rising threat of antimicrobial resistance (AMR) due to irrational antibiotic use has become a global challenge, compromising the management of such infections. **Objectives:** 1. To determine the incidence of bacterial nosocomial infections and identify the causative organisms along with their antibiotic sensitivity and resistance profiles. 2. To review the traditional antibiotic usage and its effectiveness in preventing nosocomial infections. 3. To formulate an empirical antibiotic regimen for ICU patients to prevent hospital-acquired infections. **Methods:** This was a prospective observational study conducted in the ICU of the Department of Medicine at Amaltas Institute of Medical Sciences, Dewas. Sixty patients were enrolled, all of whom were free of any infection on admission. A total of 386 clinical samples were sent for culture and sensitivity analysis. **Results:** Of the 386 samples sent, 130 (33.7%) were culture-positive. The most frequently isolated organisms were Klebsiella spp. (47%), Pseudomonas spp. (21%), Escherichia coli (19%), Staphylococcus aureus (6%), Enterococcus spp. (4%), Non-Lactose Fermenting Bacteria (3%), and Acinetobacter spp. (3%). Most isolates exhibited resistance to cephalosporins but showed sensitivity to carbapenems and colistin.

Result

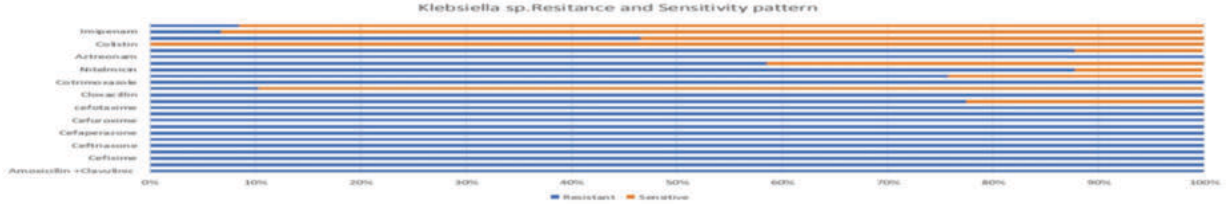
Study Population

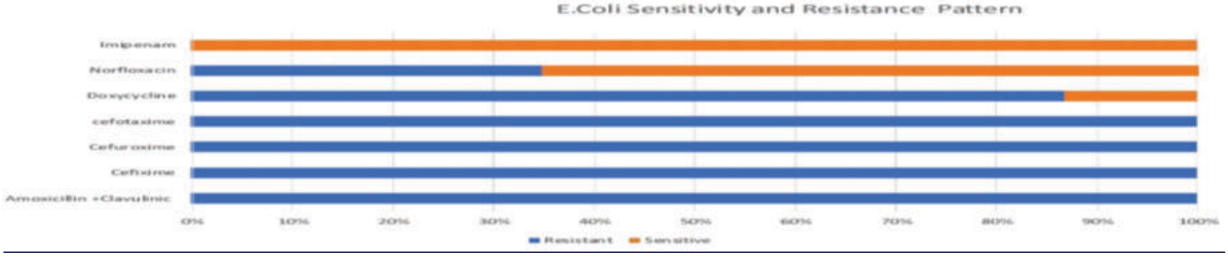
S.No	Male	Female
Sex	37	23

S.No	Type of sample collected	Total no.of collected sample	No.of detected infection
1	Blood	122	24
2	Sputum /Tracheal aspirate	144	59
3	Urine	120	37

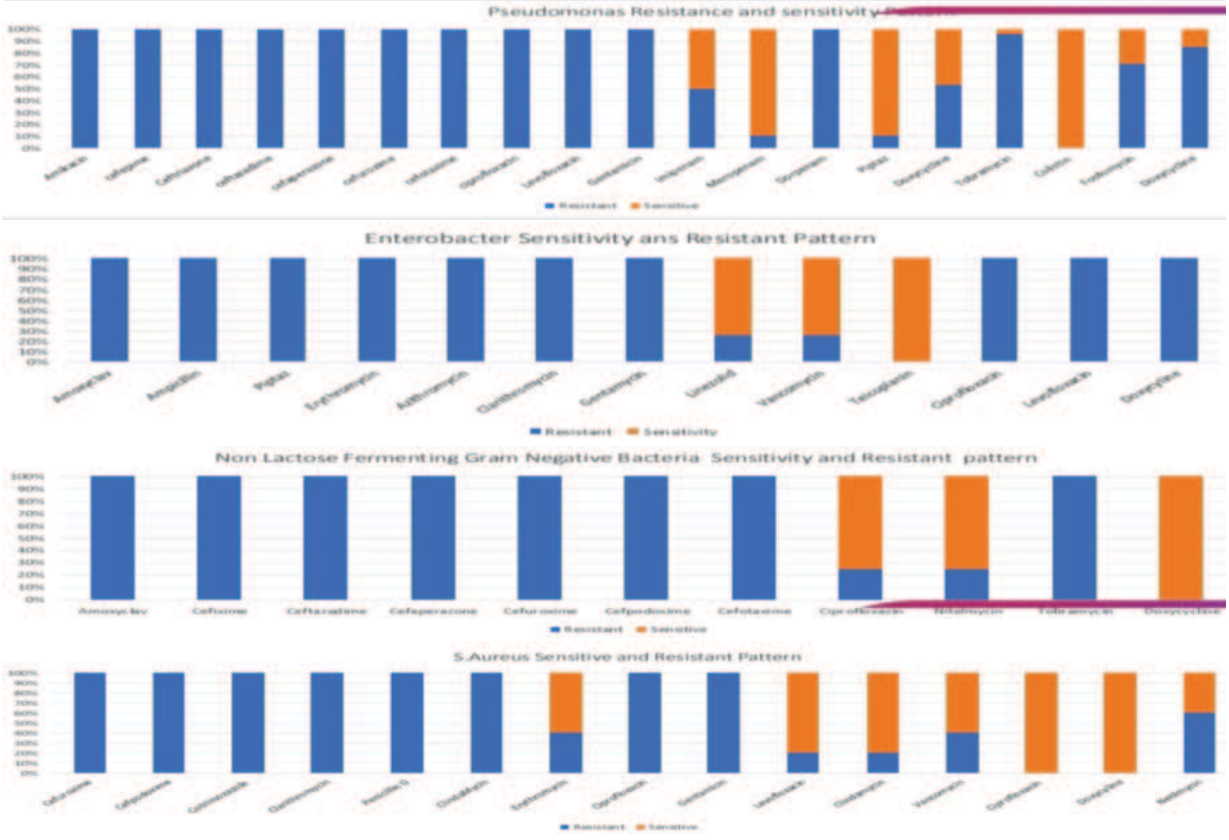
Bacteria Involved

No.	Organisms	N
1	Escherichia coli	23
2	Klebsiella	58
3	Pseudomonas	28
4	Enterococcus	5
5	Staphylococcus	5
6	Nonfermenting gram-negative Bacillus	4





ABSTRACT



Conclusion: Regular antibiogram updates and implementation of antibiotic stewardship programs are essential to monitor resistance patterns and guide empirical therapy. Early sample collection and initiating antibiotics based on sensitivity data can help control nosocomial infections effectively.

KEYWORDS

Nosocomial infection, antibiotic resistance, ICU, antimicrobial sensitivity, Klebsiella, carbapenem, colistin

INTRODUCTION

Nosocomial infections (NIs) are defined as infections occurring ≥48 hours after hospital admission, not present or incubating at the time of admission [1]. These infections are associated with high morbidity and mortality, especially in intensive care units (ICUs), and are often caused by multidrug-resistant organisms (MDROs) [2].

The misuse and overuse of antibiotics have led to increasing antimicrobial resistance (AMR), posing a global public health threat [3,4]. In the ICU setting, prompt and appropriate antimicrobial therapy is vital, making knowledge of local resistance patterns essential [5].

This study was undertaken to analyze the incidence, microbiological profile, and antimicrobial susceptibility patterns of nosocomial infections in ICU patients in a tertiary care hospital in Central India.

Aims And Objectives

1. To determine the incidence of bacterial nosocomial infections and identify the causative organisms along with their antibiotic resistance and sensitivity patterns.
2. To analyze the traditional antibiotic usage and its effectiveness in preventing nosocomial infections.
3. To design a rational empirical antibiotic regimen for patients with prolonged ICU stays to prevent hospital-acquired infections.

MATERIALS AND METHODS

Study Design:
Prospective Observational Study

Study Setting:
Intensive Care Unit (ICU), Department of Medicine, Amaltas Institute of Medical Sciences, Dewas (M.P.), India

Study Duration:
[Insert timeline, e.g., January 2025 – June 2025]

Sample Size:
60 patients

Inclusion Criteria:
Patients admitted to ICU without infection at the time of admission
No fever or infectious symptoms on admission
No prior antibiotic therapy

Exclusion Criteria:
Referred cases already on intravenous antibiotics
Evidence of infection on admission
Fever at the time of admission

Sample Collection And Laboratory Methods:
A total of 386 clinical samples (urine, blood, sputum, catheter tips, etc.) were collected aseptically. Samples were cultured using standard microbiological techniques.

Antibiotic susceptibility testing was performed using the Kirby-Bauer disc diffusion method and interpreted as per Clinical and Laboratory Standards Institute (CLSI) guidelines [6].

RESULTS

Total Samples Processed: 386
Culture-positive Samples: 130 (33.7%)
Bacterial Isolates Identified

Organism	Frequency (%)
Klebsiella spp.	47%
Pseudomonas spp.	21%
Escherichia coli	19%
Staphylococcus aureus	6%
Enterococcus spp.	4%
Non-Lactose Fermenting Bacteria	3%
Acinetobacter spp.	3%

Antibiotic Resistance Patterns
Cephalosporins (3rd/4th gen): High resistance (>80%) in Gram-negative isolates
Carbapenems (Meropenem, Imipenem): High sensitivity (~90%)
Colistin: Highly effective across MDR isolates
Aminoglycosides: Moderate sensitivity
Vancomycin And Linezolid: Effective against Gram-positive cocci (including MRSA and VRE)

DISCUSSION

Our study highlights a significant burden of nosocomial infections in ICU patients, with an incidence of 33.7%. The predominant organisms were Gram-negative bacilli, particularly Klebsiella spp., which is consistent with studies across India and globally [7,8]

The resistance pattern observed in this study reflects global concerns. Resistance to cephalosporins was alarmingly high, while carbapenems and colistin remained effective, supporting their role as last-line agents [9,10]. However, overreliance on these agents can lead to the emergence of pan-drug-resistant organisms (PDRs), which is an impending global health crisis.

This study emphasizes the importance of hospital-based antibiograms and the implementation of effective antibiotic stewardship programs. These programs must include routine microbiological surveillance, rational empirical therapy, de-escalation based on culture results, and strict infection control practices [11].

CONCLUSION

1. The study revealed a high incidence of nosocomial infections in ICU patients, predominantly caused by MDR Klebsiella, Pseudomonas, and E. coli.
2. Resistance to cephalosporins is widespread, while carbapenems and colistin remain effective agents.
3. Regular antibiogram updates and antimicrobial stewardship interventions are essential for effective infection control and improved outcomes.

Recommendations
Implement local antibiogram-based empirical therapy guidelines.
Reserve colistin and carbapenems for MDR organisms only.
Encourage culture-based diagnosis and rational antibiotic use.
Monitor and control the spread of resistant organisms through infection control practices.

Limitations
Single-center study with limited sample size

Short Duration (6 Months)
Viral and fungal pathogens not assessed

Conflict Of Interest:
None declared.

Funding:
No external funding was obtained.

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