A MICROBIOLOGICAL STUDY OF MULTI-DRUG RESISTANT ACINETOBACTER BAUMANNII IN CLINICAL SAMPLES WITH SPECIAL REFERENCE TO AN INTENSIVE CARE UNIT.

Microbiology

Akanksha Tomar	Tutor, Department of Microbiology Chintpurni Medical College and Hospital Bungal, Pathankot
Shivani Sharma	Assistant Professor, Department of Microbiology Chintpurni Medical College and Hospital Bungal, Pathankot.
Dr. Rupinderjit Kaur	Assistant Professor, Department of Microbiology Chintpurni Medical College and Hospital Bungal, Pathankot.

ABSTRACT

Acinetobacter baumannii is a significant pathogen in Intensive Care Unit (ICU) of hospitals with a growing incidence of multi-drug resistant (MDR) strains. Present study was undertaken to know anti-microbial suscecptibilty pattern of A. baumannii from various clinical samples collected from patients admitted in ICU at Chintpurani Medical college & Hospital, Bungal Pathankot over a period of six months from November 2017 to April 2018. A total of 45 isolates of A. baumnnii were obtained from 120 samples 37.5% . Anti-microbial susceptibility testing was done by Kirby-Bauer Disk Diffusion method. Maximum isolates of A. baumannii were obtained f rom tracheal aspirate 64% from purulent aspirate 55% From Endotracheal secretions 39% followed by Sputum 18%, Urine 22%, Blood 29%, Pus 40%, Drain fluid 33% and CSF 10%. All A. baumnnii isolates were highly resistant to Cefaperazone (95%), Cefuroxime and Cefotaxime (93%), Ceftazidime and Ampicillin Sulbacutm (91%). Higher level of resistance was also recorded for Amikacin (89%), Gentamicin (89%), Piperacillin- tazobactum (87%), Ofloxacin (87%), Ciprofloxacin (87%), Lomefloxacin (84%), Neticillin (84%), Pefloxacin (84%). Resistance towards Meropenem was recorded as (53%) and Imipenem as (47%). Minimum resistance was shown towards Polymixin B (13%) and Colistin (11%). Strict adherence to infection control helped to reduced the burden of this pathogen.

INTRODUCTION

Acinetobacter baumannii has become an increasingly frequent cause of healthcare-associated infections (HAI), particularly in ICUs.[1] The increased risk of infection is associated with severity of patient's illness, length of exposure to invasive and procedures, increased patient contact with healthcare personnel and length of stay in ICU. it has been shown to colonize the skin as well as being isolated in high numbers from the respiratory and oropharynx secretions of infected individuals.[2]Acinetobacter baumannii causes respiratory and urinary tract infections, meningitis, endocarditis, burn infections, and wound sepsis, especially in intensive care units (ICUs). Mechanically ventilated and immuno compromised patients as it shows a special predilection for ICU. In recent years, it has been designated as a "red alert" human pathogen generating alarm among the medical fraternity, arising largely from its extensive antibiotic resistance spectrum.[3]There are many species in this genus but only three species i.e. - A.baumannii, A.calcoaceticus and A. lwoffii appear to be of clinical importance. These species have been included under the term A.calcoaceticus-A.baumannii complex and are usually reported as Acinetobacter.[4,5]A. baumannii infections are often difficult to eradicate due to high-level resistance to many antibiotics as a result of both intrinsic and acquired mechanisms. ß-Lactamase production is the most important mechanism of acquired ß-lactam resistance in gram-negative pathogens. Carbapenems (e.g., imipenem and meropenem) have become the drugs of choice against Acinetobacter infections in most of the hospital in India. A. baumannii has acquired resistance to broad-spectrum Cephalosporin, Carbapenems, Amikacin, and Fluoroquinolones and is susceptible only to Polymixin B and Colistin.[6]

Material & Methods

A total of 120 clinical samples which included Tracheal aspirate, Purulent aspirate, Endotracheal secretions, Sputum, Urine, Blood, Pus, Drain fluid, CSF were collected from patients admitted in ICU of CMCH Pathankot over a period of six months from November 2017 to April 2018. The samples were inoculated on Blood Agar and MacConkey Agar plates under strict aseptic conditions. Plates were incubated at 37C for 24-48 hrs. A.baumannii was identified and confirmed by Gram staining as Gram negative coccobacilli in pairs, nonmotile. Followed by biochemical test–Catalase positive, Oxidase negative, Alkaline/Alkaline(K/K) reaction in Triple sugar Iron (TSI) slant, Indole negative, Citrate utilization test positive, Nitrate reductase negative, Urease test negative. It showed Oxidative-Fermentative (O/F) test –oxidative and growth at 44 C. Acinetobacter baumannii were identified using standard microbiological procedures.

The Kirby-Bauer Disk Diffusion method was carried out for antimicrobial susceptibility testing as per CLSI guidelines.

Result

In our study, A total of 45 A.baumannii isolates were obtained from 120 samples collected from ICU patients (Table 1). Maximum number of A.baumannii were isolated from Respiratory Samples-Tracheal aspirate, Purulent secretions, ET secretions and Sputum 48.5 %, followed by Pus 40%, Drain fluid 33%, Blood 29%, Urine 22% and CSF 10% (Table 2). All A.baumannii isolates were highly resistant to Cephalosporins – Cefoperazone 95%, Cefuroxime and Cefotaxime 93%, Ceftazidime 91%. High level of resistance was also recorded for Ampicillin-Sulbacutm 91%, Amikacin 89%, Gentamicin 89%, Piperacillin-tazobactum 87%, Ofloxacin 87%, Ciprofloxacin (87%), Lomefloxacin 84%, Neticillin 84%, Pefloxacin 84%, Cefepime 80%. Resistance towards Meropenem was recorded as 53% and Imipenem as 47% (Table 3).

Discussion and Conclusion

In the present study, 37.5% A.baumannii isolates were obtained from different ICU samples. Higher prevalence of Acinetobacter baumannii was seen in the respiratory samples 48.5% as compared to non-respiratory samples. This is quite comparable with the study carried out by Jaggi et al., (2012) maximum isolates were from respiratory samples 59.6%.[7] Peymani et al reported that respiratory tract was the most common site where A. bamannii was isolated in ICU. Patients with chronic lung disease are at increased risk of airway colonization and pneumonia, especially when they require intubation. A. baumannii has the ability to colonize and infect skin and soft tissue.[8]

In the present study, very low isolation rate was reported from CSF sample 10% is quite comparable with the study carried Peymani et al (2011) and Mindolli et al who reported it as 6% and 0.5% respectively in body fluids.[9]

In our study, Acinetobacter showed high degree of resistance to all third generation Cephalosporins – 92% and Ampicillin-Sulbacutm 91%, followed by Gentamicin (89%), Piperacillin-tazobactum , Ofloxacin and Ciprofloxacin (87%), Followed by Lomefloxacin and Neticillin (84%). Carbapenems (53% resistant to Meropenem and 47 % resistant to Imipenem). Lowest resistance were seen in Polymixin B (13%) and Colistin (11%). Peymani et al., (2011) found that the resistance to Piperacillin+tazobactum was 89% Meropenem 56%, Imipenem 54%, Gentamicin 86%, Amikacin 81% and Ciprofloxacin

86%. These findings were similar to the results of our study.

Pesent study shows, Acinetobacter were resistant to all antibiotics routinely used in the ICU of hospital. Many Indian studies have reported high level of resistance in Acinetobacters. Most isolates were from critical care setting. The high resistance pattern seen in our isolates may be use of selective antibiotics pressure which in turn has resulted in increased prevalence of multi drug resistance Acinetobacter. Therefore, improving hand hygiene compliance among HCW's and standard precautions may be adequate to control multidrug resistant ICU bugs in endemic settings.

Table-1: Total numbers of isolates.

Total samples	Acinetobacter baumannii isolated	Percentage
120	45	37.5

Table-2: Prevalence of Acinetobacter baumannii in different clinical samples.

Types of Sample	Total Number	Isolates of Acinetobacter	Percentage %
Tracheal aspirate	28	18	64%
Purulent aspirate	11	6	55%
Endotracheal secretions	18	7	39%
Sputum	11	2	18%
Urine	27	6	22%
Blood	7	2	29%
Pus	5	2	40%
Drain Fluid	3	1	33%
CSF	10	1	10%

Table-3: Antimicrobial Resistance Pattern of Acinetobacter baumannii.

Antibiotic Name	Conc. (mg)	Sensitivity n%	Resistant n%
Amikacin (AK)	30	5(11%)	40 (89%)
Ciprofloxacin (CIP)	05	6 (13%)	39 (87%)
Cefotaxime (CTX)	30	3 (7%)	42 (93%)
Cefuroxime (CXM)	30	3 (7%)	42 (93%)
Ampicillin-Sulbacutm (AS)	10/10	4 (9%)	41(91%)
Lomefloxacin(LOM)	30	7(16%)	38(84%)
Ceftazidime (CAZ)	30	4 (9%)	41 (91%)
Cefaperazone (CPZ)	75	2(4%)	43 (95%)
Gentamicin (GEN)	10	3 (7%)	42 (93%)
Neticillin (NET)	30	7 (16%)	38 (84%)
Piperacillin-tazobactum	100/10	6 (13%)	39 (87%)
Pefloxacin (PF)	5	7 (16%)	38 (84%)
Ofloxacin (OF)	5	6 (13%)	39 (87%)
Imipenum (I)	10	24(53%)	21 (47%)
Meropenum (MRP)	10	21(47%)	24(53%)
Cefepime (CPM)	30	9 (20%)	36 (80%)
Polymixin-B	300 units	40 (89%)	5 (11%)
Colistin	10 µg	39 (87%)	6 (13%)

REFERENCES
1. Appleman MD, Belzberg H, Citron DM, et al. In vitro activities of nontraditional antimicrobials against multiresistant Acinetobacter baumannii strains isolated in an intensive care unit outbreak. Antimicrob Agents Chemother 2000; 44(4): 1035- 1040.
2. Nahar A, Anwar S, Saleh AA, Miah RA. Isolation of Acinetobacter species and their antimicrobial resistance pattern in an Intensive Care Unit (ICU) of a tertiary care hospital in Dhaka, Bangladesh. Bangladesh J Med Microbiol. 2012; 06:03-06.
3. Cerqueira GM, Peleg AY. Insights into Acinetobacter baumannii pathogenicity. IUBMB Life 2011; 63:1055-60.
4. Scott P, Deye G, Srinivasan A et al. An outbreak of multidrug–resistant Acinetobacter baumannii – calcoaceticus complex infection in the US military healthcare system associated with military operations in Iraq. Clin Infect Dis. 2007;44:1577-84.
5. Lahiri KK, Mani NS, Purai SS. Acinetobacter spp as nosocomial pathogen: Clinical significance and antimicrobial sensitivity. MJAFI 2004;60:7-10.
6. Byung-Chan Jeon, Investigation of Nosocomial outbreaks of Imipenem-Resistant Acinetobacter baumannii producing OXA-23 β lactamase in Korea. Journal of Clinical Microbiology 2005 May; 43(5):2241-2245.
7. Jaggi N, Sissodia P, Sharma L. Acinetobacter baumannii isolates in a tertiary care hospital: Antimicrobial resistance and Clinical significance. Journal of Microbiology and Infectious Diseases. 2012;2:57-63.
8. Peymani, A., Nahaei, M.R., Farajnia, S., Hasani, A., Mirsalehian, A., Sohrabi, N., et al., 2011. High prevalence of metallo-beta-lactamase-producing Acinetobacter baumannii in a teaching hospital in Tabriz, Iran. Jpn J Infect Dis. 64 (1):69–71.
9. Mindolli, P.B., Salmani, M.P., Vishwanath, G., Hanumanthappa, A.R. 2010. Identification and speciation of Acinetobacter and their antimicrobial susceptibility testing. Al Ameen J Med Sci., 3(4):345-49.