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Research Article

Regional Prevalence and Evaluation of Carbapenem Resistant *A. Baumannii*

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ABSTRACT

Acinetobacter spp is an opportunistic pathogen causing nosocomial outbreaks and its increasing antibiotic resistance make treatment difficult. Hence, a preliminary study was conducted on the prevalence of carbapenem resistant *Acinetobacter spp* infections at Sunrise Institute of Medical Sciences, a tertiary care hospital in Kochi, kerala. Various clinical specimens like blood, urine, abscess, vaginal swab were analyzed and 15% of the isolates was confirmed and identified as to be resistant to carbapenems.

Keywords: *Acinetobacter* spp, Antibiotic resistance, Carbapenems**,** clinical specimens.

INTRODUCTION

Acinetobacter spp is an emerging opportunistic nosocomial Gram negative bacterial pathogen with increasing prevalence in particular the species *Acinetobacter baumannii*. Against the font that the species can survive on moist and dry surfaces, would be present in foodstuffs and on healthy skin, along with both intrinsic and acquired antibiotic resistance of *A. baumannii* account for a significant cause of outbreaks. Significant levels of morbidity and mortality have been reported with outbreaks (Tak-Chiu, 2011) and common infections include ventilator associated pneumonia and bacteremia; less frequently burn wounds and urinary tract (Bergogne, et al., 1996). *A.baumannii* is also a common cause of bloodstream infections in the intensive care setting (Wisplinghoff *et al*., 2004) and the lower respiratory tract infections and intravascular devices (Seifert *et al*., 1995; Cisneros *et al*., 1996; Jang *et al*., 2009; Jung *et al*., 2010) are reported to be the common sources. In addition wound infections and urinary tract infections have also been reported as foci of infection (Seifert *et al*., 1995). While the risk factors associated with acquiring *A. baumannii* bloodstream infections include immunosuppression, ventilator use associated with respiratory failure, previous antibiotic therapy, colonization with *A. baumannii*, and invasive procedures (García-Garmendia *et al*., 1999; Jang *et al*., 2009; Jung *et al*., 2010). The risk factors of the infection with multidrug resistant *Acinetobacter spp* include prolonged hospital stay, exposure to an intensive care unit, receipt of mechanical ventilation, colonization pressure, exposure to antimicrobial agents, etc. (Fournier et al., 2006.). As the multidrug resistant *Acinetobacter spp* infection usually occurs in severely ill patients in the ICU, the mortality rate is high up to 68% (Lisa& Trish, 2008). In recent years, a substantial increase in *A.baumanii* associated nosocomial pneumonia cases (Stahl et al.,2015) are reported. (Peleg *et al.*,2008) reported that *A. baumannii* ranks with 10th among the organisms causing monomicrobial blood stream infections.

It becomes a need of novel therapeutic options owing to the emergence of isolates resistant to drugs choice like carbapenems. In recent studies done by Chang et al., 2015 also revealed high prevalence of CRAB., upto 60% of total isolates. Other researchers were also found high prevalence rate of CRAB in nosocomial infections (Hassen et al., 2014 & Khan Nhu et al., 2014).

Against the font that a regular monitoring of resistance patterns among *A baumanii*.

In a study conducted by Henwood et al., 2002, among consecutive *A baumanii* isolates collected more than 85% were resistant to cephalosporins, 43% were resistant to gentamicin and 46% were resistant to quinolones, leaving carbapenems as the only drug active against more than 90% of isolates.

Carbapenems are among the drug of choice for the treatment of nosocomial but resistance to this class is emerging, leading to the evolution of pan resistance strains and to the need of new therapeutic options (Quale, et al., 2003 & Van Looveren, et al., 2004). Carbapenem resistant *Acinetobacter* are becoming widespread in several regions of the world (Coelho etal. 2006). Mechanistically, resistance to these potential beta lactams may be due to impaired permeability resulting from altered outer membrane proteins or to alterations in the pencillin binding proteins (PBP) (Bou, et al., 2000). However, the carbapenem hydrolyzing beta lactamases that includes MBLs and oxacillinases are recognized as important contributors of carbapenem resistance in *Acinetobacter*. Resistance offered by oxacillinases is more often than MBLs (Poirel et al., 2006). There are four major OXA

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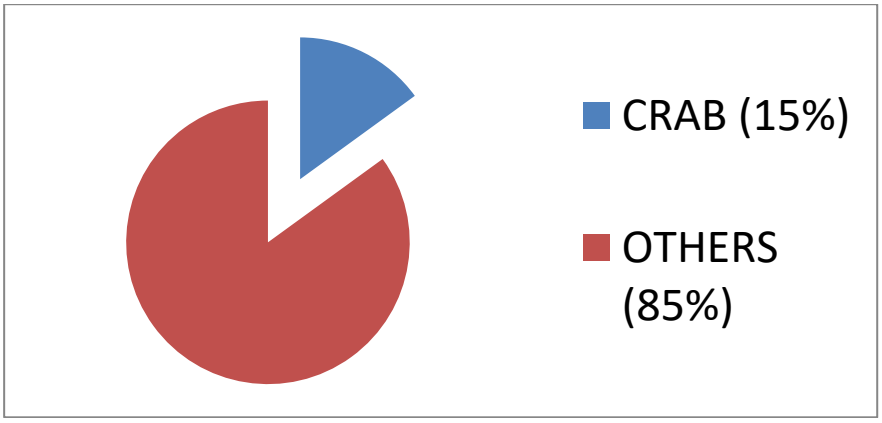

Fig 2:

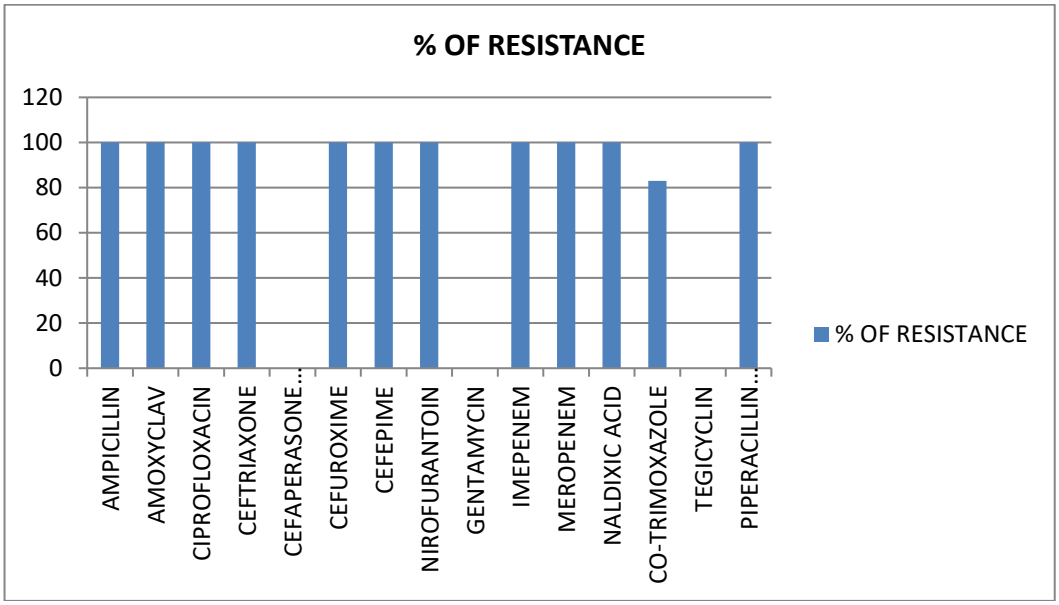

Fig 3

subgroups (OXA -51, OXA -23, OXA-40 and OXA-58) associated with *A.baumanii*.

MATERIALS AND METHODS

The study was conducted at Sunrise Institute of Medical Sciences, Kakkanad, Kochi, Kerala and various clinical specimens (urine, blood, pus, abscess and endo-tracheal aspirations) were microbiologically screened and the isolation of *A. baumanii*. were recorded and evaluated further appropriately. The specimens were cultured on 5% sheep blood agar (Biomerieux), Mac Conkey agar at 37° C for 24 to 48 hours and colonies resembling *A. spp* were subsequently assessed by additional cultural and biochemical evaluation with Vitek 2 compact system for identification.

Similarly, the Clinical and Laboratory Standards Institute (CLSI 2014) recommendations were followed to determine the antibiotic susceptibility of the confirmed isolates of *Acinetobacter* along with AST N280 cards on Vitek 2 compact system based determination. Accordingly a total of thirteen (13) antibiotics were included for the determination of susceptibility patterns.

Prevalence study was conducted in Sunrise Institute Medical Sciences for a period of one year. The samples were collected from patients admitted in the hospital in various departments as well as OP patients. Various clinical specimens like urine, blood, pus, abscess and endo-tracheal aspirations were screened for the presence of *Acinetobacter spp.* All the samples were collected by aseptic methods.

Selective culture and biochemical identification

All samples were plated and isolation of the bacteria was carried out by culturing on two enriched and selective agar media, 5% sheep blood agar (Biomerieux) and on Mac Conkey agar at 37° C for 24 to 48 hours. All colonies resembling *Acinetobacter* were initially identified by standard morphological, cultural and biochemical characteristics and further identification was done by Vitek 2 compact system from Biomerieux India pvt Ltd.

Susceptibilitytesting

Antibiotic susceptibility testing was done by disc diffusion on Mueller Hinton agar (Himedia) plates according to the guidelines of Clinical Laboratory Standards Institute (CLSI2014). Along with the disc diffusion method susceptibility were also analysed using AST N280 cards

Table 1

Nature of specimen	No of isolates
Urine	19
Pus/ Abscess	7
Endo – Tracheal Secretion	2
Blood	5
Vaginal Swab	1
Sputum	4
Semen	1

Table 2

Isolate	% of isolate
Acinetobacterbaumanii	84
Acinetobacterjunii	5
Acinetobacterlowfii	8
Acinetobacterursingii	3

on Vitek 2 compact system. The antibiotics tested include ampicillin, amoxyclav, ciprofloxacin, ceftriaxone, cefuroxime, cefepime, nitrofurantoin, gentamycin, imepenem, meropenemnaldixic acid, co-trimoxazole, tegicyclin and piperacillintazobactam.

RESULTS

A total of 39 preliminarily identified isolates of *Acinetobacter* spp. from different clinical specimens were subsequently processed through vitek 2 compact system for further identification. *A. baumanii* was confirmed to be the most abundant species (84 %), followed by *A. lowfii*, *A. junii* and *A. ursingii* and that a majority of the isolates were identified from patients with urinary tract infection (Table1& 2)

Susceptibility to antimicrobial agents

In this study, 15% of the 39 *A baumanii* isolates were noted to be carbapenem resistant *A baumanii* (CRAB). A resistance to most of the antibiotics was observed to be common among the identified CRAB isolates. In particular, of the 15 various antibiotics tested, the CRAB isolates had 100% resistance to all the 11 antibiotics (Ampicillin, Amoxyclav, Ciprofloxacin, Ceftriaxone, Cefuroxime, Cefepime, Nitrofurantoin, Imepenem, Meropenem, Naldixic acid, Piperacillin tazobactam) and were found to be multi drug resistant. However, Tigecyclin and gentamycin were the only drugs against which the isolates were susceptible. The antibiogram- resistogram patterns of the Carbapenem Resistant *A. baumanii* is given in fig 3.

DISCUSSION

The screening study carried out at the tertiary care hospital, Kochi brought out the fact that the prevalence of carbapenem resistant *A. baumanii* was consistent in this region as it was identified across the study duration though the previous reports from the same region determined higher % of carbapenem resistant *A. baumanii.* Pierre et al. (2006) reported 17 CRAB isolates out of 18 isolates of *A. baumanii*.

It was further found that the source of the isolates of the present evaluation was different compared to previous studies. In particular, most (48%) of the *Acinteobacter* isolates of the study was identified from urine samples while only 12.8% was from blood specimens. On the other hand, Manikal *et al*. (2000) reported as much as 17% of the isolates from blood samples. Similarly, 30% and 27% of susceptibilities were reported by them against gentamycin and trimethoprim sulfamethaxazol in contrast to as high as 100 & 83% of susceptible isolates of the present study. Though, the study is being undertaken currently and is progressive, the findings of the study had thrown a light on the continuing menace due to carbapenem resistant *A. baumanii.*

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