Original Research Article

Prevalence of infection by Acinetobacter species and their antibiogram at a tertiary care hospital

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Abstract

Background: Acinetobacter species have emerged as an important nosocomial pathogen involved in outbreaks of hospital infections. Acinetobacter species tend to be resistant to a variety of antibiotics and thus the infections are difficult to treat. The knowledge of the prevalence and antimicrobial susceptibility pattern helps in treating these notorious pathogens successfully. Therefore, the study was undertaken to know the prevalence and antimicrobial susceptibility pattern of Acineto bacterspp. **Material and Methods:** A total of 184Acinetobacter spp. were isolated from various clinical samples. Speciation of Acinetobacter was done on the basis of hemolysis on blood agar, growth at 42ºC, oxidation fermentation test, arginine dihydrolase, malonate and gelatin liquefaction. Antibiotic susceptibility testing was done as per standard CLSI guidelines. **Results:** Maximum isolation of Acinetobacter species was from pus or wound swabs 58 (31.5%) followed by sputum and tracheal secretions 52 (28.2%) and urine 46 (25%) samples. All the strains were sensitive to colistin. Most of the strains were sensitive to imipenem (82%), meropenem (80.4%) and piperacillin-tazobactam (55.4%), whereas, maximum resistance was observed to co-trimoxazole (9.8%) and doxycycline (13%). **Conclusion:** Acinetobacterspp. has emerged as a major nosocomial pathogen. Broad-spectrum antibiotics should be used with caution and only after antibiotic susceptibility testing. Empirical antibiotic policy should be determined for each hospital according to the resistance rates of that hospital setting.

Key Words: Acinetobacterspp., frequency, antibiotics, resistance.

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INTRODUCTION

Acinetobacter species, non-fermenting gram-negative bacilli, have emerged as an important nosocomial pathogen involved in outbreaks of hospital infections owing to its ability to survive in adverse growth conditions. *Acinetobacter baumannii* is the most common species[1]. The ubiquitous organism can be recovered from hospital environment, from colonized or infected patients. They have been implicated in a variety of nosocomial infection, including bacteremia, urinary tract infections, and secondary meningitis, but their predominant role is as agents of nosocomial pneumonia, particularly ventilator associated pneumonia in patients confined to hospital intensive care units[2]. Presence of prosthesis, endotracheal intubation, intravenous catheters and prior antibiotic therapy, length of intensive care unit and hospital stay may increase the risk of infection with *Acinetobacter* spp. *Acinetobacter* species tend to be resistant to a variety of antibiotics and thus the infections are difficult to treat. There is almost universal resistance to penicillin, ampicillin, and cephalothin, and most strains are resistant to chloramphenicol. The knowledge of the prevalence and antimicrobial susceptibility pattern helps in treating these notorious pathogens successfully. Therefore, the study was undertaken to know the prevalence and antimicrobial susceptibility pattern of *Acinetobacter*spp.

MATERIAL AND METHODS

This retrospective study was conducted in a department of Microbiology of a tertiary care hospital. Various

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clinical samples such as pus or wound swab, sputum, tracheal secretions, urine, blood, sputum, body fluids etc., were examined for isolation and identification of *Acinetobacter*spp., and antimicrobial susceptibility testing. All the samples for bacteriological culture were inoculated on Blood agar and MacConkey agar and incubated at 37ºC for 24 hrs. All non-lactose fermenters isolated and gram negative bacilli / coccobacilli were subjected for oxidase test. All oxidase negative organisms were further identified by battery of biochemical tests such as indole, methyl-red, Voges- Proskeur test, citrate, urease and triple sugar iron test. Speciation of *Acinetobacter* was done on the basis of hemolysis on blood agar, growth at 42ºC, oxidation fermentation test, arginine dihydrolase, malonate and gelatin liquefaction[3]. Antibiotic susceptibility testing was done as per Clinical Laboratory Standards Institutes (CLSI) guidelines[4,5]. The following standard antibiotic disks were placed on the MHA plate: Levofloxacin (Le) (5 mcg), Amikacin (Ak) (30 mcg), Doxycycline (DO) (30 mcg), Co-trimoxazole (COT) (1.25/23.75 mcg), Ceftazidime (CA)(30 mcg), Piperacillin-tazobactum (PT) (100/10mcg), Imipenem (IMP) (10 mcg), Meropenem (MR) (10 mcg) and Colistin (CL) (10 mcg). All the antibiotic discs were commercially obtained from Hi-Media Pvt. Ltd.

RESULTS

A total of 3498 samples were processed for bacteriological examination over a period of six months from patients of different age group admitted in various medical, surgical wards and ICU. Out of these samples, 184(5.2%) of *Acinetobacter*spp. were isolated. Out of 184 samples, 104samples (56.5%) were from inpatients, and 80 samples (43.5%) were from outpatients. In 32 (17.3%) cases, growth was polymicrobial, most of these patients were elderly and suffering from chronic debilitating disease. *E.coli* was the most common associated organism with *Acinetobacter*. *P. aeruginosa* and *Staphylococcus aureus* were associated organisms in cases of burn wound infection, cellulitis, abscess. Other organisms isolated were coagulase negative Staphylococci and beta hemolytic Streptococci.

Table 1: Distribution of *Acinetobacter* species isolated from different clinical samples

Clinical samples	No. of isolates
Pus/ wound swab	58 (31.5%)
Sputum/tracheal secretions	52 (28.2%)
Urine	46 (25%)
Blood	17 (9.2%)
Body fluids	11 (5.9%)

(Body fluids include cerebrospinal fluid, peritoneal fluid, ascetic fluid, synovial fluid) Maximum isolation of *Acinetobacter*species was from pus or wound swabs 58 (31.5%) followed by sputum and tracheal secretions52 (28.2%) and urine 46 (25%) samples (Table 1). Out of 184 isolates, 172 (93.5%) *A. baumannii* were isolated, 4 (2.2%) were *Acinetobacter junii*, and 8 (4.3%) were *Acinetobacter lwoffii*. *Acinetobacter* infection was seen more in males 126 (68.5%) compared to females 58 (31.5%). The rate of isolation of*Acinetobacter* spp. was significant in inpatients admitted in surgical wards and ICUs with history of long hospital stay.

Table 2: Antibiotic susceptibility of *Acinetobacter* spp. isolated

Antibiotics	Sensitive (S) (%)	Intermediate sensitive (IS) (%)	Resistance (R) (%)
Levofloxacin (Le)	41 (22.3%)	12 (6.5%)	131 (71.2%)
Amikacin (Ak)	85 (46.2%)	11 (5.9%)	88 (47.8%)
Doxycycline (DO)	24 (13%)	9 (4.9%)	151 (82.1%)
Co-trimoxazole (COT)	18 (9.8%)	6 (3.2%)	160 (87%)
Ceftazidime (CA)	78 (42.4%)	21 (11.4%)	85 (46.2%)
Piperacillin-tazobactum (PT)	102 (55.4%)	14 (7.6%)	68 (37%)
Imipenem (IMP)	151 (82%)	12 (6.5%)	21 (11.4%)
Meropenem (MR)	148 (80.4%)	10 (5.4%)	26 (14.1%)
Colistin (CL)	184 (100%)	00	00

All the strains were sensitive to colistin. Most of the strains were sensitive to imipenem (82%), meropenem (80.4%) and piperacillin-tazobactam (55.4%), whereas, maximum resistance was observed to co-trimoxazole (9.8%) and doxycycline (13%) (Table 2).

DISCUSSION

Acinetobacter spp. are increasingly important nosocomial pathogens and are capable of rapid adaptation to the hospital environment. The variety of potential source of contamination or infection with *Acinetobacter* spp. in the hospital environment makes control of outbreaks caused by these difficult. *Acinetobacter* spp. is the second most frequent non-fermenter encountered in clinical laboratories after *P.aeruginosa*[6]. *Acinetobacter* spp. may be found either as a single pathogen or as a part of polymicrobial bacteremia. *A.baumannii* is the most common species in most adult patients[7]. In our study, the rate of isolation of *Acinetobacter*spp. from different clinical specimens was 5.2%. Vaja *et al*[8] and Dash *et al*[9] found 4.8% and 3% rate of isolation in their study respectively. Tripathi *et al*[10] found less (1.02%) rate of

isolation. The prevalence rate of this study is less compared to 14% and 9.6% rates among the hospital isolates reported by Mostofi *et al*[11] and Joshi *et al*[12] respectively. There is a significant difference in the behavior and spread of multi-drug resistant *Acinetobacter* spp. recovered various geographic locations[13]. In our study, maximum isolation of *Acinetobacter*species was from pus or wound swabs 58 (31.5%) followed by sputum and tracheal secretions 52 (28.2%) and urine 46 (25%) samples. The findings are similar to the study by Dash *et al*[9] who have reported maximum isolation from pus/swab (56%).Similar findings were obtained by Chakraborty *et al*[14]. In humans, *Acinetobacter* can colonize skin, wounds, respiratory and gastrointestinal tracts[15]. The rate of isolation of *Acinetobacter* spp. was significant in inpatients admitted in surgical wards and ICUs with history of long hospital stay with underlying comorbid conditions such as diabetes mellitus, similar to the findings of the studies published earlier[9,16,17]. We found that the all *Acinetobacter*spp. isolates were sensitive to colistin. which indicates that it is being selectively used only in case of carbapenem-resistant gram-negative bacteria. Dash *et al*[9] also observed 100% sensitivity to colistin in their study. Indiscriminate use of commonly used antibiotics especially in developing countries like India leads to emergence of multi-drug resistant *Acinetobacter* spp. In our study, majority of the isolates were found to be resistant to commonly used antibiotics such as co-timoxazole, doxycycline, levofloxacine, ceftazidime, gentamicin and amikacin. Reserve drugs such as imipenem, meropenem and piperacillin/tazobactam were found to be more potent antibiotics against this pathogen. In conclusion, *Acinetobacter*spp. has emerged as a major nosocomial pathogen and antibiotic resistance is on rise. Broad-spectrum antibiotics should be used with caution and only after antibiotic susceptibility testing. Empirical antibiotic policy should be determined for each hospital according to the resistance rates of that hospital setting.

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