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A Study on Pseudomonas Aerugenosa & Acinetobacter Baumannii Isolated from Various Clinical Specimen and Analysis of Their Resistance Pattern

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***Abstract*-- Most of the gram-negative bacterial infections, *Pseudomonas aerugenosa* & *Acinetobacter baumannii* infections are of critical importance given the severity of infections, intrinsic resistance to most antibiotics, and also capability to acquire new drug resistance.**

Nosocomial infections constitute a global health problem, leading to a high rate of morbidity and mortality. The choice of antimicrobial treatment for nosocomial infections is often empirical and based on the knowledge of local antimicrobial activity patterns of the most important bacteria causing such infections.

***Pseudomonas aeruginosa* and *Acinetobacter baumannii* are opportunistic, nosocomial pathogens known for causing severe infections, particularly in intensive care units (ICUs). They are frequently isolated from clinical specimens like respiratory samples (sputum), urine, pus and wound swab. These bacteria are highly concerning due to their rising, often multi-drug resistance (MDR) patterns.**

Nosocomial infections caused by *Pseudomonas aeruginosa* and *Acinetobacter baumannii* are critical healthcare challenges, particularly among vulnerable populations including children (under 12 years) and elderly patients (over 60 years), as well as ICU patients, burn victims, and those with underlying chronic diseases. Both pathogens are recognized by the WHO as critical priority organisms due to their high rates of multi-drug resistance (MDR).

This study aims to analyze the prevalence of *Pseudomonas aeruginosa* and *Acinetobacter baumannii* and, crucially, determine their resistance profiles to improve infection control and antibiotic stewardship.

In this study, the *Acinetobacter baumannii*, and *Pseudomonas aeruginosa* isolates were obtained from various samples (Pus/Wound; Sputum; Urine) of patients. This retrospective study (January 2026 to March 2026) at Serum Analysis Center Pvt. Ltd., Howrah, West Bengal, India. examined clinical and laboratory data. The Vitek® 2 systems is an automated, rapid, and accurate method for determining the Minimum Inhibitory Concentration (MIC) method was used to assess antibiotic sensitivity to common antibiotics.

***Results:* In our study as per our both age group, prevalence of nosocomial (hospital-acquired) infections (*Pseudomonas aerugenosa* & *Acinetobacter baumannii* both) average rate of percentage is 8.42% in all type of sample; as per sample in average of Pus/wound is 15.04%, Urine is 1.82% and Sputum is 8.40%.**

Also our study in all type of specimen including all respective both age group highly resistance antibiotic is Colistin (80.0%) and significantly highly sensitive commonly use of antibiotic are Piperacillin/Tazobactam (75.0%), Ceftazidime(70.0%) , Meropenem (76.0%) and Moderately sensitive commonly use of antibiotic are Cefoperazone/Sulbactam (63.0%), Cefepime (58.0%) and Imipenem (64.0%).

This studies emphasize that these pathogens are frequently co-isolated from infected patients and are becoming increasingly difficult to treat due to their enhanced resistance mechanisms, including biofilm formation. Effective infection control, strict antibiotic stewardship, and monitoring of local resistance patterns are necessary to manage these infections.

***Keywords:* Pseudomonas aeruginosa, Acinetobacter baumannii, Various Clinical Specimens; Antibiogram, Resistance.**

I. INTRODUCTION

Non-fermating Gram-negative bacteria infections are one of the most crucial health problems not only in the community but also in hospitalized patients. Due to the Lipopolysaccharide layer (LPS), GNB's, are known to cause sepsis at a higher rate and hence increased morbidity and mortality of patients [1].

Enterobacteriaceae and the Non-Enterobacteriaceae GNB are responsible for most clinical isolates from cases of gram-negative infections [2].

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Though the proportion of infection with Non-Enter bacteriaceae GNB is less when compared to that of Enterobacteriaceae, Non-Enterobacteriaceae GNB are of critical importance given the severity of infections they can cause and intrinsic resistance to most antibiotics [3].

Among the Non-Enterobacteriaaceae GNB, the *Acinetobacter baumannii* and *Pseudomonas aerugenosa* are the two most important clinically significant pathogens. *Acinetobacter baumannii* is intrinsically resistant to several commonly used antibiotics, including aminopenicillins, and first, second-generation cephalosporins [4].

Apart from the intrinsic property, they have a high capacity to acquire resistance to broad-spectrum β-lactams, aminoglycosides, fluoroquinolones and tetracyclines. They have emerged as a highly troublesome pathogen for many institutions especially in intensive care units (ICUs) globally, due to their immense ability to acquire or up-regulate antibiotic drug resistance determinants [5,6]. Their ubiquitous nature in the ICU environment and inadequate infection control practice has continuously raised.

Pseudomonas aeruginosa and *Acinetobacter baumannii* are major causes of nosocomial infections, with high multidrug resistance (MDR) and ICU-associated prevalence.

Nosocomial infections are one of the common complications of hospitalized patients. Nosocomial infections can cause increased patient morbidity, affect the success of initial illness treatment that the patient is hospitalized for, delay patient discharge which then causes additional costs for the health care system and even result in patient death [7].

Development and implementation of proper infection control programs to prevent spread of antimicrobial resistant bacteria through clinics and hospitals have been shown to be a key component in reducing infection rates [8]; however, nosocomial infections cannot be completely eliminated. In spite of bacterial culture and antimicrobial susceptibility testing for diagnosis of bacterial growth and to guide best antibiotic treatment, empirical treatment is often necessary [9].

Acinetobacter baumannii and *Pseudomonas aerugenosa* has emerged worldwide as important pathogenic bacteria causing nosocomial infections due to the emergence of multidrug resistant (MDR) [10].

Pseudomonas aeruginosa and *Acinetobacter baumannii* are very important nosocomial pathogen, which survives in moist environments and colonizes the respiratory tract of mechanically ventilated patients [11]. It causes severe infections such as pneumonia in critically ill and immunocompromised patients [12].

Multidrug resistant *Psseudomonas aeruginosa* and *Acinetobacter baumannii* are especially associated with increased mortality because no adequate therapeutic option exists. Recently, MDR *Pseudomonas aeruginosa and Accinetobaccter baumannii* has been variously reported worldwide [13, 14].

II. Key Clinical Importance And Age Groups

- *Elderly Patients (>60 years):* This group is at the highest risk for *Acinetobaccter baumannii* and *Pseudomonas aeruginosa* nosocomial infections. They often present with pneumonia, urinary tract infections, and bloodstream infections due to reduced immunity and higher rates of intensive care unit (ICU) admissions.
- *Infants/Pediatric (Under 12 years): Pseudomonas aeruginosa* and *Acinetobacter baumannii* are significant threats, particularly in burn units and neonatology wards, often causing wound infections. In pediatric ICUs, these are the second most common causes of nosocomial infection.
- *Highest Risk Factors:* Mortality is highest in patients with prolonged ICU stays, invasive device usage (arterial catheters, ventilators), and comorbid conditions.

In this studies focusing on *Pseudomonas aeruginosa* and *Acinetobacter baumannii* from clinical specimens is to determine their prevalence and analyze their antimicrobial resistance (AMR) patterns. These studies identify the resistance trends to guide clinicians in selecting effective therapeutic agents and strengthening hospital infection control.

III. Materials And Methods

Study Area:

The present retrospective study was carried out in the Referral Laboratory, Serum Analysis Centre Pvt. Ltd.; 177, Netaji Subhas Road, Halder Para, Howrah-711101, West Bengal, India.

Study Period:

This study was carried out a period of Three months from January 2026 to March 2026.

Study Samples:

The inclusion criteria for this study in all patients of both sexes of outpatients of various sample, like, Pus/ wound, sputum and urine.

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Age Group:

1. Elderly Patients (>60 Years)
2. Infants/Pediatric (Under 12 years)

IV. Collection Of Samples

Bacteriological cultures require aseptic techniques to isolate pathogens, starting with cleaning the site with sterile saline (for wounds) or using midstream techniques (for urine). Key methods include deep tissue swabbing/aspiration for pus, clean-catch urine, and early morning deep-cough sputum, all placed in sterile containers for rapid transport to the lab.

V. Sample Processing

The study aimed to analyze of *Pseudomonas aeruginosa* and *Acinetobacter baumannii* for three months. Common sample sources included urine, sputum, pus/wound swabs. These samples were transported to the microbiology laboratory standard protocols to maintain integrity and prevent contamination ensuring prompt processing for accurate isolation and identification of NFGNB. Clinical specimens were streaked onto appropriate culture media such as Blood agar and MacConkey agar.

The cultures were incubated aerobically at 37°C for over night incubation. Bacterial colonies were examined for characteristic morphology, biochemical reaction and confirmed as *Pseudomonas. aeruginosa* and *Acinetobacter baumannii* using the VITEK2 system (bioMérieux, Marcy-l'Étoile, France).

The antimicrobial susceptibility of NFGNB isolates was determined according to established guidelines using the VITEK2 system. The VITEK2 system utilizes standardized antimicrobial susceptibility panels to assess susceptibility profiles against various antibiotics through automated turbidimetric methods. Susceptibility profiles were classified as susceptible, intermediate, or resistant. Data from the VITEK2 system, including identification and antimicrobial susceptibility profiles, were exported and analyzed using Microsoft Excel. To maintain the quality of the VITEK system, the instrument undergoes regular calibration following the manufacturer's instructions. The reagents, including microbial identification and susceptibility cards, are also routinely calibrated using control strains such as *Pseudomonas aeruginosa ATCC 27853* and *Acinetobacter baumannii ATCC 19606*, specifically for testing *Pseudomonas aeruginosa* and *Acinetobacter baumannii.* The prevalence of multi-drug resistance among NFGNB isolates was determined based on criteria for defining resistance to multiple antibiotic classes [15].

VI. Identification Of Isolates:

The isolates were identified using colony morphology, Gram staining, Motility test, Indole test, Citrate test [Simmons Citrate Agar media], Urease test [Urease Agar media + 40% Urea], Triple Sugar Iron Agar media, and Oxidase test [16, 17].

VII. Results

Table: 1.
Distribution of clinical samples by source:

Source of Clinical Sample	Total No. of Sample (>60 Years)	Total No. of Sample (Under 12 Years)
Pus/Wound Swab	**70**	**16**
Urine	**1212**	**184**
Sputum **[Respiratory secretions]**	**58**	**10**

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Table: 2.
Prevalence of pathogens isolated on PUS/WOUND SWAB culture:

Pathogens	>60 Years		Under 12 Years	
	Male	Female	Male	Female
Pseudomonas aerugenosa	10(14.28%)	02(2.85%)	06(37.5%)	04(25.0%)
Acinetobacter baumannii	02(2.85%)	02(2.85%)	02(12.5%)	02(12.5%)

Table: 3.
Prevalence of pathogens isolated URINE culture:

Pathogens	>60 Years		Under 12 Years	
	Male	Female	Male	Female
Pseudomonas aerugenosa	20(1.65%)	10(0.82%)	08(4.34%)	02(1.08%)
Acinetobacter baumannii	08(0.66%)	08(0.66%)	06(3.26%)	04(2.17%)

Table: 4.
Prevalence of pathogens isolated SPUTUM culture:

Pathogens	>60 Years		Under 12 Years	
	Male	Female	Male	Female
Pseudomonas aerugenosa	04(6.89%)	02(3.44%)	02(20.0%)	01(10.0%)
Acinetobacter baumannii	02(3.44%)	01(3.44%)	01(10.0%)	01(10.0%)

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Table: 5.

Percentage of Resistant & Susceptibility of isolated *Pseudomonas aerugenosa* to tested use of antibiotics in PUS/WOUND Culture [>60 Years]:

Total Isolates: 12

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	04	33.34%	08	66.66%
Ceftazidime	04	33.34%	08	66.66%
Cefoperazone+Sulbactam	04	33.34%	08	66.66%
Cefepime	06	50.00%	06	50.00%
Ciprofloxacin	06	50.00%	06	50.00%
Levofloxacin	08	66.66%	04	33.34%
Amikacin	06	50.00%	06	50.00%
Imipenem	10	83.34%	02	16.66%
Meropenem	04	33.33%	08	66.66%
Colistin	10	83.34%	02	16.66%
Aztreonam	06	50.00%	06	50.00%

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Table: 6.

Percentage of Resistant & Susceptibility of isolated *Pseudomonas aerugenosa* to tested use of antibiotics in PUS/WOUND Culture [Under 12 Years]:

Total Isolates: 10

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	02	20.0%	08	80.0%
Ceftazidime	04	40.0%	06	60.0%
Cefoperazone+Sulbactam	02	20.0%	08	80.0%
Cefepime	02	20.0%	08	80.0%
Ciprofloxacin	04	40.0%	06	60.0%
Levofloxacin	04	40.0%	06	60.0%
Amikacin	02	20.0%	08	80.0%
Imipenem	06	60.0%	04	40.0%
Meropenem	02	20.0%	08	80.0%
Colistin	08	80.0%	02	20.0%
Aztreonam	04	40.0%	06	60.0%

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Table: 5.7.

Percentage of Resistant & Susceptibility of isolated *Acinetobacter baumannii* to tested use of antibiotics in PUS/WOUND Culture [> 60 Years]:

Total Isolates: 04

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	01	25.0%	03	75.0%
Ceftazidime	01	25.0%	03	75.0%
Cefoperazone+Sulbactam	01	25.0%	03	75.0%
Cefepime	03	75.0%	01	25.0%
Ciprofloxacin	01	25.0%	03	75.0%
Levofloxacin	01	25.0%	03	75.0%
Gentamicin	1	25.0%	03	75.0%
Minocycline	01	25.0%	03	75.0%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	01	25.0%	03	75.0%
Imipenem	01	25.0%	03	75.0%
Meropenem	01	25.0%	03	75.0%
Colistin	03	75.0%	01	25.0%
Amikacin	01	25.0%	03	75.0%

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Table: 5.8.

Percentage of Resistant & Susceptibility of isolated *Acinetobacter baumannii* to tested use of antibiotics in PUS/WOUND Culture [Under 12 Years]:

Total Isolates: 04

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	02	50.0%	02	50.0%
Ceftazidime	01	25.0%	03	75.0%
Cefoperazone+Sulbactam	02	50.0%	02	50.0%
Cefepime	02	50.0%	02	50.0%
Ciprofloxacin	02	50.0%	02	50.0%
Levofloxacin	02	50.0%	02	50.0%
Gentamicin	02	50.0%	02	50.0%
Minocycline	02	50.0%	02	50.0%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	01	25.0%	03	75.0%
Imipenem	02	50.0%	02	50.0%
Meropenem	02	50.0%	02	50.0%
Colistin	03	75.0%	01	25.0%
Amikacin	02	50.0%	02	50.0%

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Table: 5.9.

Percentage of Resistant & Susceptibility of isolated *Pseudomonas aerugenosa* to tested use of antibiotics in URINE Culture [>60 Years]:

Total Isolates: 30

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	20	66.66%	10	33.34%
Ceftazidime	20	66.66%	10	33.34%
Cefoperazone+Sulbactam	14	46.66%	16	53.34%
Cefepime	20	66.66%	10	33.34%
Ciprofloxacin	24	80.00%	06	20.00%
Levofloxacin	22	73.33%	08	26.67%
Amikacin	16	53.33%	14	46.67%
Imipenem	20	66.66%	10	33.34%
Meropenem	16	53.33%	14	46.67%
Colistin	28	93.33%	02	6.67%
Aztreonam	22	73.33%	08	26.67%

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Table: 5.10.

Percentage of Resistant & Susceptibility of isolated *Pseudomonas aerugenosa* to tested use of antibiotics in URINE Culture [Under 12Years]:

Total Isolates: 10

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	02	20.0%	08	80.0%
Ceftazidime	02	20.0%	08	80.0%
Cefoperazone+Sulbactam	08	80.0%	02	20.0%
Cefepime	02	20.0%	08	80.0%
Ciprofloxacin	08	80.0%	02	20.0%
Levofloxacin	08	80.0%	02	20.0%
Amikacin	08	80.0%	02	20.0%
Imipenem	02	20.0%	08	80.0%
Meropenem	02	20.0%	08	80.0%
Colistin	08	80.0%	02	20.0%
Aztreonam	08	80.0%	02	20.0%

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Table: 5.11.

Percentage of Resistant & Susceptibility of isolated *Acinetobacter baumannii* to tested use of antibiotics in URINE Culture [>60 Years]:

Total Isolates: 16

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	02	12.5%	14	87.5%
Ceftazidime	04	25.0%	12	75.0%
Cefoperazone+Sulbactam	02	12.5%	14	87.5%
Cefepime	04	25.0%	12	75.0%
Ciprofloxacin	04	25.0%	12	75.0%
Levofloxacin	04	25.0%	12	75.0%
Gentamicin	08	50.0%	08	50.0%
Minocycline	12	75.0%	04	25.0%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	04	25.0%	12	75.0%
Imipenem	06	37.5%	10	62.5%
Meropenem	02	12.5%	14	87.5%
Colistin	14	87.5%	02	12.5%
Amikacin	04	25.0%	12	75.0%

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Table: 5.12.

Percentage of Resistant & Susceptibility of isolated *Acinetobacter baumannii* to tested use of antibiotics in URINE Culture [Under 12 Years]:

Total Isolates: 10

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	02	20.0%	08	80.0%
Ceftazidime	02	20.0%	08	80.0%
Cefoperazone+Sulbactam	02	20.0%	08	80.0%
Cefepime	04	40.0%	06	60.0%
Ciprofloxacin	08	80.0%	02	20.0%
Levofloxacin	08	80.0%	02	20.0%
Gentamicin	02	20.0%	08	80.0%
Minocycline	08	80.0%	02	20.0%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	02	20.0%	08	80.0%
Imipenem	04	40.0%	06	60.0%
Meropenem	02	20.0%	08	80.0%
Colistin	08	80.0%	02	20.0%
Amikacin	02	20.0%	08	80.0%

Table: 5.13.

Percentage of Resistant & Susceptibility of isolated *Pseudomonas aerugenosa*to tested use of antibiotics in SPUTUM Culture [>60 Years]:

Total Isolates: 06

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	01	16.67%	05	83.33%
Ceftazidime	01	16.67%	05	83.33%
Cefoperazone+Sulbactam	05	33.34%	04	66.66%
Cefepime	02	33.34%	04	66.66%
Ciprofloxacin	03	50.00%	03	50.00%
Levofloxacin	03	50.00%	03	50.00%
Amikacin	01	16.67%	05	83.33%
Imipenem	01	16.67%	05	83.33%
Meropenem	01	16.67%	05	83.33%
Colistin	05	83.34%	01	16.66%
Aztreonam	02	33.34%	04	66.66%

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Table: 5.14.

Percentage of Resistant & Susceptibility of isolated *Pseudomonas aerugenosa*to tested use of antibiotics in SPUTUM Culture [Under 12 Years]:

Total Isolates: 03

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	00	00.00%	03	100.0%
Ceftazidime	00	00.00%	03	100.0%
Cefoperazone+Sulbactam	00	00.00%	03	100.0%
Cefepime	00	00.00%	03	100.0%
Ciprofloxacin	01	33.34%	02	66.66%
Levofloxacin	01	33.34%	02	66.66%
Amikacin	00	00.00%	03	100.00%
Imipenem	00	00.00%	03	100.0%
Meropenem	00	00.00%	03	100.0%
Colistin	02	66.64%	01	33.33%
Aztreonam	01	33.34%	02	66.66%

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Table: 5.15.

Percentage of Resistant & Susceptibility of isolated *Acinetobacter baumannii* tested use of antibiotics in SPUTUM Culture [>60 Years]:

Total Isolates: 03

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	01	33.33%	02	66.67%
Ceftazidime	01	33.33%	02	66.67%
Cefoperazone+Sulbactam	02	66.66%	01	33.34%
Cefepime	02	66.66%	01	33.34%
Ciprofloxacin	02	66.66%	01	33.34%
Levofloxacin	02	66.66%	01	33.34%
Gentamicin	02	66.66%	01	33.34%
Minocycline	02	66.66%	01	33.34%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	02	66.66%	01	33.34%
Imipenem	01	33.33%	02	66.67%
Meropenem	01	33.33%	02	66.67%
Colistin	03	100.0%	00	00.00%
Amikacin	01	33.33%	02	66.67%

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Table: 5.16.

Percentage of Resistant & Susceptibility of isolated *Acinetobacter baumannii* tested use of antibiotics in SPUTUM Culture [Under 12 Years]:

Total Isolates: 02

Antibiotics	R (No.)	R (%)	S (No.)	S (%)
Piperacillin + Tazobactam	00	00.0%	02	100.0%
Ceftazidime	01	50.0%	01	50.0%
Cefoperazone+Sulbactam	01	50.0%	01	50.0%
Cefepime	01	50.0%	01	50.0%
Ciprofloxacin	01	50.0%	01	50.0%
Levofloxacin	01	50.0%	01	50.0%
Gentamicin	01	50.0%	01	50.0%
Minocycline	02	100.0%	00	00.0%
Co-trimoxazole [Trimethoprim+ Sulphamethoxale]	02	100.0%	00	00.0%
Imipenem	00	00	02	100.0%
Meropenem	00	00	02	100.0%
Colistin	01	50.0%	01	50.0%
Aztreonam	01	50.0%	01	50.0%

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VIII. Discussion

The mostly resistant bacteria causing nosocomial infections has become a health care issue that has caused serious concern to Doctors [18]. The growing of invasive nosocomial infections caused by Multi Drug Resistant bacteria (MDR), however, did not only increase the total burden of nosocomial infections, but also resulted in a much more complicated status of the hospitalized patients [19]. This our study investigated the prevalence and antibacterial resistance patterns (AMR) of health-threatening bacteria including *Acinetobacter baumannii*, and *Psseudomonas aeruginosa* isolated from patients admitted to hospital wards suffering from nosocomial infections.

In our study as per our both age group, prevalence of nosocomial (hospital-acquired) infections (*Pseudomonas aerugenosa* & *Acinetobacter baumannii* both) average rate of percentage is 8.42% in all type of sample; as per sample in average of Pus/wound is 15.04%, Urine is 1.82% and Sputum is 8.40%.

Also our findings in all type of specimen including all respective both age group highly resistance antibiotic is Colistin (80.0%) and significantly highly sensitive commonly use of antibiotic are Piperacillin/Tazobactam (75.0%), Ceftazidime(70.0%) , Meropenem (76.0%) and Moderately sensitive commonly use of antibiotic are Cefoperazone/Sulbactam (63.0%), Cefepime (58.0%) and Imipenem (64.0%).

Acinetobacter baumannii and *Pseudomonas aerugenosa* are most important pathogenic bacteria causing nosocomial infections especially in ICUs. Also, Multi Ddrug Resisstance (MDR) *Acinetobacter baumannii* and *Pseudomonas aerugenosa* are pathogenic bacteria in the ICUs [20, 21]. Immunodeficient patients in ICUs are much more susceptible to *Acinetobacter baumannii* and *Pseudomonas aerugenosa* infection since ICUs are contamination and thereby spreading pathogens to patients [22, 23]. The patients with *Acinetobacter baumannii* and *Pseudomonas aerugenosa* infection revealed that most strains were isolated from patients in ICUs and these patients manifested symptoms of respiratory tract infection, suggesting that Muti Drug Resistance (MDR) *Acinetobacter baumannii* and *Pseudomonas aerugenosa* mainly causes respiratory infections in the hospitals and infects patients in ICUs [24]. This bacterium also infects patients who undergo invasive operations [25].

Pseudomonas aeruginosa and *Acinetobacter baumannii* was maximum isolated from the samples of patients admitted to the neurosurgery wards followed by neurosurgery and surgery ICUs, surgery wards and orthopedic wards suggesting the fact that nosocomial infections due to *Pseudomonas aeruginosa* and *Acinetobaccter baumannii* were seen more in the postoperative patients and those who are in the hospital for a long time [26]. This finding is in consistent with a retrospective case-control study and a retrospective cross-sectional study in India which concluded that the major risk factors for infection or colonization with multi-resistant *Pseudomonas aeruginosa* and *Acinetobacter baumannii* were prolonged stay in the ICU [26, 27]. The total *Pseudomonas aeruginosa* and *Acinetobaccter baumannii* isolates, maximum Multi Drug Resistance (MDR) isolates were obtained from the wards mentioned above, respectively. The patients with nosocomial infections caused by *Pseudomonas aeruginosa* and *Accinetobacter baumannii* can be divided into 3 groups:

1. Patients for whom their treatment had to be revised but later discharged healthy;
2. Patients who required no extra interventions in the treatment protocol
3. The infection was controlled simply by removing the offending implant/devices or after minor debridement; patients who died due to *Pseudomonas aeruginosa and Acinetobacter baumannii* nosocomial infection [26, 28, 29].

Pseudomonas aeruginosa and *Acinetobacter baumannii* mostly colonizes on the patients surrounding area and instruments and thus, spreading to the patients; hence, simple cleaning was able to minimize the infection rate considerably.

The high prevalence of concomitant resistance to different antimicrobial drugs has resulted in attempts made to look for alternative antibiotics in several studies. Fluoroquinolones and β-lactam antibiotics have been among the dominant class of antimicrobial agents widely used for nosocomial infections [30]. In our study, relatively high resistance to Colistin among all two bacterial species was observed and thus, these widely used antimicrobial agents for treatment of nosocomial infections caused by *Acinetobacter baumannii*, and *Pseudomonas aeruginosa* could not be effective.

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IX. Conclusion

Studies on *Pseudomonas aeruginosa* and *Acinetobacter baumannii* isolated from clinical specimens (often respiratory, pus, and urine) reveal high rates of multidrug resistance (MDR). These opportunistic pathogens are common in ICUs, predominantly affecting elderly populations.

The studies emphasize that these pathogens are frequently co-isolated from infected patients and are becoming increasingly difficult to treat due to their enhanced resistance mechanisms, including biofilm formation. Effective infection control, strict antibiotic stewardship, and monitoring of local resistance patterns are necessary to manage these infections.

Pseudomonas aeruginosa and *Acinetobacter baumannii* are major, frequently co-isolated opportunistic nosocomial pathogens showing rates of multidrug resistance (MDR) and extensive drug resistance (XDR).

The high prevalence of MDR and XDR in these both organisms necessitates strict infection control measures, regular antibiotic stewardship, and monitoring of local antibiograms to guide empirical therapy.

The observation in our study underscore the complex important underlying the emergence of Anti Microbial Resistance (AMR) in non-fermenting bacteria such as *Pseudomonas aeruginosa* and *Acinetobacter baumannii*. We have gained valuable insights into these pathogens' resistance mechanisms and transmission patterns by integrating clinical microbiology. These insights are crucial for developing targeted, evidence-based strategies to combat Anti Microbial Resistance (AMR). It forward, the implementation of strict antibiotic stewardship measures, enhanced surveillance systems, and continued research into new antimicrobial treatments. Additionally, reinforcing infection control practices and educating the public on responsible antibiotic use will be essential components of a comprehensive approach to mitigate this public health threat. Through these multidisciplinary efforts, we can effectively address the growing challenge of antibiotic resistance and ensure sustainable therapeutic options for the future in our country.

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