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Original Article

Acinetobacter spp. an Emerging Pathogen of Septicemia in a Tertiary Care Hospital

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Abstract

Introduction: Bloodstream infections are an important cause of patients serious morbidity and mortality worldwide. Changing bacterial flora and emergence of resistant strains further aggravate the problem. *Acinetobacter* spp. has emerged as an important pathogen. Multidrug-resistant (MDR) *Acinetobacter* has become a global threat to the seriously infected patients who critically rely on antibiotic therapy. Carbapenems remain the treatment of choice if isolates are susceptibility to this antimicrobial class. Carbapenem-resistant *Acinetobacter* isolates are increasingly reported worldwide. MDR of *Acinetobacter* increasingly jeopardizes the health-care setting, and this is leading to substantial mortality and morbidity globally. The Centers for Disease Control and Prevention considers *Acinetobacter* a "serious" threat.

Methods: The study was done from September 2014 to August 2015. Blood culture of 1073 samples was processed, of which 374 were positive. The tests were done in the microbiology laboratory of the institution. Blood specimens were collected aseptically into Bactec blood culture bottles. Identification of *Acinetobacter* species was made on the basis of phenotypic criteria. Antimicrobial susceptibility was done using the disc diffusion method (modified Kirby-Bauer test).

Results: *Acinetobacter* spp. was isolated in 41 (10.96%) cases, of which *Acinetobacter baumannii* was isolated in 24 cases (58.54%), *Acinetobacter lwoffii* was isolated in 17 cases (41.46%). In the present study, *Acinetobacter* spp. is sensitivity pattern to antibiotics are as follows: Imipenem was sensitive in 33 (80.48%) cases, meropenem was sensitive in 35 (85.36%), levofloxacin in 25 (62.50%) cases, and ofloxacin was sensitive in 22 (53.65%) cases. Polymyxin and tigecycline were sensitive in all cases of *Acinetobacter* septicemia.

Conclusion: *Acinetobacter* spp. is emerging as an important pathogen and developing drug resistance. Health education to be provided to the public on the dangers of indiscriminate use of antibiotics. Rational antibiotic use along with implementation of infection control policies are required for control of such infections.

Key words: *Acinetobacter* spp., Drug resistance, Emerging, Septicemia

INTRODUCTION

Bloodstream infections are an important cause of patients serious morbidity and mortality worldwide.[1] *Acinetobacter* species are the second most commonly isolated nonfermenter in human specimens. *Pseudomonas aeruginosa* is the most common. *Acinetobacter* species ranks fourth after *P. aeruginosa, Staphylococcus aureus*, and *Klebsiella pneumonia* among the most frequent hospital-acquired infectious agents.[2] *Acinetobacter* was considered as opportunistic pathogen of low virulence, and it has recently emerged as an important nosocomial pathogen world over, mostly involving patients with impaired host defense, especially in intensive care units, neonatal units, and surgical wards.[2] Changing bacterial flora and emergence of resistant strains further aggravate the problem. *Acinetobacter* spp. has emerged as important pathogens.[3] *Acinetobacter* is strictly aerobic Gram-negative coccobacilli, and it is widely distributed in soil and water but also commonly found in the hospital environment. 33 genomic species of the

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Acinetobacter genus have been identified.[4] *Acinetobacter* is a non-glucose fermenting Gram-negative bacillus, and it has emerged in the past three decades as a major etiological agent of hospital-associated infections giving rise to significant morbidity and mortality particularly in immunocompromised patients. Multidrug resistant (MDR) *Acinetobacter* has become a global threat to the seriously infected patients who critically rely on antibiotic therapy.[5] Carbapenems remain the treatment of choice if isolates are susceptibility to this antimicrobial class. Carbapenem-resistant *Acinetobacter* isolates are increasingly reported worldwide. Tigecycline, a relatively newer glycylcycline agent, has been reported to have antimicrobial activity against MDR *Acinetobacter* species. Aminoglycoside agents such as tobramycin and amikacin (AK) are used if susceptible. These agents are usually used in conjunction with another active antimicrobial agent.[5] MDR of *Acinetobacter* increasingly jeopardizes the health-care setting, and this is leading to substantial mortality and morbidity globally.[6] The Centers for Disease Control and Prevention considers *Acinetobacter* a "serious" threat.[7]

The aim of this study was to determine the emerging occurrence of *Acinetobacter* in septicemia and their antibiotic susceptibility pattern.

METHODS

The study was done from September 2014 to August 2015. Blood culture of 1073 samples was done, of which 374 were positive. The tests were done in the microbiology laboratory of the institution. Blood specimens were collected aseptically into Bactec blood culture bottles after cleaning proposed venepuncture sites with 70% alcohol, then povidone iodine, and finally, 70% alcohol to remove the iodine at the end of venepuncture. 5 mL of blood was collected from each patient, injected into the bottle, and transported to the microbiology laboratory for incubation in the Bactec blood culture system. Gram stain and subcultures using MacConkey and blood agar plates were done for culture bottles were growths were indicated other specimens were inoculated on MacConkey agar and blood agar and incubated at 35-37°C for 18-24 h. *Acinetobacter* species grew on MacConkey agar appearing as a non-lactose fermenter. All Gram-negative coccobacilli isolates were tested for catalase and motility. All catalase-positive, non-motile Gram-negative coccobacilli were subjected to an oxidase test. All oxidase negative organisms were inoculated into peptone broth. Gram-negative coccobacilli were identified as *Acinetobacter* spp. based on the reactions on the identification. Identification of

Acinetobacter species was made on the basis of phenotypic criteria that is Gram-staining, colony morphology, penicillin susceptibility, oxidase, catalase and urease activity, citrate reduction, gelatin hydrolysis, glucose and lactose fermentation, and growth at 37°C and 44°C.

Antimicrobial susceptibility was done using the disc diffusion method (modified Kirby-Bauer test). The inoculum was prepared from a suspension of the organism made by picking 2 or 3 colonies of the organism and making an emulsion of it in peptone water. This suspension was then compared against a turbidity standard (0.5 McFarland standard). Using a sterile swab stick, Mueller-Hinton agar plates were inoculated with the broth cultures. Antibiotic-impregnated discs were placed on the surface of the agar and incubated at 35-37°C for 24 h. The diameter of the zones of inhibition was measured with a calibrated meter rule and interpreted with the standard interpretative Clinical and Laboratory Standards Institute charts.

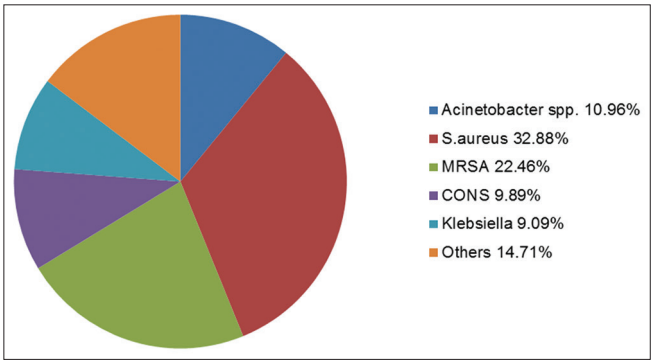

Chart 1: Isolates in septicemia

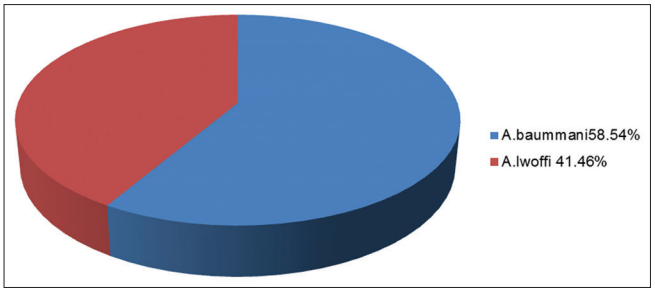

Chart 2: *Acinetobacter* spp.

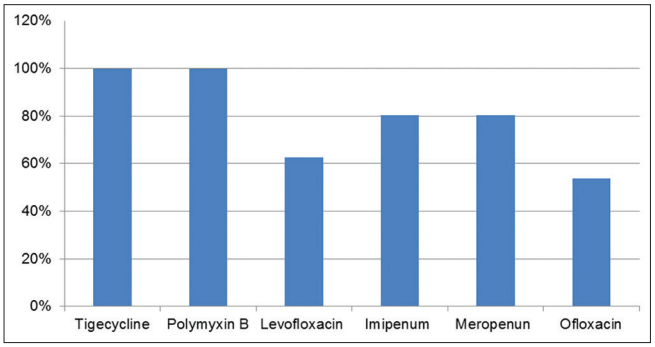

Chart 3: Antibiotic sensitivity pattern of *Acinetobacter*

RESULTS

The study was done from September 2014 to August 2015 in the Department of Microbiology of the tertiary care hospital. Blood culture of 1073 samples was done, of which 374 were positive. *S. aureus* was isolated in 123 (32.88%) cases. Methicillin-resistant *S. aureus* was isolated in 84 (22.46%) cases. Coagulase-negative *Staphylococci* was isolated in 37 (9.89%) cases Chart 1. In 34 (9.09%) cases, *Klebsiella* spp. were isolated. Other organisms were isolated in 55 (14.71%) cases Chart 2. *Acinetobacter* spp. was isolated in 41 (10.96%) cases, of which *Acinetobacter baumannii* was isolated in 24 cases (58.54%), *Acinetobacter lwoffii* was isolated in 17 cases (41.46%). In the present study, *Acinetobacter* spp. is sensitivity pattern to antibiotics are as follows: Imipenem was sensitive in 33 (80.48%) cases, meropenem was sensitive in 35 (85.36%), levofloxacin in 25 (62.50%) cases Chart 3. Ofloxacin was sensitive in 22 (53.65%) cases. Polymyxin and tigecycline were sensitive in all cases of *Acinetobacter* septicemia.

DISCUSSION

The study was done from September 2014 to August 2015 in the Department of Microbiology of the tertiary care hospital. Blood culture of 1073 samples was done, of which 374 were positive. *Acinetobacter* spp. was isolated in 41 (10.96%) cases, *A. baumannii* was isolated in 24 cases (58.54%), and *A. lwoffii* was isolated in 17 cases (41.46%).

In the present study, *Acinetobacter* spp. was isolated in 41 (10.96%) cases. In a study done by Saravu *et al.,* in 2015, *Acinetobacter* spp. was isolated in 10% of cases.[8] In a study done by Marwah *et al.,* in 2015, *Acinetobacter* spp. was isolated in 14.9%.[9] In a study done by Nwadike *et al.,* in 2014, *Acinetobacter* spp. was isolated in 9% of cases.[5] In a study done by Jyothi *et al*., in 2013, *Acinetobacter* spp. was isolated in 12.2% of cases.[10] In a study done by Shete *et al.,* in 2009, *Acinetobacter* spp. was isolated in 10.8% cases.[2] In a study done by Arora and Jaitwani in 2005, *Acinetobacter* spp. was isolated in 12.3%.[3]

Increasing rates of *Acinetobacter* infections may be due to lapses in infection-control practices. In these situations, "colonization pressure," which is a function of the proportion of patients already colonized or infected with *Acinetobacter*, can affect the likelihood of cross-transmission between patients. *Acinetobacter* has been implicated in many outbreaks. *Acinetobacter*, once considered as an opportunistic pathogen of low virulence, has recently been emerged as an important nosocomial pathogen world over, mostly involving patients with impaired host defense, especially in intensive care units, neonatal units, and surgical wards.

In the present study, *A. baumannii* was isolated in 24 cases (58.54%).

In a study done by Nwadike *et al.,* in 2014, *A. baumannii* was isolated in 79% of cases.[5] In a study done by Goel *et al.,* in 2011, *A. baumannii* was isolated in 49.44% of cases.[11] In a study done by Shete *et al.,* in 2009, *A. baumannii* was isolated in 84.6% of cases.[2] In a study done by Arora and Jaitwani in 2005, *A. baumannii* was isolated in 56.5% of cases. *A. baumannii,* in the past three decades, has emerged as a major etiological agent of hospital-associated infections giving rise to significant morbidity and mortality particularly in immunocompromised patients. In the present study, *A. lwoffii* was isolated in 17 cases (41.46%).

In a study done by Nwadike *et al.,* in 2014, *A. lwoffii* was isolated in 14% of cases.[5] In a study done by Shete *et al.,* in 2009, *A. lwoffii* was isolated in 15.4% of cases.[2] In a study done by Arora and Jaitwani in 2005, *A. lwoffii* was isolated in 43.47% of cases.[3]

In the present study, polymyxin and tigecycline were sensitive in all cases of *Acinetobacter* septicemia. Imipenem is sensitive in 80.5% of cases. Meropenem is sensitive in 85.5% of cases. Levofloxacin is sensitive in 62.5% of cases. In a study done by Shete *et al.,* in 2009, cephalosporin resistance is observed in 81-86% *Acinetobacter* strains. MDR pattern was observed with *Acinetobacter* strains. Meropenem, imipenem, and AK were found to be the most effective drugs against *Acb complex* strains. *A. lwoffii* had shown comparatively sensitive pattern. All *Acinetobacter* strains showed 100% sensitivity to imipenem and meropenem (MERO).[2]

In a study done by Arora and Jaitwani in 2005, 23 *Acinetobacter* spp. isolated, all the 23 isolates were resistant to two or more antibiotics, and resistance to ampicillin (82.5%), cephalexin (69.6%), gentamicin (GEN) (66.5%), and cefotaxime (47.8%) was noted. The strains were sensitive to AK (82.6%), ciprofloxacin (CIP) (73.9%), and piperacillin (69.6%). In a study done by Marwah *et al*., all isolates of *Acinetobacter* spp. were sensitive to polymyxin B.[9]

In a study done by Nwadike *et al.,* in 2014, *Acinetobacter* spp. Were resistant to amoxicillin clavulanate, ceftriaxone (CFN), CIP, ofloxacin, GEN, and ampicillin-sulbactam, while susceptible to MERO (64.3%), AK (50.0%), and levofloxacin (35.7%).[5] In a study done by Gowda *et al.,* in 2014, resistance to most potent drugs for *A. baumannii*-associated infections, namely, AK, CFN, and MERO firmly increased to 50%, 71%, and 55% during the year 2009 from 21%, 42%, and 12%, respectively, during year the 2005. Resistance to AM-S fluctuated in these years maximizing in the year 2009 to 60%, and similarly the resistance rates to CIP (60%) and GEN (55%) attained peak values during the year 2009.[6]

The increasing development of multiple antimicrobial resistances in this pathogen has severely restricted the

therapeutic options available for infected patients and has increased the length of stay and mortality.

CONCLUSION

MDR *Acinetobacter* septicemia may cause severe clinical disease that is associated with a high mortality. The increase in the infection rate due to a particular pathogen may be due to lapses in infection control measures. Therefore, continuous bacteriological surveillance, implementation of infection control policies, careful disinfection of intensive care equipment, and rational antibiotic use are required to control such infections.

Acinetobacter spp. is emerging as an important pathogen and developing drug resistance. Health education be provided to the public on the dangers of indiscriminate use of antibiotics. Rational antibiotic use along with the implementation of infection control policies are required for control of such infections.

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