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Study of *Acinetobacter* Isolates from Clinical Specimens in Tertiary Care Hospital and their Antimicrobial Susceptibility Pattern

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A B S T R A C T

Acinetobacter spp play a significant role in the colonization and infection of patients admitted to hospitals. *Acinetobacter* is a Gram Negative Coccobacillus. Outbreaks of infection caused by strains of A. *baumannii* resistant to multiple antibiotic classes, including carbapenems, are a serious concern in many specialized hospital units, including intensive care units (ICUs). Given the diversity of resistance mechanisms in A. *baumannii*, definitive therapy should be based on the results of antimicrobial susceptibility testing. Keeping these things mind the present study was undertaken to study the prevalence of *Acinetobacter* spp in clinical samples and the antimicrobial susceptibility pattern's A total of 888 no's clinical specimens Urine, Respiratory samples, Blood wound swab, Body fluids collected from admitted patients in wards and ICU department of GMCH for a period of one year from August 2014--July 2015. *Acinetobacter* isolation was done by conventional methods of culture. Species identification was done by KBO14 and by Vitek2 compact. Antimicrobial susceptibility of isolated *Acinetobacter* spp were tested by modified Kirby-Bauer disc diffusion method as per the recommendation of Clinical and Laboratory Standard Institute (CLSI) and VITEK 2 compact AST 281 as per guideline. Out of 888 clinical samples (31) *Acinetobacter* spp were isolated and prevalence was 3.49%. The maximum isolation rate was seen from respiratory specimens (45.16%) followed by urine (19.36%), wound swabs (16.13%), blood (12.90%) and body fluid (6.45%). *Acinetobacter baumannii* was the predominant species (90.32%) isolated, followed by *Acinetobacter* lwoffii(6.45%) and *Acinetobacter hemolyticus* (3.23%). *Acinetobacter* species isolated from patients in ICU was 80.65%(25). *Acinetobacter baumannii* were sensitive to Polymixin B (100%) followed by colistin (92.85%).The highest resistance was seen with Piperacillin tazobactum (71.43).Carbapenem resistance found in 42.85% A.*baumannii*. *Acinetobacter* spp. 38.7% (12) of isolates were MBL producers and all MBL producers were isolated from ICU.

Introduction

Acinetobacter spp play a significant role in the colonization and infection of patients admitted to hospitals (Bergogne-Berezin *et al.*, 1996). *Acinetobacter* is a Gram Negative Coccobacillus (Munoz-Price *et al.*, 2008; Schreckenberger *et al.*, 2007) that during the past three decades has emerged from an

organisms of questionable pathogenicity to an infectious agent of importance worldwide (Fournier *et al.*, 2006; Dima *et al.*, 2007). *Acinetobacter* infection have long being clinically prominent in tropical countries, have been recurrent problems during war and natural disasters, and have

recently caused multihospital outbreak in temperate climates (Lolans *et al*., 2006).

It is an opportunistic pathogen found to be associated with a wide spectrum of infection including nosocomial pneumonia, meningitis, endocarditis skin and soft tissue infections, urinary tract infection, conjunctivitis, burn wound infections and bacteramia. *Acinetobacter baumannii* is the commonest isolates from Gram- negative sepsis in immune compromised patients, posing risk for high mortality (Patwardhan *et al*., 2008).

It typically colonizes skin, the respiratory, urinary, gastrointestinal tract wounds and indwelling plastic devices of the hospitalized patients can cause infections in burn, trauma, mechanically ventilated and immunocompromised patients. It shows a special predilection for the ICU (Namita Jaggi *et al*., 2012) and more than two third of *Acinetobacter* infections are due to *Acinetobacter baumannii*.

Acinetobacter spp is easily isolated in standard cultures but is relatively nonreactive in many biochemical tests commonly used to differentiate among gram-negative bacilli. This can delay isolate identification by a day. *A. baumannii, A. calcoaceticus,* and *A. lwoffii* are the *Acinetobacter* species most frequently reported in the clinical literature. Because it is difficult to differentiate among *Acinetobacter* species on the basis of phenotypic characteristics, the term *A. calcoaceticus–A. baumannii* complex is sometimes used. Rational use of antimicrobial agents is critically important to prevent *Acinetobacter* infections as well as to avoid poor outcomes. Carbapenems have long been thought of as the agents of choice for serious *A. baumannii* infections. However, the clinical utility of carbapenems is increasingly jeopardized by the

production of carbapenemases. Outbreaks of infection caused by strains of *A. baumannii* resistant to multiple antibiotic classes, including carbapenems, are a serious concern in many specialized hospital units, including intensive care units (ICUs). The foremost implication of infection with carbapenem-resistant *A. baumannii* is the need to use "last-line" antibiotics such as colistin, polymyxin B, or Tigecycline (David *et al*., 2012).

Selection of empirical antibiotic therapy when *A. baumannii* is suspected is challenging and must rely on knowledge of local epidemiology. The interval from onset of infection to initiation of effective empirical therapy clearly influences outcome. Given the diversity of resistance mechanisms in *A. baumannii*, definitive therapy should be based on the results of antimicrobial susceptibility testing. Keeping these things mind the present study was undertaken with following aims and objectives.

The main objective of this study includes, to study the prevalence of *Acinetobacter* spp in clinical samples of GMCH. And also to study the antimicrobial susceptibility pattern of the isolated *Acinetobacter* spp.

Materials and Methods

A total of 888 no's clinical specimens Urine, Respiratory samples (Sputum, endo-tracheal aspirate and bronchoalveolar lavage), Blood /catheter tips, Pus/ wound swab, Body fluids(Pleural fluid, ascetic fluid and cerebrospinal fluid etc) collected from different medical wards, surgical wards and ICU department of GMCH for a period of one year from August 2014--July 2015. The study was commenced with ethical approval and clearance certificate from the IEC, GMCH.

Inclusion criteria

All gram negative coccobacilli, strict aerobes, nonfermenter, catalase positive, oxidase negative isolates (from Hospitalized patients Patients on a ventilator, Prolonged hospital stay, Open wounds, Person with invasive devices like urinary catheters, ICU patients) were considered

Exclusion criteria

OPD patients and Organism other than *Acinetobacter spp* isolated from clinical specimens was excluded from the study. *Acinetobacter* isolation was done by conventional methods of culture. Species identification was done by KBO14 and by Vitek2 compact. Antimicrobial susceptibility of isolated *Acinetobacter spp* were tested by modified Kirby-Bauer disc diffusion method as per the recommendation of Clinical and Laboratory Standard Institute (CLSI)and VITEK 2 compact AST 281) as per guideline. *Acinetobacter baumannii* ATCC19606 and *Acinetobacter lwoffii* ATCC 15309 were used as quality control strains. VITEK 2 compact –identification and sensitivity testing confirmation done by (GN card and AST 281) as per guideline.

Results & Discussion

Out of 888 clinical samples (31) *Acinetobacter* spp were isolated and prevalence was 3.49%.Out of the total of 31 *Acinetobacter* isolates, the maximum isolation rate was seen from respiratory specimens (45.16%) followed by urine (19.36%), wound swabs (16.13%), blood (12.90%) and bodyfluid (6.45%). *Acinetobacter baumannii* was the predominant species (90.32%) isolated, followed by *Acinetobacter lwoffii* (6.45%) and *Acinetobacter hemolyticus* (3.23%) *Acinetobacter baumannii* was the most frequently isolated species from the clinical

specimens like respiratory, urine, wound swabs, blood and body fluids. *Acinetobacter lwoffii* was the next common species isolated from clinical specimens. The single isolate *A.hemolyticus* was isolated from specimens of blood. *Acinetobacter* species isolated from patients in ICU was 80.65%(25) and other Non ICU hospitalized patients showed lower isolation rates 19.35%.*Acinetobacter baumannii* was 96 %(24) followed by A. lwoffii 4%(1) in ICU. Interestingly, lower isolation rates 19.35% (6) in Non ICU patients of which *Acinetobacter baumannii* was predominant 66.66% (4) followed by A.lwoffii (16.67%) and *A.hemolyticus*(16.67%).The result of sensitivity test *Acinetobacter baumannii* were sensitive to Polymixin B (100%) followed by colistin (92.85%). Tigecycline and Minocycline were the next most effective antibiotics (82.14 %), followed by Amikacin (71.43%) and cefoperazone sulbactum(64.85%).Highest resistance seen with Piperacillin tazobactum (71.43%) followed by Aztreonam (60%), doxycycline (57.14%).

Carbapenem resistance found in 42.85% *A.baumannii*. The antimicrobial susceptibility tests of the A.*baumannii* showed more resistant pattern to antimicrobial agents than *A.lwoffii* and *A.hemolyticus*. The single isolate *A.hemolyticus* found (100%) sensitive to all of the antibiotics plated. *Acinetobacter* spp. 38.7% (12) of isolates were MBL producer and all MBL producers were isolated from ICU.

In the present study, the highest number of isolates 32.26 % (10) in age group 21-40 years and 51.61 %(16) *Acinetobacter* spp isolated in male similar to the study done by Sivaranjani V *et al*., (2013).

Maximum isolation rates were seen from Respiratory samples 45.16%. similarly

Namita Jaggi *et al*., (2015) reported maximum isolates from respiratory secretions (57.4%) High isolation of *Acinetobacter*s in respiratory samples is perhaps due to its ability to survive in moist surfaces which helps in the transmission and propagation of this organism in the hospital setting.

In the study, the isolation rate of *Acinetobacter* from urine was (19.36%). similar observation was made by Sivaranjani *et al*., (2013).
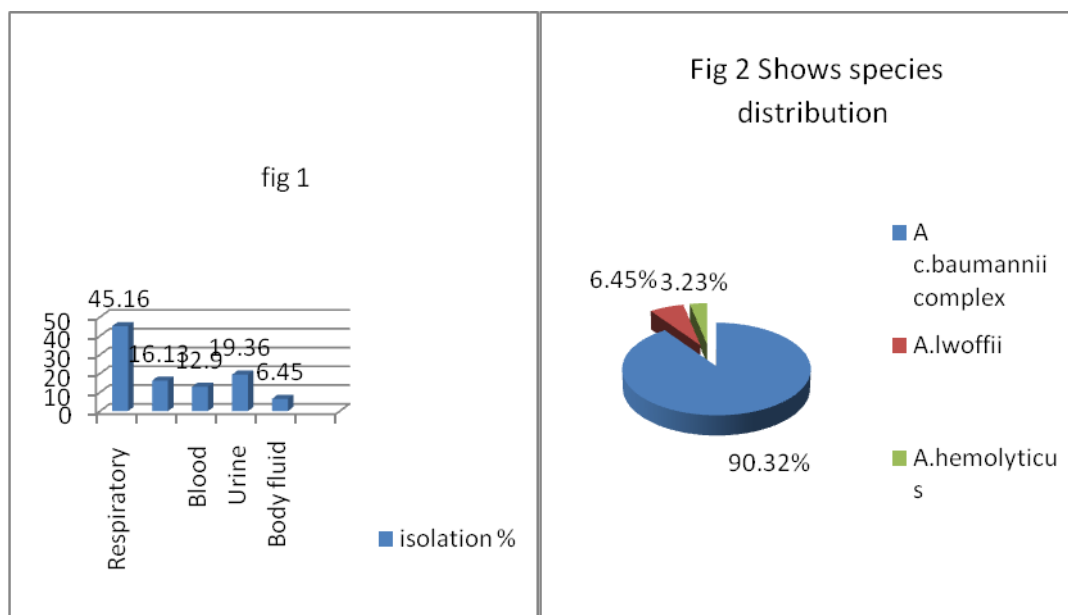
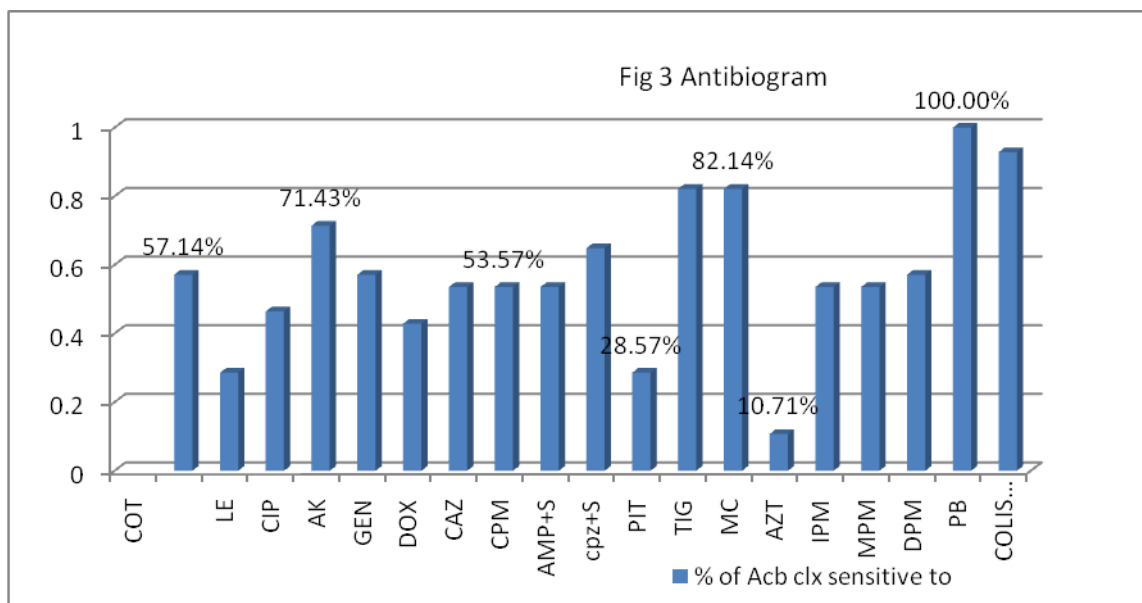In the present study, out of 31 *Acinetobacter* spp, the predominant species was A.

baumannii(90.32%) followed by A.lwoffii(6.45%) and *A.hemolyticus* (3.23%). similarly, Rahul Kamble *et al.,* (2012) and Sinha *et al.,* reported *Acinetobacter baumannii* as the predominant species. Predominance *A.calcoaceticus baumannii* complex is perhaps its non fastidious natures and higher prevalence in hospital environment. *Acinetobacter* spp. have emerged as particularly important organisms in intensive care units (ICUs), and this is probably related, at least in part, to the increasingly invasive diagnostic and therapeutic procedures used in hospital ICUs in recent years.

Table.1 Distribution of species in ICU and Indoor

Patient	No(%) of *Acinetobacter* isolates	Distribution of species(%)		
		Acb clx	*A.lwoffii*	*A.hemolyticus*
Indoor	6 (19.35)	4 (66.66)	1(16.67)	1(16.67)
ICU	25 (80.65)	24(96)	1(4)	0
Total	31 (100)	28 (90.32)	2 (6.45)	1(3.23)

Fig.1 & Fig 2

Fig 3 Antibiogram

In the present study, *Acinetobacter* species isolated from patients in ICU most frequently (80.65%) and Similarly by Sharma *et al*., (2015) found *Acinetobacter* isolates from ICU 71.5% cases. Muntasir Omer *et al.,* (2014) isolated *A. Baumannii* from ICU patients (72%).

It is observed in our study *A.calcoaceticus baumannii* complex were sensitive to Polymixin B (100%).Similar observation was seen in study done by Biglari *et al*., (2013) and Patwardhan *et al.,* (2003) reported *Acinetobacter* spp. were 100% sensitive to Polymixin B.

In the present study *Acinetobacter* sp showed susceptibility to colistin (93.55%). Study conducted by Jaggi *et al.,* reported susceptibility of colistin 98.8%. But Dash *et al.,* (July 2010) reported susceptibility of colistin 100%.

In our study resistance was seen with Piperacillin tazobactum (71.43%).similarly, Chakraborty *et al.,* (2011) reported resistance to Piperacillin/ tazobactam, (82.9%). This can be explained by great diversity of chromosomal and plasmid-mediated enzymes.

A.lwoffii(2) and (1) *A.hemolyticus* were sensitive to polymixin B, Tigecycline and Minocycline (100%) similar with Prasantha *et al*., (2004).

In conclusion, after analyzing it was concluded that *Acinetobacter* isolates constitute 3.49% with a highest isolation from ICUS (80.65%). Hospital strains of *Acinetobacter* showed resistant to commonly used antibiotics. The increasing antibiotic resistant trend reflects the extensive usage of antibiotics in hospitals and its propensity to acquire antibiotic resistance.

In our study *Acinetobacter* spp were only 100% sensitive to Polymixin B followed by colistin 92.85%. Highest resistance seen with Piperacillin tazobactum71.43% So, it is essential to implement infection control measures and antibiotic control strategy in hospitals to prevent multidrug resistance by regular analysis of antibiogram of *Acinetobacter* species. So that an effective empirical drug regime can be tailored to prevent drug resistance and thus the morbidity and mortality in Hospital acquired infection.

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