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Original Research Article

Isolation of Acinetobacter Species from Wound Infection and Their Antimicrobial Resistance Pattern in a Tertiary Care Hospital in Rajshahi, Bangladesh

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Abstract

Background: Acinetobacter species has emerged as an important pathogen globally in various infections especially in hospital acquired infections. ***Objectives:*** This study was conducted to determine the antibiotic resistance pattern of Acinetobacter species from wound swab samples. ***Materials and Methods:*** A Cross sectional study was undertaken in Department of Microbiology, Rajshahi Medical College (RMC), Rajshahi, Bangladesh from period January 2014 to December 2014. A total 13 Acinetobacter were collected from 292 wound infection patients of surgery word and its allied brances in Rajshahi medical college hospital (RMCH). Isolation, Identification and sensitivity of Acinetobacter species were performed by manual method. ***Results:*** Out of 292 patients 13(4.4%) patients showed growth of Acinetobacter species. Resistance observed to Meropenem was 38.46%, Piperacillin -Tazobactum 61.53%, Amikacin 53.84%, Ceftazidime 76.92%, Gentamicin 61.53% and Levoflaxacin 67.23%. This data suggest that Acinetobacter isolated from hospital exhibits resistanace to multiple antimicrobial drugs. ***Conclusion:*** The study will help to implement better infection control strategies and improve the knowledge of antibiotic resistance patterns of Acinetobacter species in our region.

Keywords: Acinetobacter Species, Antibiotics, Multidrug Resistance, Nosocomial.

INTRODUCTION

Members of the genus Acinetobacter are ubiquitous, free living organisms that prefer moist environment and can be easily obtained from soil, water, food and sewage [1]. They are usually considered to be opportunistic pathogens and have been reported recently to cause a number of outbreaks of nosocomial infections in hospitalized patients like wound infection, septicaemia, pneumonia, endocarditis, meningitis and urinary tract infection (UTI) [2,3]. Although acknowledged to be an opportunist in hospitalised patients, community acquired infections are reported and they can cause infections in virtually every organ system [4].

Interpreting the significance of isolates from clinical specimens is often difficult, because of the wide distribution of Acinetobacter in nature and its ability to colonise healthy or damaged tissue [5]. This study was undertaken to determine the antibiotic resistance pattern of isolated Acinetobacter species from wound swab.

MATERIALS AND METHODS

A Cross sectional study was undertaken in Department of Microbiology, Rajshahi Medical College (RMC), Rajshahi, Bangladesh from period January 2014 to December 2014. A total 292 wound swab were collected from patients of different surgical words of Rajshahi medical college hospital (RMCH). All the clinical samples were inoculated on MacConkey agar and blood agar. Inoculated plates were incubated at 37°C for 24 hours. Colonies of Acinetobacter species were white/cream coloured, smooth, circular with entire edges on blood agar and nonfermenter with a pinkish tint on MacConkey agar. Microscopy showed gram negative coccobacilli on gram stain. Oxidase test was negative [6, 7].

Identification scheme of Acinetobacter species

Acinetobacter species	Test
Non motile	Motility
Negative	Oxidase test
Negative	Indole Test
Variable	Citrate Test
Alkaline slant / No change in butt	TSI Test
Negative	Urease Test
Mostly non hemolytic	Hemolysis on Blood agar

Antibiotic sensitivity testing of Acinetobacter species were performed by Kirby Bauer disc diffusion test. Antimicrobials tested were Amikacin, Gentamicin, Cefepime, Ceftazidime, Levofloxacin, Ampicillin-Sulbactam, Piperacillin-Tazobactam, Cotrimoxazole, Cefoperazon-Sulbactam, Tetracycline, Meropenem as per CLSI [8].

RESULTS

Total 292 wound swab samples were included in present study, out of which 13(4.4%) showed growth of Acinetobacter species (Table 1).

Table-1: Prevalence of Acinetobacter in wound swab (n=13)

Clinical Sample	Isolation rate (n=13)
Wound swab (292)	13 (4.4 %)

Number of Acinetobacter species was more from paediatric surgery ward followed by general surgical ward. Most of the isolates from paediatric ward were from preterm babies (Table 2).

Table-2: Ward wise distribution of Acinetobacter Species (n=13)

Ward	Isolation rate
Paediatric surgery word	06 (46.15 %)
General Surgical word	03 (46.15%)
Neurosurgery word	02 (15.38%)
Obst and Gynee word	02 (15.38%)

In Antibiotic Sensitivity Testing, highest resistance was observed to Cefepime (84.61%) and lowest to Meropenem (38.46%) (Table 3).

Table-3: Resistance pattern of Acinetobacter Species to different antibiotics

Drug	Resistance pattern
Ampicillin Sulbactam(A/S)10/10ug/disc	(8) 61.53%
Ceftazidime(CAZ) 30ug/disc	(10) 76.92%
Levofloxacin(LE)5ug/disc	(09) 67.23%
Meropenem(MRP)10ug/disc	(05) 38.46%
Gentamicin(GEN)10ug/disc	(08) 61.53%
Amikacin(AK)30ug/disc	(07) 53.84%
Piperacillin Tazobactam(PIT)100/10 ug/disc	(08) 61.53%
Piperacillin(PI)100ug/disc	(09) 67.23%
Cefepime(CEP)30ug/disc	(11) 84.61%
Cefotaxime(CTX)30ug/disc	(10) 76.92%
Tetracycline(TE)30ug/disc	(09) 67.23%
Cotrimoxazol(COT)1.25/23.75ug/disc	(08) 61.53%

DISCUSSION

Acinetobacter spp. is the second most common Non-fermenting bacteria after Pseudomonas species that are isolated from human specimens especially among nosocomial infections [10]. In recent years, this species has emerged as the causative agent of important nosocomial infections which is probably related to the increasingly invasive procedures used, the greater quantity of broad-spectrum antimicrobials used and prolonged duration of stay in the hospital. Development of resistance to antimicrobials is a major problem in the treatment of Acinetobacter infections [11]. Isolation rate of Acinetobacter species in present study was 4.4%, which is quite comparable with Lone *et al.*

(4.8%) [12] and Mindolli PB *et al.* (4.25%) [13]. Higher prevalence rates of 14% and 9.6% among hospital isolates were observed by Mostofi *et al*. (Iran) and Joshi *et al.* (India), respectively [14,15]. Acinetobacter spp. can colonize skin, wounds, respiratory and gastrointestinal tracts [16]. It is a pathogen of tropical and humid environment but some species can survive environmental dessication for weeks, a characteristic that promotes transmission through fomite contamination in hospitals [17]. Highest isolation from wound swab of preterm babies may be due to lower immunity and more chances of bacterial infection. In a study conducted by A. Asensio *et al.* in 2008 Acinetobacter was isolated from surgical wound (15.1%) [18]. In our study 4.4% isolates were Acienetobacter. In a study conductd by Bhattacharyya *et al*. in West Bengal [19] and Mostofi *et al.* in Tehran [14] reported that multidrug resistant or MDR (isolate that is resistant to at least three classes of antimicrobial agents-all Penicillins and Cephalosporins (including inhibitor combinatons), Fluoroquinolones and Aminoglycosides were 29% and 54% respectively. Majority of the isolates in our study were resistant to commonly used antibiotics such as Ceftazidime (76.92%), Cefepime (84.61%), Gentamicin (61.53%), Amikacin (53.84%), Levofloxacin (67.23%), and Ampicillin/sulbactam (61.53%). This suggests that MDR isolates are increasing, probably due to indiscriminate use of these antibiotics in healthcare settings. Acinetobacter is ubiquitous in the hospital setting. Its ability to survive for long periods coupled with its ability to demonstrate a number of antimicrobial resistance genes has made Acinetobacter a successful hospital pathogen [20, 21]. In a Study in Dhaka, Bangladesh showed that resistant pattern of Acinetobacter species were Ampicillin 96%, Ceftriaxon 72%, Amikacin 72%, Imipenem 55%, Meropenem 60%, Tetracycline 64%, Ciprofloxacin 60% and Co-trimoxazole 38% [9] which are nearly similar to our study. Most of the patients who were admitted in our hospital had previously attended primary and secondary care hospitals and usually received combination of β-lactam antibiotics like third and fourth generation Cephalosporins along with Aminoglycosides or Fluoroquinolones. It is re- emphasized that broad spectrum antibiotics should be used with caution. We also found that Meropenem (38.46%) and Piperacillin/Tazobactam (61.53%) were showing increased resistance against this pathogen. Mostofi *et al*. in their study had reported drug resistant of Meropenem (31%) and Piperacillin/Tazobactam (40%) [14]. Differences observed between the different studies could be due to the methods, the resistance patterns and the antimicrobial patterns used [22]. Although antibiotic resistance is a worldwide concern, it is first and foremost a local problem selection for and amplification of resistant members of a species that are occurring in individual hospitals and communities, which can then spread worldwide [23]. There are many measures that may impact on antimicrobial resistance; reducing and restricting the use of antimicrobials to only those situations where they are warranted, at proper dose and for the proper duration is the most appropriate solution [24]. Carbapenems have been the drug of choice for treating Acinetobacter infections, but unfortunately, Carbapenem resistant Acinetobacter is becoming common worldwide [25, 26].

CONCLUSION

Overall infections caused by Acinetobacter spp. provide an impressive demonstration of the increasing importance of this genus as human pathogen because of the high potential of this genus to develop antibiotic resistance leading to a considerable selective advantage in environment with widespread and heavy use of antibiotics especially with relation to hospital environment and nosocomial infections. Traditional typing methods like phenotyping and antibiogram typing have an advantage over genotyping as they are readily available in all clinical microbiology laboratories. Simple identification schemes and antimicrobial susceptibility testing provide a cost effective approach for typing Acinetobacter spp. Although above systems have certain limitations when compared to molecular methodologies, the distinction between resistant and susceptible Acinetobacters atleast, is useful for effective clinical management of the infection caused by this group of organisms. To avoid resistance, antibiotics should be used judiciously and empirical antibiotic therapy should be determined based on local antibiotic sensitivity pattern of the prevalent organisms of the hospital.

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