

**Original article:**

## **Antimicrobial susceptibility pattern of clinical isolates of *Acinetobacter baumannii* in a tertiary care hospital of central India**

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### **Abstract**

**Background and purpose :** Representatives of genus *Acinetobacter* have become an important cause of hospital acquired infections due to their great ability to survive and spread in hospital environment, as well as rapid development of resistant to many antibiotics. *Acinetobacter* is a contributing cause of morbidity and mortality in hospitalised, critically ill patients. *Acinetobacter baumannii* (*A.baumannii*) is common among them. The prevalence of multidrug resistant *A.baumannii* isolates has been increasing. The aim of this study was to determine the antimicrobial susceptibility patterns in *A.baumannii* strains isolated at a tertiary care hospital of central India.

**Materials and Methods:** The laboratory records of microbiology department were retrospectively reviewed to determine the susceptibility patterns of *A.baumannii* isolates to commonly used antibiotics, from July 2018 to July 2019. Disk diffusion methods were employed and results were interpreted to national committee for clinical laboratory standards guidelines.

**Result:** 100 clinical isolates of *A.baumannii* were obtained by the processing of 2195 samples. The incidence of *A.baumannii* was 4.55 %. Major sources of these isolates included pus, tracheal aspirate, blood and urine. *A.baumannii* isolation was higher in male patients (54%) and most common in the age group of 60-80 years (57%). Majority of *A.baumannii* were isolated from pus samples (53%) followed by tracheal aspirate (18%). Majority of *A.baumannii* showed maximum susceptibility to meropenem (70%) followed by imipenem (67 %) and amikacin (55%).

**Conclusion:** This study will help to implement better infection control strategies and improve the knowledge of antibiotic resistance patterns in our region. The wide spread variability of sensitivity profile of common hospital isolates, indicate that every hospital should monitor their antibiogram profile of these isolates from time to time to serve as a basis for empirical therapy in emergency situation.

**Keywords :** *Acinetobacter* , *Acinetobacter baumannii*

## Introduction

*Acinetobacter baumannii* (*A. baumannii*) a Gram-negative, obligate aerobic coccus mostly causing infections in healthcare settings and found mostly in soil, water, and sewage<sup>1</sup>. *Acinetobacter* spp. consists of non-fermenting, coccobacilli and they are opportunistic pathogens<sup>2</sup>. Initially, *A. baumannii* infections were at low potential but now a days it is responsible for several types of hospital acquired infections and regarded as one of the most troublesome pathogens<sup>3,4</sup>. Unique feature of this organism is the ability to utilize different carbon sources and its ability to survive in a range of temperatures and pH conditions<sup>5</sup>. They have been incriminated in infections such as, septicemia, ventilator associated pneumonia, catheter associated urinary tract infection and surgical site infections<sup>4</sup>. In recent years, the problem is further compounded by the emergence of resistance to antimicrobial agents which may be due to liberal and empirical use of antibiotics.<sup>8</sup> *A. baumannii* show resistance to a wide range of antibiotics, leading to serious infections. Multi-drug resistance (aminoglycosides, fluoroquinolones, ureidopenicillins and third generation cephalosporins) exhibited by *Acinetobacter* species poses a major clinical problem in treatment.<sup>5</sup>

## Materials and Methods

This study was done in the Department of Microbiology MGM medical College , Indore (M.P.) from July 2018 to July 2019. During this period all clinical specimens received were processed for detection of *A. baumannii* without delay in the following manner.<sup>13</sup>

1. Direct smear examination by Gram staining.
2. Culture on Nutrient agar, Blood agar and MacConkey agar .
3. Motility by hanging drop method .
4. Identification with the help of biochemical tests.
5. Antimicrobial susceptibility testing on Mueller Hinton agar by Kirby Bauer's disc diffusion method.<sup>14</sup>
6. Interpretation of result.

Antibiotics used in our study were piperacillin/tazobactam (100/10 µg) amikacin (30 µg), ceftazidime (30 µg), imipenem (10 µg), meropenem (10µg), gentamicin (10µg), cefepime (30µg) and levofloxacin (5µg), ceftriaxone(30µg) ,doxycycline(10 µg) ,polymyxin(300 µg)), norfloxacin(10 µg) , nitrofurantoin(300 µg) .

## Results

**Table 1: Sex wise distribution of *A. baumannii***

Sex	Number of cases	Percentage
Males	54	54
Females	46	46
Total	100	100

**Table 2: Age wise distribution of *A. baumannii***

Age in years	Number of cases	Percentage
<1	14	14
1-20	10	10
21-40	08	08
41-60	11	11
61-80	57	57
Total	100	100

**Table 3: Distribution of various specimens and no of isolates**

S. No	Specimen	No of isolates	Percentage
1	Pus	53	53
2	Tracheal aspirate	18	18
3	Blood	15	15
4	Urine	13	13
5	CSF	01	01
	Total	100	100

**Table 4: Antibiotic susceptibility pattern of *A.baumannii***

ANTIBIOTICS	SENSITIVE		INTERMEDIATE SENSITIVE		RESISTANT	
	No of cases	%	No of Cases	%	No of Cases	%
Piperacillin +Tazobactam	52	52	13	13	35	35
Ceftazidime	41	41	15	15	44	44
Gentamycin	49	49	11	11	40	40
Levofloxacin	51	51	13	13	36	36
Ceftriaxone	13	13	20	20	67	67
Amikacin	55	55	8	8	37	37
Imipenem	67	67	7	7	26	26

Meropenim	70	70	11	11	19	19
Doxicyclin	23	23	12	12	65	65
Cefepime	22	22	11	11	67	67
Polymyxin B	50	50	12	12	38	38
Cotrimoxazole	20	20	11	11	69	69
Norfloxacin*	03	37.5	01	12.5	04	50
Nitrofurantoin*	01	12.5	01	12.5	06	75

\*For urinary isolates only.

### Discussion

100 clinical isolates of *A.baumannii* were obtained by the processing of 2195 samples. The incidence of *A.baumannii* was 4.55%. *A.baumannii* isolation was higher in male patients (54%) and most common in the age group of 60-80 years(57%). (Table1&2) Majority of *A.baumannii* were isolated from pus samples,(53%) followed by tracheal aspirate (18%). (Table 3) *A.baumannii* had showed maximum susceptibility to meropenem (70%) followed by imipenem (67%) and amikacin (55%).(Table 4). In our study the incidence of *A.baumannii* was 4.55%, which resembles with the studies of Dash *et al*<sup>1</sup> (3.12%) and Nath *et al*<sup>10</sup>(4.16%). *A.baumannii* are known to cause infection in extremes of age which was seen in our study ( 57% in the age group of 60 - 80 years) similar to study by Najmul *et al*<sup>5</sup> (46% in 71 to 80 years of age group), which could be due to physiologically deficient immune system.Out of total 100 patients, 54% were males and 46% were females which was about similar to study of Dash *et al*<sup>1</sup>.(58.58% were males while 41.42% were females) . In our study majority of *A.baumannii* were isolated from pus samples,(53%) which was similar to study done by Islahi *et al*<sup>12</sup> (48.2%), Dash *et al*<sup>1</sup>.(56.9%) . *A.baumannii* displays a wide and variable spectrum of antibiotic sensitivity pattern. There is no antibiotic for which all isolated *A.baumannii* were susceptible in our study. According to our study sensitivity of Meropenem was 70% and the sensitivity ranged from 40% to 85% in other studies<sup>1,5,10</sup> . *A.baumannii* showed resistance of 67% to Ceftriaxone, 44% to Ceftazdime, 40% to Gentamicin, 35% to Piperacillin-tazobactam which are commonly used by the clinicians in our hospital. For urinary isolates, *A.baumannii* showed 62.5% resistance to Norfloxacin while 87.5% to Nitrofurantoin in our study. *A.baumannii* showed a good sensitivity to Amikacin 55% in our study. *A.baumannii* showed an overall 26% resistance to Imipenem in our study, compared to study by Guckan *et al*<sup>11</sup>, which showed 19%. The differences in the percentage may be due to the variation in the sample size.

### Conclusion

Observations from the our study showed that the Different sensitivity pattern and multidrug resistance exhibited by *A.baumannii* pose a great problem in treating these infections and leads to high morbidity and mortality. These organisms have great potential to survive in hospital environment, so effective methods of sterilization and infection control measures should be implemented. Care in evaluation of effective antibiotic options, judicious use of antibiotics by instituting antibiotic policy of combination therapy and rigorous infection control measures will help

to fight against *A.baumannii* for effective management of patients. The wide spread variability of sensitivity profile of common hospital isolates, indicate that every hospital should monitor their antibiogram profile of these isolates from time to time to serve as a basis for empirical therapy in emergency situation.

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Indian Journal of Basic and Applied Medical Research; December 2020: Vol.-10, Issue- 1, P. 98 - 103  
DOI: 10.36848/IJBAMR/2020/16215.55605

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Date of Submission: 18 September 2020

Date of Publishing: 14 December 2020

Author Declaration: Source of support: Nil, Conflict of interest: Nil

Ethics Committee Approval obtained for this study? YES

Was informed consent obtained from the subjects involved in the study? YES

For any images presented appropriate consent has been obtained from the subjects: NA

Plagiarism Checked: Urkund Software

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DOI: 10.36848/IJBAMR/2020/16215.55605