Isolation of *Acinetobacter baumannii* and It's Antimicrobial Pattern In An Intensive Care Unit (ICU) at a Tertiary Care Hospital Kanpur

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ABSTRACT

Introduction: *Acinetobacter baumannii* has emerged over the last decade as a significant opportunistic pathogen. Although it is generally associated with benign colonization of hospitalized patients. The purpose of this study was undertaken to isolate and identify of *Acinetobacter baumannii* from clinical infections using different laboratory methods.

Aim: The aim of this study was to know antimicrobial sensitivity pattern of *Acinetobacter. baumannii* from various clinical samples collected from patients admitted in ICU at Rama Medical college hospital and research center over a period of one year from January 2024 to December 202.

Material and methods: The study was conducted in a tertiary care hospital in Kanpur over a period of one year. *Acinetobacter baumanni* was isolated from various clinical samples received in the Department of Microbiology. Antimicrobial susceptibility testing of all *Acinetobacter baumannii* isolates was done using Kirby Bauer's disc diffusion technique, as per the recommendations of the Clinical Laboratory Standards Institute (CLSI).

Results: Among316(62%) gram-negative bacilli maximum number of *A.baumannii* were isolated from endotracheal secretions 69(92%) and followed by blood 3 (20%) sputum 3 (16.6%), BALfluid 1(7%) pus 4(4.8%) urine 3 (2.7%).The antibiotic susceptibility pattern of *Acinetobacter baumanii* were 100% sensitive to polymyxin (polymyxin B and colistin) *Acinetobacter baumanii* showed maximum resistance against 3rd greneration Cephalosporins, Carbapenems and Aminoglycosides.

Conclusion: A.baumannii is emerging as a predominant healthcare associated multidrug resistant pathogen, especially in the ICU's. The findings of this study will help our clinicians to apply adequate antibiotics for treatment of patients admitted in ICU.

Keywords: *A. baumannii*, Intensive Care Unit (ICU), antimicrobial resistance

Introduction

Acinetobacter species are saprophytic, ubiquitous and have emerged as an important nosocomial pathogen due to its ability for survival in the hospital environment on a wide range of dry and moist surfaces.[1] *Acinetobacter baumannii* is an important opportunistic pathogen has potential spread among hospitalized patients and persist in the hospital environment Currently, *A. baumannii* is becoming an important emerging nosocomial pathogen worldwide and is responsible for 2-10 % of all the Gram-negative infections . These microorganisms are known principally for their role as causative agents of nosocomial pneumonia, bacteraemia, urinary tract infection, wound infections, and secondary meningitis [2] Critically ill patients acquire an infection during their stay in an Intensive care unit (ICU) and the frequency of these infections varies considerably in different populations in clinical settings. 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. [3,4] *Acinetobacter species* have the capacity to acquire resistance to almost all presently existing antimicrobial agents. Despite the increasing significance and frequency of multidrug resista*nt Acinetobacter* infections, many clinicians and microbiologists still lack an appreciation of importance of these organisms because of their confused taxonomic status. Because of their increasing importance of nosocomial infections and multidrug resistant pattern, further study is warranted.[5].

Material and Method

The collection of biological material was conducted according to physicians' recommendations. The samples were sent to the microbiology laboratory. A total of 508 clinical samples which included, Endotraheal secretions, sputum, urine, blood, wound secretion, CSF were collected from patients admitted in ICU of RMCH&R. The samples were collected from patients of all age groups, both sexes, who were critically ill and suspected for pneumonia, urinary tract infection, septicemia, skin and soft tissue infection and meningitis. The samples were inoculated on Blood Agar and MacConkey Agar plates under strict aseptic conditions. Plates were incubated at 37^0C for 24- 48 hrs. A. baumannii was identified and confirmed by Gram staining as Gram negative coccobacilli, nonmotile, oxidase negative, Alkaline/Alkaline (K/K) reaction in Triple sugar Iron (TSI) slant, catalase positive, Indole negative, Citrate utilization test positive, Nitrate reductase negative,

urease test negative. It showed Oxidative –Fermentative (O/F) test –oxidative and growth at 44^0 C[6,7,8,9]. Antimicrobial susceptibility testing of all *A.baumannii* isolates was done using Kirby Bauer disc diffusion technique as per recommendations of Clinical Laboratory Standards (CLSI)

Result

Out of 508 ICU samples, 316 (62%) were positive for gram negative baccili. Among 316 Gram negative bacilli, 83(26.2%) was obtained Acinetobacter *baumannii* as shown table no.1. Maximum number of *A.baumannii* were isolated from, endotracheal secretion (92%) and followed by blood (20%), sputum (16.6%) wound secretion (4.8%) and urine (2.7%%). Age wise distribution of Acinetobacter infection was seen in 2(5.4%) were belongs to 11-20 years of age group followed by 4(10.8%) from 21-30 years, 7 (18.9%) from 31-40 years, 9(24.3%) from 41-50 years and 15(40.5%) in > 50 years of age. The antibiotic susceptibility pattern of: *Acinetobacter baumanii* were 100% sensitive to polymyxin (polymyxin B and colistin) *Acinetobacter baumanii* showed maximum resistance against 3rd greneration cephalosporins, Carbapenems and Aminoglycosides as shown table no.3.

Table. no. 1: Isolation of *Acinetobacter baumanii* from defferent sample received from ICU ward

Clinical Sample	No. of sample	No. of gram –ve bacilli isolates	No. and % of *A. baumanii* isolates
Endotracheal secretion	78	75	69 (92%)
BAL fluid	30	13	1 (7.6%)
Sputum	39	18	3 (16.6%)
Urine	159	109	3 (2.7%)
PUS	139	83	4 (4.8%)
Blood	53	15	3 (20%)
CSF	10	3	0 (0%)
Total	508	316	83

Table no. 2:   Age wise distribution

| Age group	No. of isolates	Percentage
11-20	4	4.8%
21-30	15	18.2%
31-40	17	20.7%
41-50	18	21.9%
>50	**29**	**34.9%**
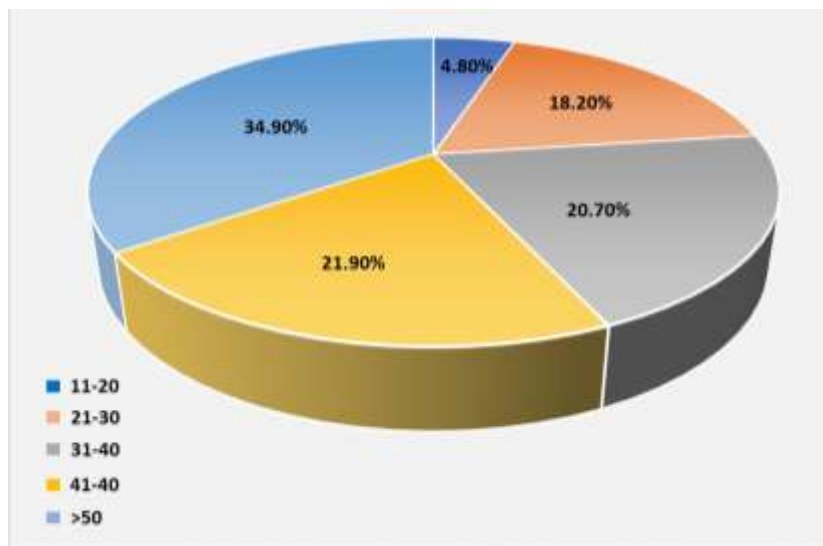
Graph no.1   Showing age wise distribution of *A. baumanii*

Table no. 3 Antibiotic Sensitivity Pattern of *A. baumannii*.

Antimicrobial agent	Sensitive n (%)
Ceftazidime	0 (0%)
Cefepime	0 (0%)
Ampicillin-sulbactum	0 (0%)
Imipenem	11 (13.2%)
Meropenem	18 (21.6%)
Piperacillin-tazobactum	5 (6%)
Cotrimoxazole	9 (10.8.%)
Ciprofloxacin	1 (1.2%)

Gentamicin	1 (1.2%)
Amikacin	11 (13.2%)
Polymixin B	83 (100%)
Colistin	83 (100%)
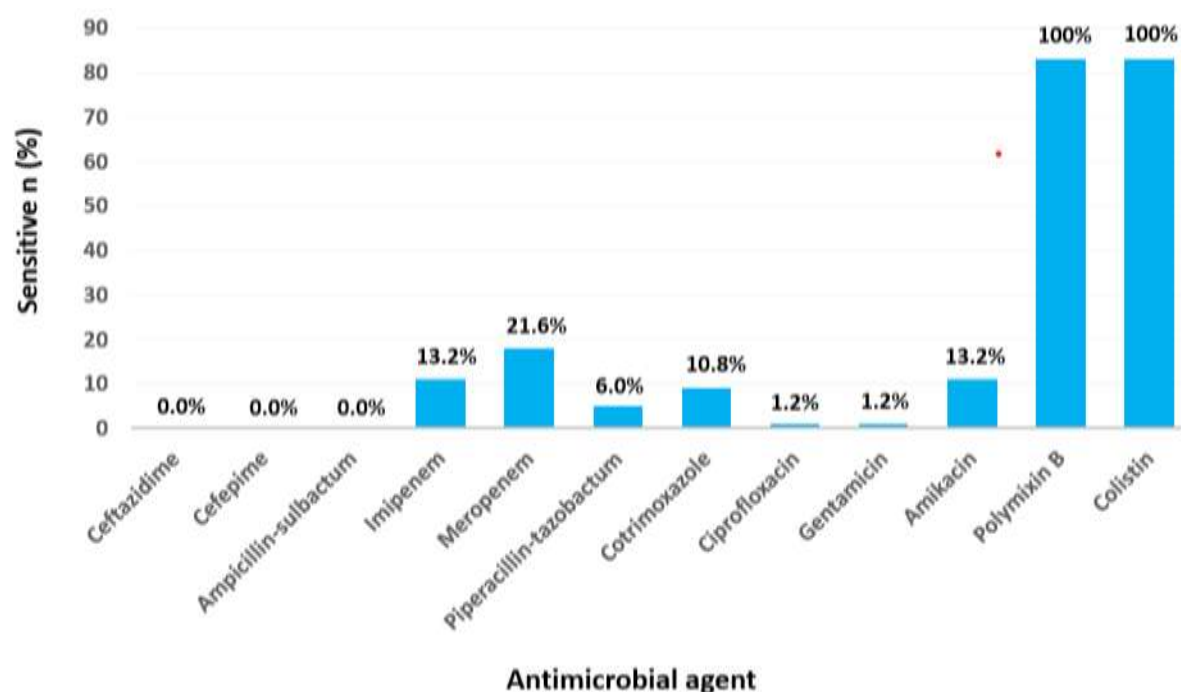
Graph no.-2 Antibiotic sensitivity pattern of *Acinetobacter baumannii*

Discussion

In the past three decades, *Acinetobacter baumannii* has emerged as a major opportunistic infectious pathogen in critically ill patients who have serious underlying disease, have been hospitalized for long periods, or are undergoing invasive procedures with prior use of antimicrobial drugs. This bacterium plays a significant role in healthcare-associated infections (HAI) in worldwide, especially in intensive care units (ICUs) [10,11]. In this investigation, the bacterial isolates obtained as a pure and predominant growth from clinical samples were only considered for the present study. All these bacteria were identified based on colonial morphology, and comparison of the biochemical characteristics. Out of 508 different ICU samples, 83 (16.3%) *Acinatobacter baumannii*. were isolated in our study. In India, *Acinetobacter baumannii* is reported to cause about 13.2% of nosocomial infections in ICU patients. Other study like Kaur, et al.[3]

reported 8.8% (48/545) *Acinatobacter baumannii.* obtained from different ICU samples. Out of 508 samples 316 (62.2%) were Gram negative bacteria. Among 316 gram negative bacteria 83 (26.2%) infections were found to be due to Acinetobacter species were predominantly isolated from endotracheal secretion 69(92%) , followed by blood 3 (20%) ,sputum 3(16%), bronchoalveolar lavage(7.6 %), pus (4.8%), urine 3 (2.7%). In this study *Acinetobacter spp.* was major commonest agent in endotracheal secretion sample in ICU patient. Whereas P. Gayathri Devi et al. [12] reported 58.3*% Acinatobacter baumannii* isolated from endotrachral secretion. Very low isolation rate was reported from urine samples (2.08%) in our study. The results are almost similar to Jaggi et al. [13] and Kaur, et al. [3] who reported 2.5% and 2.08% *Acinatobacter spp.* isolated from urine. In our study > 50yr age group was most affected by *Acinetobacter baumanni*i due to lack of immunity. In this study *Acinetobacter baumannii* showed highly resistant to ceftazidime and cefepime. A similar finding was also observed by Mostofi et al [14], Who reported 100% resistant to ceftazidime and cefepime. Raina Dimple et al [15], In their study have reported that the sensitive of Acinetobacter baumannii to meropenem was 26% which is similar to our study 23% was sensitive to meropenem whereas other study like Rani et al.[16] have reported that *Acinetobacter baumannii* was 35% sensitive to meropenem . In the current study *Acinetobacter baumannii* was 100% sensitive to plymyxins (polymyxinB and colistin) this result similar to Mohamed M. S. et.al. []and Raina Dimple et. al. [15] Where they reported 100% sensitive to polymixins.

Conclusion

Resistance to antimicrobial agents is increasing worldwide and imposes significant life-threatening risks to several different populations, especially those in intensive care units (ICUs). Bacteria can quickly develop or acquire resistance to antimicrobial drugs, and combined with their intrinsic potential to cause disease in humans, these bacteria can become deadly. Among Gram-negative bacteria, Acinetobacter baumannii is notorious as a frequent opportunistic pathogen associated with critically ill patients, and understanding the genetic basis of A. baumannii resistance to beta-lactams among patients in ICUs will result in better protocols to prevent the development of resistance as well as improved treatment regimens.

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