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Prevalence and Antibiogram of *Acinetobacter* Infections: An experience from a Teaching Institute of Rural Setting, in Central India

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A B S T R A C T

Acinetobacter baumannii has emerged as a worldwide problem as a nosocomial pathogen in hospitalized patients. *Acinetobacter* spp. can cause a multitude of infections including pneumonia, bacteremia, meningitis, urinary tract infections, and skin and soft tissue infections, and the mortality associated with these infections is high. Isolates resistant to almost all commercially available antimicrobials have been identified, thus limiting treatment options. Isolates of *Acinetobacter* received in the microbiology laboratory over a period of one year were processed, identified by conventional standard methods and antimicrobial susceptibility was performed according to CLSI guidelines**.** A total of 62 isolates were identified. Maximum (43.5%) were from respiratory specimens and indoor patients. Multi drug resistance was observed in 62.9% isolates. Drug resistance is a major therapeutic concern in *Acinetobacter* isolates. Even though no pan drug resistant organism was encountered in our study, still judicious antimicrobial use and antimicrobial stewardship program is strongly advocated to curb the growing threat of resistance

Introduction

The gram-negative coccobacillus *Acinetobacter*, a pathogen once seen only in hot, humid climates, has become an increasingly common nosocomial problem even in temperate climates. (Munoz-Price, 2008) Interest in *Acinetobacter* spp. has been growing for the past 30 years. One of the main reasons for the present increased interest in this genus is the emergence of multiresistant strains, some of which are pan-resistant to antibiotics, that suddenly cause an outbreak of infection involving several patients in a clinical unit. (Joly Guillou, 2005) The genus *Acinetobacter* comprises a complex and heterogeneous group of bacteria, many of which are capable of causing a range of opportunistic, often catheter-related, infections in humans.

In the hospital setting, *Acinetobacter* species have been implicated in a wide range of infections, particularly in critically-ill patients with impaired host defenses. These infections include pneumonia, skin and soft-tissue infections, wound infections, urinary tract infections, meningitis, and bloodstream

infections. Nosocomial infections and hospital outbreaks have been attributed mainly to *A. baumannii*, particularly in the intensive care unit (ICU) setting. *Acinetobacter* spp. have been reported occasionally as causative agents of community-acquired infections such as wound infection, urinary tract infection, otitis media, eye infections, meningitis and endocarditis (Visca, 2011).

Several factors like over the counter antibiotic use, overcrowding in hospitals, imperfect infection control practices, and use of excessive invasive devices contribute to the development of high antimicrobial resistance, especially in developing countries. Additionally, these factors also facilitate easy transmission of Multi drug resistant organisms implicated in various healthcare associated infections (HCAI). (Banerjee T, 2018)

With worldwide reports of increasing isolation of this organism from various samples, we performed retrospective study to estimate the extent of the problem in our teaching hospital and also analyze the prevalent situation for possible control measures.

Materials and Methods

A retrospective study was conducted in the department of Microbiology, at the teaching institute, over a period of one year (September 2017 to August 2018).

Sample collection: A total of 62 isolates of *Acinetobacter* species recovered from the urine, pus, blood, respiratory samples such as sputum, endotracheal aspirates, bronchoalveolar lavage (BAL) and high vaginal swabs were included in the study.

For the isolation of *Acinetobacter* spp., the clinical samples were inoculated onto blood agar and MacConkey agar. After overnight incubation at 37^0C, the suspected colonies were further processed for identification of *Acinetobacter* species by standard conventional methods. The antimicrobial susceptibility testing of all the 62 *Acinetobacter* isolates was carried out by Kirby-Bauer disc diffusion method on Mueller-Hinton agar medium and results were interpreted as per the Clinical and Laboratory Standards Institute guidelines. Antimicrobial discs used in the study were procured from Hi-media Laboratories, Mumbai, India. Escherichia coli ATCC 25922 strain was employed as a control

Multi-drug resistant (MDR) *Acinetobacter*

Acinetobacter isolates resistant to at least three classes of antimicrobial agents- all penicillins and cephalosporins (including inhibitor combinations), fluoroquinolones and aminoglycosides

Extensively drug resistant (XDR) *Acinetobacter*

Acinetobacter isolates resistant to the three classes of antimicrobials described above (MDR) and also resistant to carbapenems

Pan drug resistant (PDR) *Acinetobacter*

Acinetobacter isolates resistant to the three classes of antimicrobials described above (MDR), carbapenems, polymyxins and tigecycline.

Results and Discussion

A total of 62 non-duplicate, non- consecutive *Acinetobacter* isolates were processed for identification, antimicrobial susceptibility testing was done to know the MDR, XDR and PDR pattern of these isolates.

The isolation pattern of *Acinetobacter* from various clinical specimens is depicted in table 1. The higher isolation rates of *Acinetobacter* from the respiratory specimens is in agreement with literature. Studies on *Acinetobacter* in various countries have shown a predominance of isolation from urine (21-27%) and tracheobronchial secretions (24.8-48.8%). Genito-urinary tract infections in the form of cystitis and pyelonephritis can be seen in case of indwelling catheters or nephrolithiasis. The organism was responsible for 30.6% cases of urinary tract infection and 27.5% cases of wound infection, in a study conducted by Joshi *et al.,* (2006).

The pattern of distribution of *Acinetobacter* species from various hospital units is reflected in Figure 1. Majority of the isolates were recovered from the patients admitted in wards where a number of risk factors were present, including the fact that patients were hospitalised for very long periods, the moist environment of the catheters/urobags and treatment with antibiotics off and on, all giving an opportunity for the bacilli to colonise various sites and then later turn into a pathogen (Vincent *et al.,* 2009, Lee Sang Oh *et al.,* 2004).

In the present study, *Acinetobacter* species were found to be resistant to most commonly used antibiotics (Table 2). Resistance towards imipenem and Meropenem was recorded to be 21% and 39.35% respectively. No resistance was seen in Colistin and Polymyxin B in our study which is similar to the study published by Dash *et al.,* and Shareek *et al.,* where all isolates were sensitive to colistin. Out of total isolates 39 (62.9%) were multidrug resistant (MDR) in our study. The other studies conducted by Dash *et al.,* in Odisha and Rekha *et al.,* in Kolar, Karnataka reported MDR isolates to be 55% and 74% respectively. Bhattacharya *et al.,* Gupta *et al.,* and Mostofi *et al.,* reported MDR isolates to be 29%; 40% and 54% respectively. In ICUs most, sensitive drug was colistin (100%) followed by imipenem. *Acinetobacter* appears to have a propensity to develop antibiotic resistance extremely rapidly, perhaps as a consequence of its long term evolutionary exposure to antibiotic producing organisms in soil environment. The emergence of antibiotic resistant strains in ICU is because of higher of use of antimicrobial agents per patient and per surface area.

The antimicrobial susceptibility pattern of the isolate depends on the prevailing epidemiology of the strains circulating in the hospital and community. Thus, regular surveillance and antimicrobial stewardship programs are the need of the hour to promote the judicious use of antibiotics and prevent the development of pan drug resistant strains.

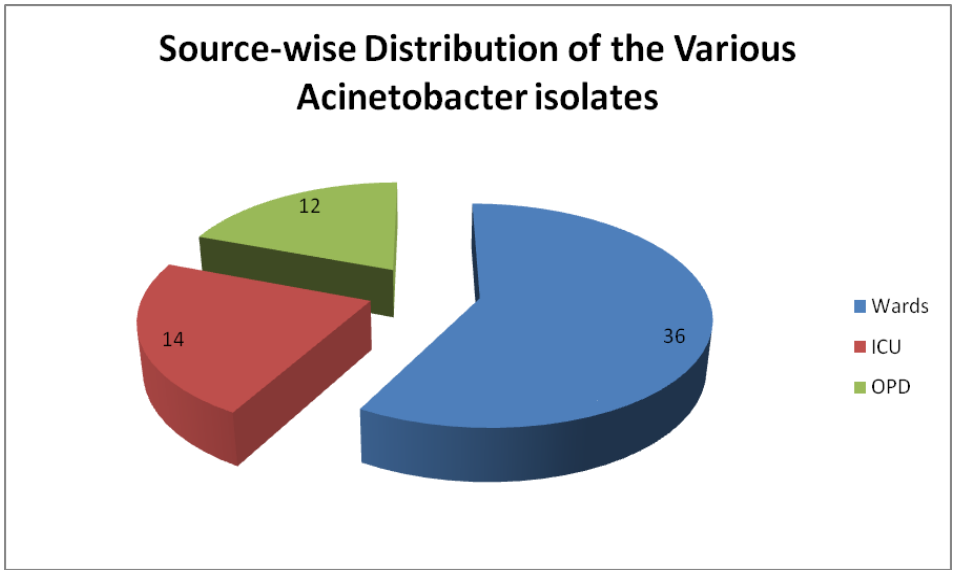
Table.1 Sample-wise distribution of the *Acinetobacter* isolates

SAMPLE	NUMBER OF ISOLATES (%)
Respiratory samples (Sputum, BAL, Tracheal aspirates)	27 (43.5%)
Pus	18 (29%)
Urine	11 (17.7%)
Blood	3 (4.8%)
High Vaginal Swabs	2 (3.2%)
Others	1 (1.6%)

Table.2 Antibiotic sensitivity pattern of the *Acinetobacter* isolates

ANTIBIOTIC	No. of susceptible isolates (%)
Amikacin	20 (32.2 %)
Gentamycin	17 (27.4%)
Amoxicillin- Clavulanic acid	9 (14.5%)
Ceftriaxone	4 (6.5%)
Ceftazidime	3 (4.8%)
Cefepime	8 (12.9%)
Ciprofloxacin	24 (38.7%)
Cotrimoxazole	8 (12.9%)
Doxycycline	10 (16.1%)
Imipenem	49 (79%)
Meropenem	38 (61.35)
Piperacillin/Tazobactam	48 (77.4%)
Colistin	62 (100%)
Polymyxin B	62 (100%)

Figure.1



In conclusion *Acinetobacter* is nowadays a common threat in hospital acquired infections especially in critically ill patients admitted to ICU. *Acinetobacter* species in our study were found to be resistant to most commonly used antibiotics. It is a great challenge for the physicians to treat MDR *Acinetobacter* spp. which is independently associated with high mortality, emphasizing the need for aggressive infection control strategies. To avoid resistance, antibiotics should be used judiciously and empirical therapy should be determined for each hospital according to the resistance rates of the hospital. Also since the organism is still susceptible to most of the disinfectants, proper hand hygiene and

protocol should be maintained to prevent the rise in nosocomial infections.

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