

## Isolation & study of multidrug resistant *Acinetobacter* from various clinical samples in a tertiary care hospital

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### Abstract

**Introduction:** Nosocomial infections with *Acinetobacter* are being increasingly reported worldwide from debilitated & Critical care patients. Multidrug resistance among *Acinetobacter* are now a major cause of concern.

So the study was conducted to know prevalence & antimicrobial resistance pattern of *Acinetobacter species* in our area.

**Materials & Methods:** A total of 100 non-duplicate clinical specimens were processed for *Acinetobacter* by the routine microbiological procedures. Antimicrobial susceptibility testing was performed as per CLSI guidelines.

**Result:** *Acinetobacter species* were isolated from 9% of clinical samples. The higher percentage of isolates were from Pus 7(20%) followed by urine 1(4%) and 1(3%) from Blood. We found Highest isolates were from ICU -7(77.78%) followed by wards 2(22.22%). No isolates were found from Outpatient (OPD).

77% of our isolates showed resistance to drugs piperacillin-tazobactam and ceftriaxone while lower resistance was noted to ciprofloxacin & tetracyclines (33% respectively).

Resistance pattern for other drugs was co-trimazole (66%), gentamycin & piperacillin (55% respectively), amikacin, ofloxacin & imipenem - 44%. Interesting finding in our study was 11% of our isolated were sensitive to all the tested antimicrobials whereas 22% isolates were resistant to all the tested antimicrobials.

**Conclusion:** 22% of our isolates showed resistant to all the tested antimicrobials. Thus judicious use of antimicrobials & adopting strict infection control policies will be useful.

**Key words:** Multidrug resistance, Morbidity & Mortality, *Acinetobacterspp*, ICU & debilitated patients, Antimicrobial policy, Infection control.

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likecolistin & tigecycline for treatment. The accurate identification & reporting of *Acinetobacter* will help to prevent spread of multidrug resistant organism.

### Aims & Objectives

- To know the prevalence of *Acinetobacterspp* from various clinical samples.
- To know the antimicrobial resistance pattern of isolates.

### Material & Methods

This study was conducted at the department of Microbiology, Smt. Kashibai Navale Medical College, Pune, from May 2015 to July 2015. A total of 100 clinical specimens such as blood, Pus and CSF were received from patients admitted to various wards, ICU & from OPD. The samples were processed by the routine microbiological procedures<sup>3</sup>. *Acinetobacter* isolates obtained were identified by various biochemical tests.

Antimicrobial sensitivity tests of the *Acinetobacter* isolates were done by modified Kirby – Bauer disc diffusion method for the following antimicrobial agents according to the Clinical and Laboratory Standards Institutes (CLSI) guidelines<sup>4</sup>- amikacin (30mcg), ceftriaxone (30mcg), co-trimazole (23.75/1.25mcg), gentamycin (10mcg),

### Introduction

*Acinetobacter*, once considered as opportunistic pathogen has recently been emerged as an important nosocomial pathogen world over, mostly involving patients with impaired host defense<sup>1</sup>. It is a significant nosocomial pathogen due to its ability to survive at various temperatures, pH, on dry & moist surfaces. This helps it in transmission & propagation of infections in hospitals. *Acinetobacter species* causes illness in debilitated & ICU patients leading to increase in morbidity & mortality. Apart from ICU patients it has been shown to cause nosocomial pneumonia, meningitis, endocarditis, skin & soft tissue infection, urinary tract infection, conjunctivitis, burn wound infection, bacteraemia.<sup>2</sup>

Increasing multidrug resistance pattern by *Acinetobacter species* has narrowed range of drugs for treatment. This leads to use higher antimicrobials

tetracyclines (30mcg), piperacillin (100mcg), imipenem (10mcg), piperacillin & tazobactam (100/10mcg), ofloxacin (5mcg).

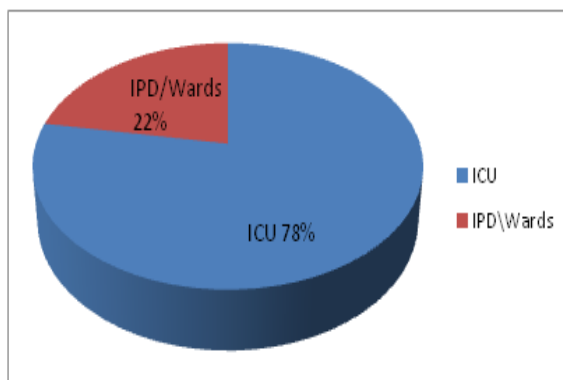
**Results**

During the study, out of 100specimens received from hospital 9*Acinetobacter species* were isolated from various clinical samples as indicated in Table 1& diagram 1. Maximum isolates were from pus which includes pus, tissue, endotracheal tube secretions (ETT), tip of central line, tip of Foleys catheter. Out of 7 isolates from pus, 5 isolates were from ETT secretions from ICU(55%).

Highest isolates were from ICU -7(5 from ETT secretions & 1 from blood, 1 from pus), followed by IPD\wards- as shown in diagram 2.

Sensitivity pattern of *Acinetobacter species* to different antimicrobials showed higher resistance i.e. 77% to drugs piperacillin & tazobactam, ceftriaxone. Lower resistance was observed to drug sciprofloxacin & tetracyclines, it was 33%. Resistance pattern for other drugs was co-trimaxazole-66%, gentamycin & piperacillin -55%, amikacin, ofloxacin & imipenem - 44%. As shown in table 2 & bar diagram 3 & 4.

22% isolates were resistant to all antimicrobials used in the study. 11% isolates were sensitive to all antimicrobials used for sensitivity testing in this study.



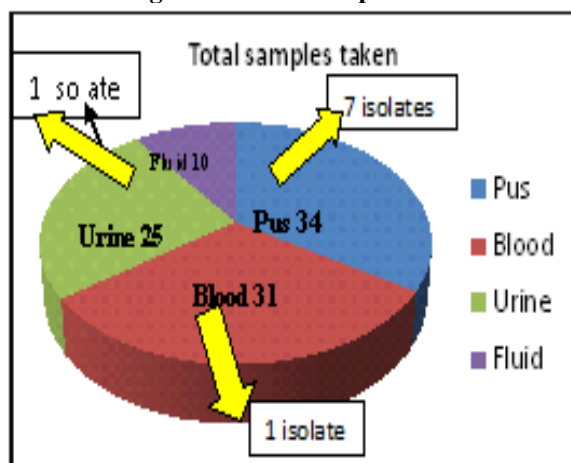
**Table 2: Resistance pattern of antibiotic drugs**

Antibiotics	Resistant strains (n= 9)%
Amikacin	4(44%)
Ceftriaxone	7(77%)
Ciprofloxacin	3(33%)
Co-trimaxazole	6(66%)
Gentamycin	5(55%)
Tetracyclines	3(33%)
Piperacillin	5(55%)
Imipenem	4(44%)
Piperacillin & Tazobactam	7(77%)
Ofloxacin	4(44%)

**Table 1: Isolation from different samples**

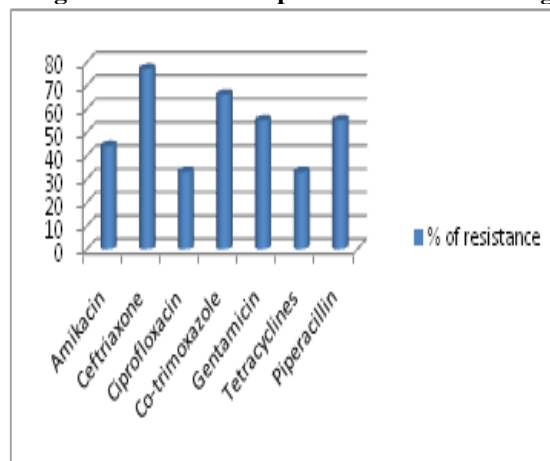
Clinical Samples	Total Samples taken	No of Isolates(%)
Pus	34	7(20%)
Blood	31	1(3%)
Urine	25	1(4%)
Fluid	10	0(0%)

**Diagram 1: Total samples taken**

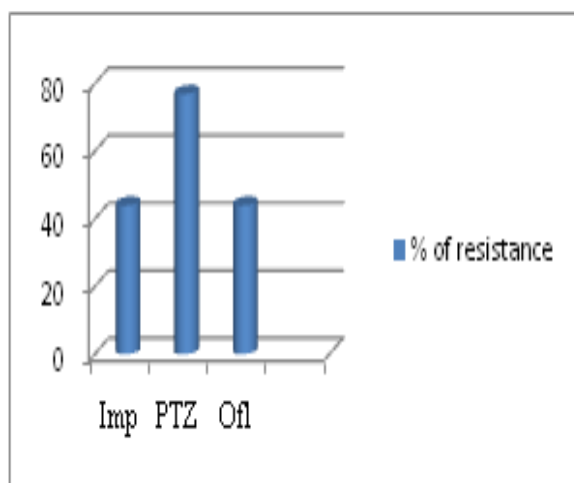


**Diagram 2: Distribution of Isolates from wards, ICU, OPD**

**Diagram 3: Resistance pattern of first line drug**



**Diagram 4: Resistance pattern of II line drug**



## Discussion

*Acinetobacter species* has emerged as an important pathogen with a trend towards increased drug resistance. This leads to increase in mortality & morbidity to infections by *Acinetobacter*spp.

In the present study, the prevalence of *Acinetobacter species* isolated from various clinical specimens was 9%. This is in accordance with the prevalence in the study by Oberoi<sup>5</sup> et al (2009), N Jaggi<sup>6</sup> et. al (2011) & D. Banerjee<sup>7</sup> et. al. They reported the prevalence of 8.4%, 11%, & 5% respectively. The wide variations of prevalence of *Acinetobacter species* may be due to variations in geographical distribution as well as difference in antibiotic policy used by different institutes.

Higher percentage of isolates i.e. 77% were from ICU. Similar results were seen in the study by Jaggi et. al (75.9%). 55% isolates were from respiratory secretions, which is in accordance with the study by M. Mathew<sup>8</sup> et. al (2013), which was 55%.

In this study highest resistance i.e. 77% was observed to ceftriaxone, piperacillin & tazobactam. These findings are similar to findings of M. Mathew<sup>8</sup> et al who observed 86% resistance to these drugs.

In the ICU based study by Patwardhan<sup>9</sup> et al (2007) the resistance was 96% to these drugs. This indicates that, there is more resistance in ICU strains. This could be the cause of increase in morbidity & mortality in ICU patients.

*Acinetobacter* strains in this study showed comparatively lower resistance to drugs Ciprofloxacin & tetracycline which was 33%. While findings seen in the study by Mathew et al & Mushtaq<sup>10</sup> et al, it was 50%. Thus antimicrobial sensitivity pattern shows more resistance to higher antimicrobials used as second line than first line of antimicrobials. This reversal of sensitivity pattern may be due to antimicrobial policy of using higher antimicrobials.

More use of higher antimicrobial leads to more resistance to these antimicrobials.

22% isolates (2 isolates out of 9) were resistant to all antimicrobials tested for sensitivity. The resistance may occur due to inadequate antimicrobial policy. Also may be due to adoption of various resistance mechanisms by *Acinetobacter spp.* The various resistance mechanisms include production of a variety of chromosomal or plasmid-mediated  $\beta$ -lactamases, especially extended-spectrum  $\beta$ -lactamase (ESBL), alteration of drug-binding proteins, permeability changes in the cell membrane, loss of porins, and efflux pump<sup>11</sup>. Biofilm formation also has correlation with development of multidrug resistant (MDR) strains.

This shows increase in resistant strains, which will again add to mortality & morbidity of infections by *Acinetobacter spp.* Also this situation will narrow the range of antimicrobials available for treatment. If this trend of resistance will continue, then antimicrobials like tigecyclin, colistin has to be used. Thus search for other options of antimicrobials for treatment is necessary.

11% isolates (1 out of 9 isolates) were sensitive to all antimicrobials tested in this study. This indicates that, there are strains which have not adopted the resistance gene or resistance mechanisms. So, we still have hopes for controlling situation up to certain extent, which can be achieved by antimicrobial stewardship.

To prevent the emergence of resistance to newer antimicrobial agents, we recommend:

1. Regular monitoring of antimicrobial resistance of the microorganism
2. Antimicrobial and infection control policy in hospitals to be strictly followed
3. Antimicrobial stewardship programmes can be implemented to reduce inappropriate use of antimicrobials, thereby controlling the development of resistance

This increasing trend of resistance can be controlled by applying proper antimicrobial policy & strict infection control strategy. As this is a pilot study, to apply the findings of this study there is a need for study on larger scale.

## Conclusion

In this study, 77% isolates were from ICU & 22% of isolates were resistant to all tested antimicrobials. This indicates infections caused by *Acinetobacter species* are becoming difficult to treat day by day due to increasing drug resistant isolates. These drug resistant infections can be minimised to some extent by judicious use of antibiotics and adopting strict infection control policies. Judicious use of antibiotics means **use of right drug, at right time, in correct dose & in right patient**. Strict infection control policy

includes proper use of sterilisation & disinfection methods, hand hygiene & use of universal safety precautions.

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