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Original Article

Multidrug-Resistant (MDR) Acinetobacter: a Major Nosocomial Pathogen Challenging Physicians

^aMohan B S, ^bLava R, ^cVinod Nambiar, ^dKrishna Kumar, ^eSrikrishna R

^aMohan, Asst. Professor, Dept. of Microbiology, Saptagiri Institute of Medical Sciences, Bangalore

^bLava, Professor, Dept. of Microbiology, JJM Medical college, Davangere

^cVinod Nambiar, Assoc. Professor, Oman medical college

^dKrishna Kumar, professor, Oman medical college

^eSrikrishna R, Assoc. Professor, Siddhartha Medical college, Tumkur

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ABSTRACT

Abstract- There is increasing reports of emergence of multiple drug resistant (MDR) *Acinetobacter* spp. in the world. *A. baumannii* isolates from JJM Medical College hospital were studied in order to find the profile of antibiotic resistance. Among them, 40.6% (59/145) of *A. baumannii* isolates were identified as MDR. Overall susceptibility rates to ofloxacin, gentamicin, carbenicillin, ceftazidime and ceftriaxone were 45.45%, 38.96%, 42.86%, 41.56%, 50.65% and 29.87%, respectively. The susceptibility rates to amikacin, ciprofloxacin, imipenem, and meropenem were 57.14%, 58.44%, 67.53% and 71.42% respectively. Our findings also highlight the importance of clinicians' access to updated susceptibility data regarding *A.baumannii* in developing countries such as India.

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1. Introduction

Acinetobacter species are becoming a major cause of nosocomial infections and can present major challenges for physicians. Of growing concern is the increase in multidrug resistance exhibited by clinically relevant species. *A.baumannii* is emerging as a cause of numerous global outbreaks, displaying ever-increasing rates of resistance¹. Today, the increasing recovery of multi-drug resistant (MDR) *A. baumannii* in the nosocomial setting is a frightening reality².

Acinetobacter are pleomorphic, encapsulated, aerobic, nonfermentative gram-negative bacilli. *Acinetobacter* species are ubiquitous, living in soil and water. The organism can survive for extended periods in the environment and tolerates both wet and dry conditions³. *Acinetobacter* utilizes a wide variety of carbon and other energy sources and grows well on routine laboratory media. There are over 20 species of *Acinetobacter*, although the species *A. baumannii* accounts for >80% of isolates causing human disease⁴. The organism can survive for months on clothing and bedclothes, bed rails, ventilators and other surfaces in the environment,

including sinks and doorknobs, making nosocomial transmission extremely difficult to control.

Acinetobacter is an organism of low virulence, but it is capable of causing infections. *A. baumannii* is primarily a healthcare-associated pathogen commonly isolated from the hospital environment and hospitalized patients. It is increasingly reported as the cause of outbreaks and nosocomial infections such as bloodstream infections, ventilator-associated pneumonia (VAP), urinary tract infections (UTI) and wound infections^{5, 6, 7, 8}.

Acinetobacter baumannii infections are often difficult to eradicate due to high level resistance to a wide range of antibiotics as a result of both intrinsic and acquired mechanisms^{9, 10}. The objective of the present investigation was to assess the samples received from the JJM Medical college hospital in order to find the profile of antibiotic resistance among *A.baumannii* strains isolated from patients admitted in our hospital. Knowledge on incidence of MDR *Acinetobacter* may help physicians to properly treat infections due to MDR *A.baumannii*.

* Corresponding Author : **Khayati Sant Ram**

Dept of Anatomy, Hind institute of medical sciences

Assistant professor, Dept. of Anatomy

Hind institute of medical sciences

Safedabad, Barabanki, U.P, INDIA

E.mail: khayati_santram@yahoo.com

2. Material and Methods

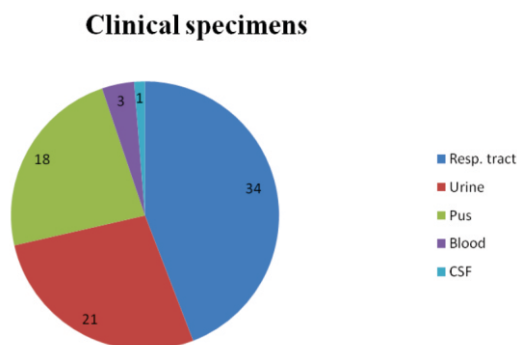
The present study was conducted at the Department of Microbiology, J.J.M. Medical College, Davangere. The study included 72 *A. baumannii* isolates from patients with nosocomial infections. All presumptive *Acinetobacter* isolates, which were oxidase-negative, non-lactose fermentative, and gram-negative coccobacilli, were identified as *Acinetobacter baumannii* by using the conventional biochemical tests and growth potential at 37°C and 44°C. Biochemical tests used for detection of *A. baumannii* included growth on MacConkey medium, oxidation of glucose, hydrolysis of esculin, decarboxylation of lysine, hydrolysis of arginine, and reduction of nitrate¹¹.

Antimicrobial susceptibility tests

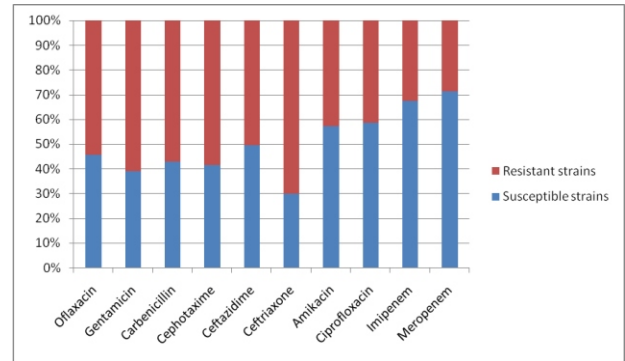
Antimicrobial susceptibility was determined by the Kirby-Bauer Disk diffusion Agar method according to NCCLS Standard guidelines^{12, 13}. Quality control organisms were utilized routinely in the JJMMC hospital and Department of Microbiology laboratories to ensure accurate performance of the susceptibility tests. Owing to the high risk of nosocomial infections due to *A. baumannii* strains, isolates that showed intermediate susceptibility to an antimicrobial agent were categorized as resistant isolates for data analysis and presentation. We defined *A. baumannii* as MDR, when the organisms were resistant to all studied antimicrobial agents.

3. Results:

Totally, 77 strains were identified as *A. baumannii*, out of which 73 were isolated from patients with more than 48 hours of hospitalization (defined as nosocomial infections). Only 4 of them were isolated from outpatients (no nosocomial origin was documented). Sites from which *A. baumannii* was initially isolated included respiratory tract (34), urine (21), pus (18), blood (3) and CSF (1).



Overall susceptibility rates to ofloxacin (45.45%), gentamicin (38.96%), carbenicillin (42.86%), ceftaxime (41.56%), and ceftazidime (49.35%) were less than 50%. The least effective drug was ceftriaxone (29.16%). The susceptibility rates to amikacin, ciprofloxacin, imipenem, and meropenem were 57.14%, 55.84%, 67.53% and 71.42% respectively.



4. Discussion

At present, *Acinetobacter* spp., especially *A. baumannii* accounts for a substantial proportion of nosocomial infections. Recent trends indicate increasing antimicrobial resistance of *Acinetobacter* isolates, posing a serious threat to hospitalized patients^{14, 15, 16, 17, 18}.

The spread of antimicrobial resistance among *Acinetobacter* spp., in India has emerged as an important challenge for the Indian medical community. According to global surveillance reports, at present, *Acinetobacter* isolates are the best candidates for the study of antimicrobial susceptibility among microorganisms responsible for nosocomial infections.

In present study, 73 (94.08%) strains were isolated from hospital admitted patients. These results were consistent with some other studies¹⁹. MDR *A. baumannii* infections tend to occur in immunosuppressed patients, in patients with serious underlying diseases, and in those subjected to invasive procedures and treated with broad-spectrum antibiotics²⁰. More than 50% of *A. baumannii* strains were isolated from ICU. As shown in other reports, ICUs are high-risk areas for nosocomial infections because of the severity of underlying diseases, the duration of stay and the use of invasive procedures^{21, 22}. Although *A. baumannii* commonly causes nosocomial infections, community-acquired infections had also been reported. Community-acquired *A. baumannii* infections usually occur in immunocompromised hosts including patient with advanced age or cirrhosis. The patients frequently presented with respiratory tract infections^{23, 24}. In our study, 4 patients acquired *A. baumannii* infections from the community. Two of the 4 patients did not have any underlying diseases.

The present study showed that meropenem (71.42%) and imipenem (67.53%) were most effective drugs. Indeed, carbapenems are generally the last resort in the treatment of life threatening infections caused by *Acinetobacter* spp. because they are not affected by most β -lactamases, including extended-spectrum β -lactamases. However their efficacy is increasingly compromised by the emergence of carbapenem-hydrolysing β

-lactamase enzymes of Ambler molecular class B (metallo- β -lactamases) and D (oxacillinases) 25, 26. The least effective drug was ceftriaxone (29.16%). Overall susceptibility rates to ofloxacin (45.45%), gentamicin (38.96%), carbenicillin (42.86%), cephotoxime (41.56%), and ceftazidime (49.35%) were less than 50%. This may be attributed to the over use of these antibiotics in the hospital admitted patients.

This study had several limitations. Infection was not differentiated from colonization. Causation between multidrug resistance and poor outcomes cannot be established or inferred from this study; additional analysis and data collection would be required to control for confounding effects on the association between multidrug resistance and outcome.

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