

## Original Article

### Multidrug Resistant *Acinetobacter* Isolates from Patients Admitted at Kolar

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#### ABSTRACT

**Objectives :** To study the antimicrobial susceptibility pattern of *Acinetobacter* isolated from various clinical specimens.

**Methods :** A total of 34 isolates of *Acinetobacter* were obtained from 4086 samples over a period of 7 months (Jan- July 2010). Antimicrobial susceptibility testing was done by Kirby – Bauer's disc diffusion method with commercially available discs on Mueller Hinton agar plates. The zones of inhibition were interpreted for antibiotic sensitivity as per the CLSI guidelines 2010.

**Results :** *Acinetobacter* was isolated predominantly from tracheal aspirates (38%) followed by sputum 35%, pus from surgical site infections (12%), blood (9%) and urine (6%). Majority of the isolates were from the Intensive care unit (ICU) patients 26/34 (76.5%), followed by those isolated from patients hospitalized in the wards 6/34 (17.6%). Community acquired infections were also seen in 2 (5.9%) outpatient department (OPD) cases. Overall 70.6% of the isolates were sensitive to Imipenem followed by Piperacillin-Tazobactam (26.5%), Gentamicin (20.6%), Piperacillin; Amikacin and Ciprofloxacin (17.6%) each, Tetracycline (14.7%), Trimethoprim-sulfamethoxazole and Ceftazidime (5.9%) each. Most of the isolates (74%) were multidrug resistant.

**Conclusions :** *Acinetobacter* is emerging as a predominant health care associated multidrug resistant pathogen, especially in the ICUs with increasing resistance to Carbapenems. This is a major concern as untreatable infections by this organism may contribute to increased morbidity and mortality.

**Keywords :** *Acinetobacter*; multidrug resistance; nosocomial infection;

#### INTRODUCTION

Members of the genus *Acinetobacter* are ubiquitous organisms which have emerged as important agents causing health care associated infections in the recent years. There are many species in this genus, but only three species i.e *A.baumannii*, *A.calcoaceticus* and *A.lwoffii* appear to be of clinical importance. These species have been included under the term *A.calcoaceticus* – *A.baumannii* complex and are usually reported as *Acinetobacter*.<sup>[1]</sup> *Acinetobacter* species have been associated with a wide variety of nosocomial infections such as ventilator associated pneumonia, catheter-associated urinary tract infections, surgical site

infections, catheter-related bloodstream infections, skin and soft tissue infections and iatrogenic meningitis in hospitalized patients, especially patients in the Intensive Care Units (ICUs).<sup>[2,3]</sup> An increase in antibiotic resistance among the isolates of the organism during recent years, has made these infections difficult to treat. Further, these bacteria are known to colonize the skin and the gastrointestinal tract of patients; they also survive for long periods in the hospital environment, with enhanced opportunities for transmission between patients.<sup>[4]</sup> Success of antimicrobial therapy depends on the appropriateness of the choice of antibiotics that should be used on the basis of prior knowledge of the susceptibility pattern of the agent. Thus, the

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Table:1 Distribution of *Acinetobacter* isolates from various clinical samples(N=34)

Sl.No.	Clinical Sample	No. of Isolates (%)
1	Tracheal aspirates	13(38)
2	Sputum	12(35)
3	Pus	4(12)
4	Blood	3(9)
5	Urine	2(6)
<b>Total</b>		<b>34</b>

objective of this study was to determine the antimicrobial susceptibility pattern of *Acinetobacter* species isolated from various clinical specimens collected from patients admitted to RL Jalappa Hospital, Kolar.

#### MATERIALS AND METHODS

The present study included *Acinetobacter* strains isolated from various clinical samples over a period of 7 months (Jan-July 2010) at RL Jalappa Hospital, Tamaka, Kolar. The isolates were biochemically identified by standard microbiological method.<sup>[4]</sup> Antimicrobial susceptibility testing of the isolates was performed by the standard Kirby – Bauer's disc diffusion method with commercially available discs (Himedia) on Mueller Hinton agar plates<sup>[5]</sup> and the zones of inhibition measured and interpreted for antibiotic sensitivity as per the Clinical Laboratory Standards Institute (CLSI) guidelines 2010<sup>[6]</sup>. Antibiotics included were Ceftriaxone (30 µg), Ceftazidime (30 µg), Cefipime (30 µg), Piperacillin (100 µg), Piperacillin-Tazobactam (100/10 µg) Amikacin (30 µg), Gentamicin (10 µg), Ciprofloxacin (5 µg), Levofloxacin (5µg), Tetracycline (30 µg) Trimethoprim-sulfamethoxazole (1.25/23.75 µg), and Imipenem (10 µg).

#### RESULTS

A total of 34 (0.8%) *Acinetobacter* isolates were obtained from 4086 clinical samples processed between Jan – July 2010. The samples processed were tracheal aspirates, sputum, pus from surgical site infection, blood and urine. Table-1 shows the distribution of *Acinetobacter* species isolated from various clinical samples. Among the 34 isolates obtained, predominant isolation was from the purulent respiratory specimens [tracheal aspirates (38%) and sputum (35%)] followed by pus from surgical site Infections (12%), blood (9%) and urine (6%). Majority of the isolates were from the ICU patients 26/34 (77%), followed by those hospitalized in the wards 6/34 (18%). Two (6%) isolates were from the outpatient department (OPD) cases, one from a urine sample and the other from sputum. Results of the antimicrobial susceptibility testing are presented in Figure-1. In general, the isolates showed resistance to cell wall acting antibiotics like Cephalosporins (Ceftazidime, Ceftriaxone, Cefipime). They were also resistant to Aminoglycosides (gentamicin, amikacin), Fluoroquinolones (Ciprofloxacin, Levofloxacin) and Trimethoprim -sulfamethoxazole but, 70.6%

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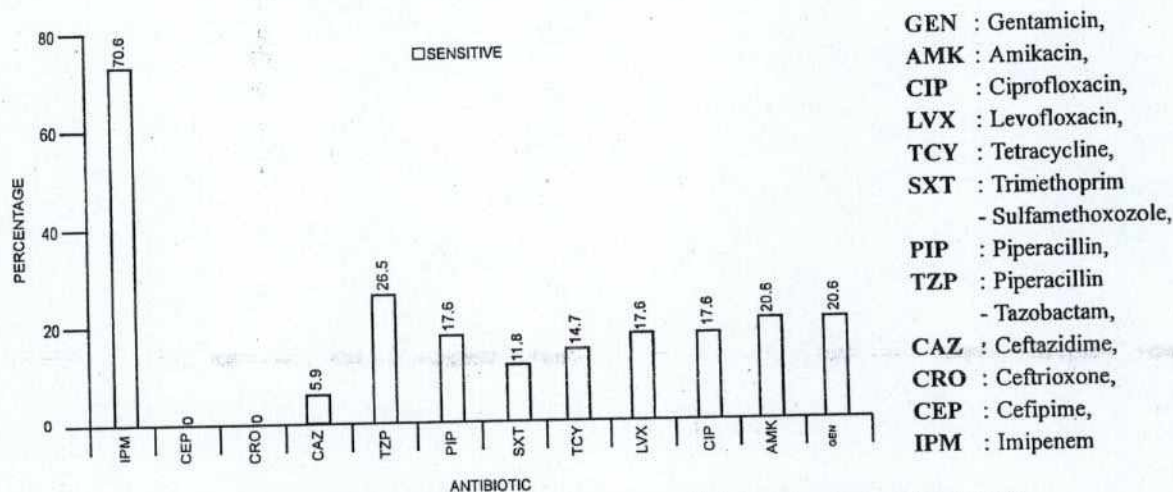


Figure -1 : Antimicrobial susceptibility pattern of *Acinetobacter* isolates (n=34)

of the isolates were susceptible to Imipenem. Some isolates that were resistant to Imipenem [5(14.7%)] were susceptible to Tetracycline.

## DISCUSSION

In the present study 76.5% of the isolates were from the critical care settings and the source was most often respiratory samples (70%). This may probably be related to the advanced invasive diagnostic and therapeutic procedures adopted in the present day ICUs as emphasized by various studies<sup>[3,7,8,9]</sup>. In this study, 74% of the *Acinetobacter* isolates were multidrug resistant. Some studies have shown varying rates of resistance to multiple antibiotics (range= 40-70%).<sup>[2,8,10,11]</sup> Antimicrobial resistance as shown in this study is an important concern for clinicians treating patients with *Acinetobacter* infections. However, before the patients are treated with antibiotics one has to confirm whether the organism isolated is a colonizer or a pathogen. To incriminate the isolate as a pathogen, stringent clinical criteria such as host factors, period of hospitalization, subject to procedures – indwelling catheters, intubation, catheter lines etc. And previous antibiotic therapy

(Cephalosporins/Fluoroquinolones)<sup>[1]</sup> have to be evaluated. The high resistance pattern seen in our isolates may be related to the selective pressure of extensive usage of third generation cephalosporins. It has also been observed frequently that *Acinetobacter* species can develop resistance when the patient is on treatment. So initially, the isolates may show a sensitive pattern but, subsequently the same isolates may show resistance to the antibiotics to which they were previously susceptible. The resistance mechanisms in *Acinetobacter* are multiple. They include production of  $\beta$ -lactamases, alteration in cell wall channels and efflux pumps by which the organism becomes resistant to  $\beta$ -lactam antibiotics; production of aminoglycoside modifying enzymes and mutations in genes *gyrA* and *parC* mediate resistance to aminoglycosides and quinolones respectively.<sup>[11]</sup>

Carbapenems are frequently used as a last choice in treating serious infections caused by multi-drug resistant gram negative bacilli.<sup>[7,8]</sup> In this study, 29.4% of the *Acinetobacter* isolates were resistant to Imipenem. Similar observations were made by other authors<sup>[8,9,10]</sup>. These findings suggest

1. The first part of the report is a general introduction to the subject of the study. It discusses the importance of the study and the objectives of the research.

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3. The third part of the report is a presentation of the results of the study. It includes tables, figures, and text describing the findings of the research.

4. The fourth part of the report is a discussion of the results and their implications. It includes a comparison of the findings with previous research and a discussion of the limitations of the study.

5. The fifth part of the report is a conclusion and a list of references. The conclusion summarizes the main findings of the study, and the references list the sources of information used in the research.

6. The sixth part of the report is an appendix containing additional information related to the study. This may include raw data, detailed calculations, or other supporting materials.

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8. The eighth part of the report is a list of figures and tables. Each figure and table is accompanied by a caption describing its content and purpose.

9. The ninth part of the report is a list of abbreviations and symbols used in the study. This helps to clarify the meaning of the symbols and abbreviations used throughout the report.

10. The tenth part of the report is a list of acknowledgments. This section is used to thank individuals or organizations that provided support or assistance during the course of the study.

11. The eleventh part of the report is a list of references. This section lists the sources of information used in the study, including books, articles, and other publications.

12. The twelfth part of the report is a list of appendices. This section contains additional information related to the study, such as raw data, detailed calculations, or other supporting materials.



that Carbapenems (Imipenem, Meropenem & Doripenem) should be used judiciously in ventilated patients to prevent any further increase in resistance to this group of drugs as in such instances the only alternative antimicrobials available for treatment are Colistin, Polymyxin B and Tigecycline.<sup>[1]</sup> Fortunately some of these resistant isolates were susceptible to Tetracycline in our study, which could be used as an alternative drug in our patients, thus emphasising the need to culture the organisms from the clinical samples and determine their antimicrobial susceptibility pattern. A few studies have reported similar findings.<sup>[7,11]</sup> However, it is considered that Tetracyclines and Tigecycline are not very Useful in treating nosocomial respiratory infections. In view of the increasing resistance to carbapenems, the study also highlights the need to test for the presence of carbapenemases routinely in the laboratory by the modified Hodge test.<sup>[6]</sup> Antibiotic usage in ICUs whether needed or not in sepsis and pneumonias may be guided by the estimation of procalcitonin levels which is highly specific for bacterial sepsis.<sup>[14,15,16]</sup>

*Acinetobacter* could be endogenous, fomite-associated or airborne.<sup>[1]</sup> They colonise and invade the patient to cause infection. Though the organism has developed multidrug resistance, it has largely remained susceptible to disinfectants and antiseptics.<sup>[1]</sup> Thus the prevention involves aseptic care of vascular catheters and endotracheal tubes, proper disinfection of the surfaces with which the patient comes in contact and thorough hand hygiene of the health care workers.

## CONCLUSION

This study reports multidrug resistant *Acinetobacter* isolates in ICU settings and wards emerging as a predominant pathogen in our hospital. Emergence of Carbapenem resistance is

Worrisome. This stresses the importance of constant monitoring of resistance to these nosocomial isolates of *Acinetobacter* and institution of appropriate antimicrobial therapy when needed. In case of pandrug resistant *Acinetobacter* infections, the only alternative antibiotics available are Colistin, Polymyxin B and Tigecycline.<sup>[1,11,12,13]</sup> To confront the imminent threat of untreatable infections caused by this organism, a correct antibiotic strategy should be addressed and strict compliance to appropriate infection control practices are needed to prevent the occurrence and spread of such multidrug resistant isolates in the hospital.

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