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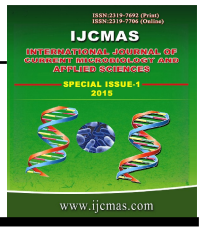

Original Research Article

Multidrug-Resistant *Acinetobacter* Species: An increasing Threat in Tertiary Care Settings

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Keywords

Acinetobacter, MDR, Kirby Bauer Disc diffusion method

A B S T R A C T

Acinetobacter species are gram-negative coccobacilli belonging to the group of Non-fermenting gram-negative *Bacilli*, which are ubiquitous in nature. *Acinetobacter* species has become a leading cause of blood stream infection in health care setting. *Acinetobacter* species possess a wide array of β-lactamases that hydrolyze and confer resistance to penicillins, cephalosporins and carbepenems. They cause outbreaks in intensive care units and healthcare settings. The aim of the study is to determine the prevalence of multi-drug resistant *Acinetobacter* species from blood samples. Total numbers of 1532 samples were received in 4 months from June 2014 to September 2014 for blood culture. Antimicrobial susceptibility testing was done on Mueller Hinton's agar by Kirby Bauer Disc diffusion method as per the Clinical and Laboratory Standards Institute (CLSI) guidelines for the following antimicrobials: cefotaxime 30µg, ceftriaxone 30µg, cefoperazone 75µg, cefipime 30µg, cefoperazone+sulbactum 75/75 µg, gentamicin 10µg, amikacin 30µg, tobramycin 10µg ,ciprofloxacin 5µg, piperacillin+tazobactum 100/10 µg , Imipenem 10µg. Isolates resistant to at least three drugs belonging to three different groups were considered to be multidrug resistant (MDR). ESBL, AmpC and MBL production was detected. A total of 218 (14.22%) blood culture were positive of which 17(7.8%) were identified as *Acinetobacter* spp. 15 (88.23%) of these *Acinetobacter* spp were isolated in less than 48 hrs and 2 (11.76%) were isolated in more than 48 hrs. Out of 17 *Acinetobacter* isolates, 8 (47 %) were multi-drug resistant of which 1 (5.88 %) was resistant to all drugs tested including Imipenem. 88% of the patients had a favourable outcome. Multi-drug resistant *Acinetobacter* has emerged as an important nosocomial pathogen. Antibiotic susceptibility testing is critical in the treatment of infections caused by *Acinetobacter*, particularly in those with inadequate response to antibiotic therapy.

Introduction

Acinetobacter species are gram-negative coccobacilli belonging to the group of Non-Fermenting Gram-Negative *bacilli*, which are ubiquitous in nature. Members of the genus *Acinetobacter* have emerged from organisms of questionable pathogenicity to pan resistant nosocomial pathogens worldwide in the past two or three decades,

especially since 2005–2006 (Munoz-Price and Weinstein, 2008). They cause outbreaks in intensive care units and healthcare settings. Infections caused by this organism include ventilator associated pneumonia, bacteraemia, surgical site infections, meningitis, urinary tract infections with the most common risk factor being long hospital stays (Valencia *et al.,* 2009). *Acinetobacter* species has become a leading cause of blood stream infection in health care setting. They possess a wide array of β-lactamases that hydrolyze and confer resistance to penicillins, cephalosporins and carbepenems. In the hospital environment, *A. baumannii* can colonize the respiratory, urinary, gastrointestinal tract and wounds of the patients and can cause infections in burn, trauma, mechanically ventilated and immunocompromised patients. It shows a special predilection for the ICU (Towner, 2009). The epidemiological, clinical, prognostic, and therapeutic characteristics of *A. baumannii* isolated from infected patients have been studied widely in the last decade (Jose *et al.,* 1996). The most alarming problems encountered during this period are the organism's ability to accumulate diverse mechanisms of resistance and the emergence of strains that are resistant to all commercially available antibiotics coupled with the lack of new antimicrobial agents in the pipeline (Lolans *et al.,* 2006). The present study was done to study the prevalence of *Acinetobacter* species and their antimicrobial sensitivity pattern in patients with blood stream infections.

Materials and Methods

The study was done in the Department of Microbiology, Jawaharlal Nehru Medical College and Hospital, Aligarh from June 2014 to September 2014. Total number of 1532 samples was received for blood culture in brain heart infusion broth. Informed consent was taken from all patients before collection of blood sample. Repeated subcultures were done on 5% sheep Blood agar and Mac-Conkeys agar after 24 hours, 48 hours and 7 days of incubation at 37°C. Cultures showing growth were identified by standard biochemical proce-dures (Collee *et al.,* 2006). Antimicrobial susceptibility testing was done on Mueller Hinton's agar by Kirby Bauer Disc diffusion method as per the Clinical and Laboratory Standards Institute (CLSI) guidelines (CLSI, 2003) for the following antimicrobials: cefotaxime 30μg, ceftriaxone 30μg, cefoperazone 75μg, cefipime 30 μg, cefoperazone-sulbactum 75/75 μg, gentamicin 10μg, amikacin 30μg, tobramycin 10μg, ciprofloxacin 5μg, piperacillin + tazobactum 100/10 μg, and Imipenem 10μg.

Manchanda *et al.* (2010) defined isolates resistant to at least three drugs belonging to three different groups to be multidrug resistant (MDR). Screening of possible ESBL production was done by using ceftriaxone (30μg) and cefoperazone (75μg). Those isolates with zone diameters less than 25mm for ceftriaxone and less than 22mm for cefoperazone were subsequently confirmed for ESBL production. Confirmation was done by noting the potentiating of the activity of cefoperazone in the presence of cefoperazone sulbactum (CLSI, 2003).

Detection of AmpC betalactamase was done for isolates resistant to ceftriaxone (30μg), cefoperazone (75μg) and cefoperazone-sulbactum (75/75μg). Induction of AmpC synthesis was based on the disc approximation assay using imipenem as inducer (Rizvi *et al.,* 2009). Imipenem resistant isolates were tested for MBL production by modified Hodge test and Double Disc synergy test using EDTA (Lee *et al.,* 2001).

Result and Discussion

A total of 218 (14.22%) blood culture were positive of which 17 (7.8%) were identified as *Acinetobacter* spp. 15 (88.23%) of these *Acinetobacter* spp were isolated in less than 48 hrs and 2 (11.76%) were isolated in more than 48 hrs. Majority of the isolates 11 (64.7%) were from the patients between 0–10 years of age (Figure 2).

On antimicrobial sensitivity testing, 8 (47 %) isolates were multi-drug resistant of which 1 (5.88 %) was resistant to all drugs tested including imipenum. Maximum resistance was shown to the β-lactam group of antimicrobials (63.1%).

Aminoglycosides and flouroquinolones also had a poor activity with resistance to 57.6% and 37.9% of the isolates. ESBL producing isolates were 2 (11.8%) and 8 (47.05%) isolates were AmpC producers. One isolate was found to be MBL producer. Eighty-eight percent of the patients had a favourable outcome (Figure 3).

Acinetobacter species are rapidly spreading pathogens with emergence of extended resistance to almost all the antimicrobial agents. *Acinetobacter* species are commonly present in the hospital environment and cause cross contamination, which sometimes results in life threatening infections. A number of studies emphasized on proper and prescribed use of antibiotics against *Acinetobacter* species. *Acinetobacter* infections are the emerging threat to the health care institutes now a day. This organism spreads through person to person contact, medical devices, hospital environment, sinks or medical care staff.

This study provides the current data about the frequency and antimicrobial susceptibility of *Acinetobacter* species, isolated from blood samples. According to our study the frequency of *Acinetobacter* species was 17 (7.8%) among the culture positive blood samples which was comparable to other studies who reported 8.6% (Singhi *et al.*, 2008) and 9.9% prevalence of *Acinetobacter* species isolated in blood samples (Lee *et al.*, 2010) (Figure 1).

Figure.1 Prevalence of *Acinetobacter* species on blood culture

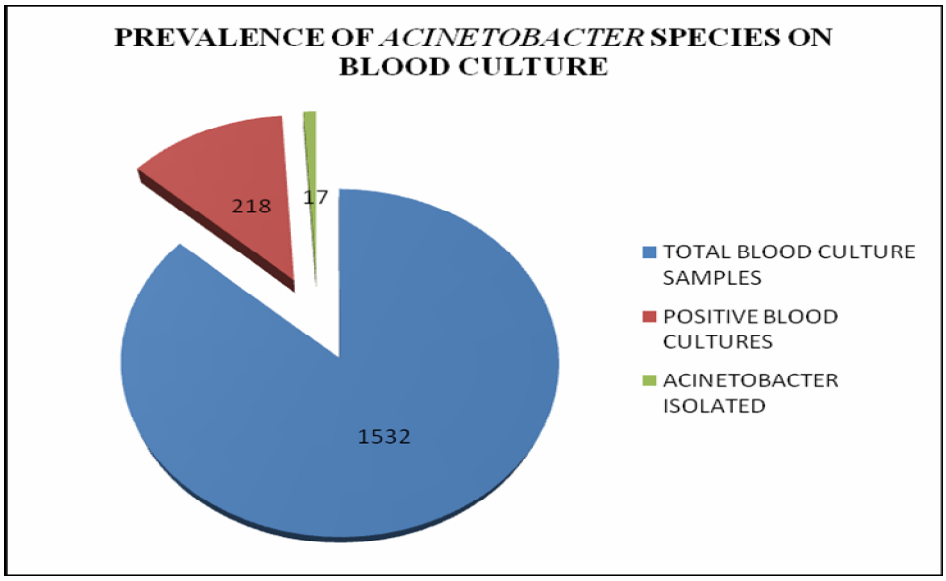


Figure.2 Pattern of *Acinetobacter* species isolated in bloodstream infections in relation to age

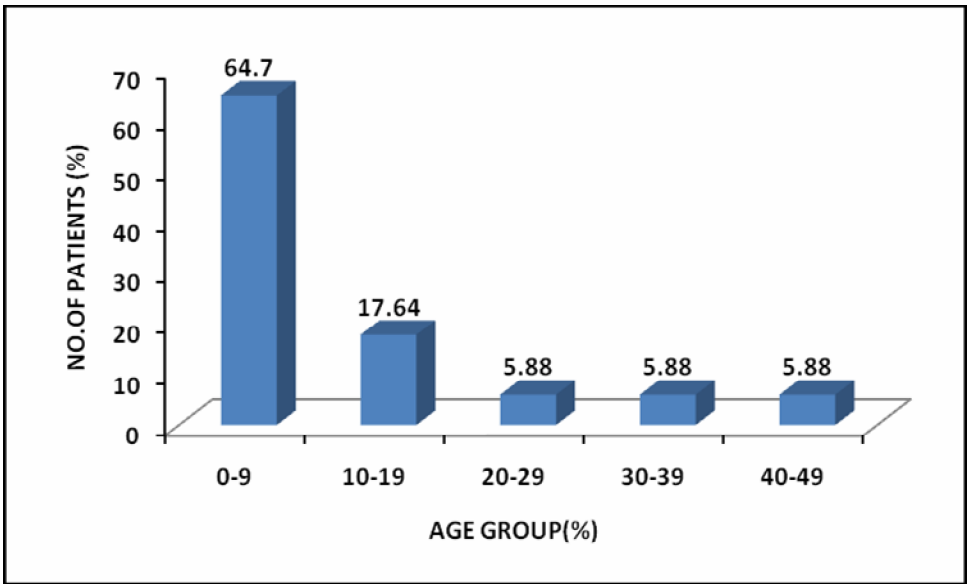
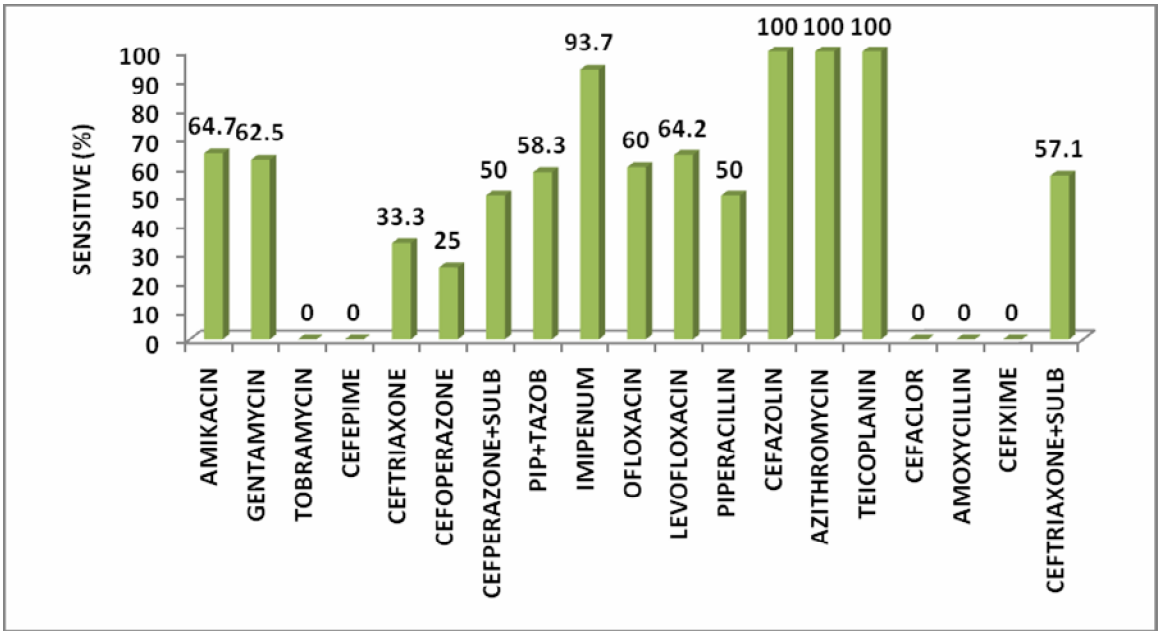


Figure.3 Bar diagram showing pattern of antimicrobial resistance of *Acinetobacter baumanii* (n=17)



The fluoroquinolones, aminoglycosides and especially the β-lactam antimicrobials can no longer be recommended for the treatment of patients with *Acinetobacter* bacteremia because of the high level of resistance. In our study, maximum resistance was shown to the β-lactam group of antimicrobials (63.1%). Aminoglycosides and flouroquinolones also had a poor activity with resistance to 57.6% and 37.9% of the

isolates. All the isolates were uniformly sensitive to azithromycin, teicoplanin, cefazolin. 47% of the isolates were found to be multidrug resistant.

Although imipenem at present have a good spectrum but resistance to imipenem is also coming up in different regions of India and other parts of the world (Manchanda *et al.*, 2010). In our study, 16 out of 17 (93.7%) isolates were found to be sensitive to imipenem. A study conducted in Taiwan reported 99.0% sensitivity of *Acinetobacter* species to carbapenems (Singhi *et al.*, 2008). A recent study done in an Italian hospital reported that *Acinetobacter* species developed some resistance against carbapenems (Carreto *et al.*, 2011).

In conclusion, there should be some educational for the hospital staff, personal hygienic awareness guides for patients and attendants to avoid the incidence of *Acinetobacter* infections. This can be helpful to reduce the incidence of *Acinetobacter* infections among the hospitalized patients. The frequency of *Acinetobacter* species in our study was low as compared to the other studies. Rational and appropriate use of antimicrobial agents is of paramount importance to minimize the risk of resistant organism.

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