Section: Microbiology

Original Research Article

CLINICO-MICROBIOLOGICAL PROFILE OF ACINETOBACTER BAUMANNII INFECTIONS IN A TERTIARY CARE HOSPITAL IN GREATER NOIDA

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Received : 07/01/2024
Received in revised form : 15/03/2024
Accepted : 3103/2024

Keywords:
Acinetobacter baumannii, Minocycline, Antimicrobial susceptibility testing.

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DOI: 10.47009/jamp.2024.6.2.112

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (2); 517-520

Abstract

Background: Acinetobacter baumannii is one of the common pathogenic bacteria which have capability to cause nosocomial and community acquired infections. A. baumannii strains are often multi drug resistant, and therapy of infection can be difficult as we are left with very less therapeutic options. **Materials and Methods:** All clinical specimens from in and out patient departments received in the laboratory were processed for the isolation of Acinetobacter baumannii. A.baumannii isolates were identified as per the standard microbiological procedure followed by antimicrobial susceptibility testing (AST) were done by Vitek-2 compact system. **Result:** Of the 949 clinical strains, 85 (9%) strains were identified as A. baumannii. Most of the patients which showed growth of A. baumannii were inpatients (64.7%) with male preponderance than out patients (30). Ventilator-Associated Pneumonia (VAP) demonstrated maximum growth of A. baumannii (51%) followed by Soft-tissue infection (15%). Overall Minocycline showed best and beta-lactams showed least sensitivity against the A. baumannii isolates. **Conclusion:** Management of infections caused by A. baumannii are getting difficult day by day due to development of drug resistance. This study concludes that Minocycline is the preferred choice for empirical treatment in all A.baumannii related clinical scenarios showing high sensitivity and good efficacy.

INTRODUCTION

Acinetobacter baumannii(A.baumannii) is strictly aerobic, gram-negative bacilli or coccobacilli, short, non-motile and non-fermenting. They are ubiquitous saprophytes, recovered in nature and in the hospital and able to survive on moist surfaces, such as mechanical ventilation equipment, and on dry surfaces, such as human skin. These bacteria are also part of the normal oropharyngeal flora of healthy people and can proliferate to large numbers during hospitalization.[1,2] A. baumannii is the most commonly found species in human clinical specimens, followed by A. lwoffii, A. haemolyticus and A. johnsonii. A. baumannii is the most often responsible for causing community and hospital-acquired infections and is increasingly being reported as a significant pathogen causing sepsis, wound infections and pneumonia.[3] Immunosuppressed individuals, comorbid conditions, indiscriminate antibiotic usage and prolonged ICU stays are the common risk factors for A. baumannii infections.[4] Infections due to A. baumannii possesses a serious threat to the healthcare system as most of the strains are frequently resistant to commonly used antimicrobial agents including cephalosporins, aminoglycosides, fluroquinolones and carbapenems. One of the common causes of resistance is the prolonged and indiscriminate usage of broad-spectrum antibiotic as empirical therapy without the culture and sensitivity support.[5,6] Rational use of antimicrobial agents is critically important to prevent Acinetobacter infections as well as to avoid poor outcomes. Therefore, aim of the study was to determine the prevalence and resistance status of A. baumannii in different clinical scenarios in a tertiary care hospital in Greater Noida (India).

MATERIALS AND METHODS

This is a study in which samples with isolated A. baumannii from patients with different infections received, processed and reported from January 2022 to January 2023 in the Microbiology laboratory of a tertiary care hospital in Greater Noida were included. Clinical isolates apart from A. baumannii were excluded from present study. All clinical samples from in and outpatient departments received in the laboratory were processed as per the standard microbiological procedure for the isolation of A. baumannii followed by identification tests and antimicrobial susceptibility testing (AST) were done

ISSN (O): 2687-5365; ISSN (P): 2753-6556

by Vitek-2 compact system, bioMérieux, France.[7] The isolated A. baumannii were tested for antibiotics :Cefepime, Meropenem, Minocycline, Ceftazidime, Piperacillin-Tazobactam, Amikacin, Levofloxacin, Imipenem.

RESULTS

Total of 2875 various clinical samples were received in the laboratory and 949 (33%) came out to be culture positive for pathogenic bacteria. Of the 949 clinical strains, 85 (9%) strains were identified as A. baumannii. Most of the patients which showed growth of A. baumannii were inpatients (64.7%) with male preponderance than outpatients (30) as mentioned in table1.Ventilator-Associated Pneumonia (VAP) demonstrated maximum growth of A. baumannii (51%) followed by Soft-tissue infection (19%) as mentioned in table 2. Minocycline is the most sensitive in UTI followed by Carbapenems, piperacillin-Tazobactam and Amikacin. Minocycline is the most sensitive in septic shock & CLABSI followed by Amikacin. Minocycline is the most sensitive in soft tissue infection followed by Piperacillin Tazobactam, Amikacin and Levofloxacin. Minocycline is most sensitive in VAP followed by Amikacin. Minocycline, Meropenem and Imipenem is most sensitive in meningitis. The pie chart analysis Figure1 indicates a notable trend favoring minocycline(67.14%) over other antibiotics in terms of sensitivity. This suggests that minocycline could serve as a robust empirical treatment option due to its high effectiveness. According to Table 3, Minocycline shows the highest sensitivity in UTI at 66.6% followed by Meropenem, imipenem, Piptaz (piperacillin/tazobactam), and Amikacin show sensitivity at 33.3%. Cefepime, ceftazidime, and levofloxacin are less effective with a sensitivity of 22.2%.In CLABSI (Central Line-Associated Bloodstream Infection) Minocycline exhibits the highest sensitivity at 62.5%.Amikacin follows with a sensitivity of 25%. Piptaz, Meropenem, imipenem, and levofloxacin show sensitivity at 18.7%.Cefepime and ceftazidime have a sensitivity of 12.5%.In Soft Tissue Infection ,Minocycline demonstrates the highest sensitivity at 62.5%.Piptaz, Amikacin, and levofloxacin show sensitivity at 18.7%.Meropenem, imipenem, and cefepime have a sensitivity of 12.5%.In VAP (Ventilator-Associated Pneumonia) Minocycline is most effective with a sensitivity of 44.1%.Amikacin follows with a sensitivity of 11.6%.In Meningitis Minocycline, imipenem, and meropenem exhibit 100% sensitivity. Cefepime and ceftazidime are less effective with a sensitivity of 6.9%.

In summary, Minocycline consistently shows high sensitivity across different infections, while other antibiotics vary in effectiveness depending on the type of infection. Imipenem and meropenem also demonstrate high sensitivity in meningitis cases. Out of the 85 patients from whom Acinetobacter baumannii was isolated, follow-up was conducted for 75 patients. Among these, 67 patients were successfully cured through treatment with minocycline."

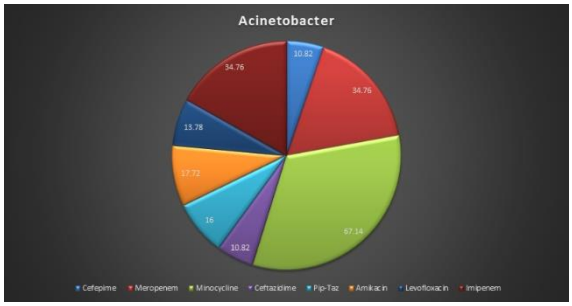

Figure 1: Overall Antimicrobial Sensitivity Pattern of A. baumannii (%)

Table 1: Baseline characteristics of A. baumannii positive isolates

Total A. baumannii isolates	85 (9%)
Male: Female	2.2:1
Median age for males	50-55yrs
Median age for females	20-25yrs
Inpatients	55 (64.7%)
Out patients	30 (35.3%)

Table 2: Distribution of A. baumannii Isolates among Different clinical conditions

S. No.	Clinical conditions	A. baumannii [n=85 (100%)]
1.	Ventilator-Associated Pneumonia (VAP)	43 (51%)
2.	Septic shock	13 (15%)
3.	Soft tissue infection	16 (19%)
4.	Urinary tract infection (UTI)	09 (11%)
5.	Meningitis	1 (01%)
6.	Central-line associated blood-stream infection (CLABSI)	3 (04%)

Table 3: Antimicrobial Sensitivity Pattern of A. baumannii in Various Clinical Conditions

Antibiotic	UTI N=9	Septic shock& CLABSI N=16	Soft tissue infection N=16	VAP N=43	Meningitis N=1
	S [n(%)]	S [n(%)]	S [n(%)]	S [n(%)]	S [n(%)]
Cefepime	2(22.2)	2(12.5)	2(12.5)	3(6.9)	0(0)
Meropenem	3(33.3)	3(18.7)	2(12.5)	4(9.3)	1(100)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Minocycline	6(66.6)	10(62.5)	10(62.5)	19(44.1)	1(100)
Ceftazidime	2(22.2)	2(12.5)	2(12.5)	3(6.9)	0(0)
Piperacillin-Tazobactam	3(33.3)	3(18.7)	3(18.7)	4(9.3)	0(0)
Amikacin	3(33.3)	4(25)	3(18.7)	5(11.6)	0(0)
Levofloxacin	2(22.2)	3(18.7)	3(18.7)	4(9.3)	0(0)
Imipenem	3(33.3)	3(18.7)	2(12.5)	4(9.3)	1(100)

DISCUSSION

A. baumannii is one of the common bacteria which often shows drug resistance and has been associated with high morbidity and mortality; therefore, antibiotic susceptibility pattern of this organism is of utmost importance to the clinicians and help them in better patient management as well as in maintaining antibiotic stewardship. The present study showed 9% prevalence of A baumannii out of all pathogenic bacteria. Our study identified 85 patients with Acinetobacter baumannii among total 949 samples. Subsequent follow-up of 75 patients revealed a promising treatment outcome, with 67 patients achieving cure following minocycline therapy. This underscores the efficacy of minocycline in managing Acinetobacter baumannii infections, highlighting its potential as a therapeutic option in clinical settings.

Previous published studies have reported prevalence of A. baumannii from 3-11% which was comparable with current research.[8-11] This study demonstrated highest prevalence of A. baumannii among patients with pneumonia which is in accordance with other studies.[12,13] One study from Nigeria,[14] have reported maximum strains from blood samples. In this study, 19% A. baumannii were isolated from the patients having soft tissue infections which is in concordance with another study that also documented 13% A baumannii in this group; although in contrast a study by Uwingabiye J et al,[10] has demonstrated very low prevalence (2%) of A. baumannii in these patients. We reported a prevalence of 15% and 11% of A. baumannii in sepsis and UTI patients respectively. Other published studies have also documented 3-14% isolation rate of A. baumannii from blood and 5-53% from urine which are comparable to this study.[10,12,13] Overall, in our study Cephalosporins, Fluroquinolones and carbapenems have showed less effecacy whereas Minocycline have showed highest sensitivity (67.14%) against A baumannii in all clinical conditions with good treatment response seen in 89% patients. A study from Greece,[15] by Paraskevi F et al was in concordance with this study, concluding that Minocycline has efficacy against A baumannii. Another study by Lashinsky J et al concluded Minocycline as most efficacious drug for Multidrug and Extensively drug resistance A.baumannii.[16] A Study by David J. Ritchie et al reported successful use of minocycline intravenous for treatment of serious MDR Acinetobacter infections, particularly for nosocomial pneumonia.[17] A systematic review of A study from Saudi Arabia,[9] concluded that they have got best results while using carbapenems and polymyxins in ICU patients. Studies from Morocco,[10] and Madhya Pradesh,[12] have revealed resistance high in beta-lactam antibiotics which correlates well this study results.

CONCLUSION

A baumannii is a notorious pathogen which causes wide range of illness. MDR status of it makes it even more lethal therefore availability of microbiological data regarding the A baumannii help the clinicians to prescribe the most effective empirical therapy which can lead a step forward for antimicrobial stewardship. In our study, Minocycline was most potent drugs against A baumannii. In our health care settings Resistance pattern of A. baumannii is quite alarming, so judicious use of antibiotics as well as effective infection control practices should be mandatory, as well as clinical guidance regarding the potential risks for therapeutic failure is crucial. Based on the study findings, it is evident that minocycline emerges as the most potent and efficacious drug. This conclusion suggests that clinicians could consider empirical use of minocycline to effectively manage patient conditions and potentially enhance outcomes. This finding underscores the potential for minocycline to be a preferred choice in clinical scenarios where empirical treatment is warranted, potentially leading to improved patient outcomes and more targeted antibiotic prescribing practices.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556