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Original Research Article.

Antibiotic Susceptibility Pattern of Acinetobacter Spp Isolated From ICU at Tertiary Care Hospital

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ABSTRACT

Introduction: *Acinetobacter* is a gram negative coccobacillus that can cause infections in the respiratory tract, blood, soft tissue, urinary tract and CNS. Their ubiquitous nature in the ICU environment coupled with inadequate infection control practices have continuously raised the incidence of *Acinetobacter* infection over the past two decades.

Aims and Objectives: To determine the antibiotic susceptibility pattern of *Acinetobacter spp*. isolated from ICU patients at RIMS, Ranchi.

Material and Methods: The study was done in the Department of Microbiology RIMS, Ranchi from Nov 2016 to April 2017. Specimens were obtained from ICU wards. Total 152 samples were collected, processed and AST was done by using Kirby Bauer method as per the CLSI guidelines.

Results: Among 152 samples, 51 (33.55%) were culture positive. From 51 culture positive samples, *Acinetobacter spp* .were isolated in 8 (15.68%) samples. The number and percentage of *Acinetobacter* in various clinical sample were sputum 5 (62.5%), blood 2 (25%) and urine 1 (12.5%). The strains showed maximum resistance to cefotaxime (100%) and ceftazidime (100%) followed by ciprofloxacin (87.5%), ampicillin (87.5%), gentamicin (75%) and amikacin (62.5%). All the strains were sensitive to colistin (100%), imipenem (75%), cefoperazone-sulbactum (62.5%) and piperacillin-tazobactum (50%).

Conclusion: The emerging resistant strains of *Acinetobacter* infections have led to fewer treatment options. Due to these limited therapeutic options, prevention and infection control measures are essential, including not only traditional measures but also antibiotic control strategies in the ICU.

Keywords: *Acinetobacter*, Intensive Care Unit, Gram Negative Coccobacillus.

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INTRODUCTION

Acinetobacter spp. are widely distributed in moist natural and hospital environments. *Acinetobacter* spp. can be found on fomites and in soil, water, and animal food products.[1] A member of this genus, *Acinetobacter baumanni*, is an increasing concern to the medical community because of the rapidity with which it becomes resistant to antibiotics. Some strains are resistant to most available antibiotics. A. *baumanni*, is an opportunistic pathogen primarily found in a hospital setting. The antibiotic resistance of the pathogen, combined with the weakened health of infected hospital patients, has resulted in an unusually high mortality rate. A. *baumanni*, is primarily a respiratory pathogen, but it also infects skin and soft tissue, wounds and occasionally invades the bloodstream. It is more environmentally hardy than most gram-negative bacteria, and once established in a hospital, it becomes difficult to eliminate.[2]

Predisposing factors for *Acinetobacter* infections include the presence of prosthesis, endotracheal intubation, intravenous (i.v.) catheters and prior antibiotic therapy in a seriously ill-patient in hospital. Such infections are often extremely difficult to treat because of widespread resistance to the major groups of antibiotics and long-term survival of bacteria in the hospital environment.[3]

The resistance mechanisms of *Acinetobacter* are multiple. They include production of beta lactamases, alterations in cell wall channels and efflux pumps by which it becomes resistant to beta-lactum antibiotics, production of aminoglycoside modifying enzymes and mutations in genes *gyr*A and *par*C mediate resistance to aminoglycosides and quinolones respectively.[4]

Due to the high rate of infection with *Acinetobacter spp*. in ICU as well as various patterns of antibiotic resistance in different

geographical areas, an investigation on antibiotic sensitivity pattern in different part of the world is essential. These data would provide useful information on distribution of resistance patterns and the possibility to choose the proper treatment strategy.[5] Therefore the aim of this study was to determine the antimicrobial resistance pattern of *Acinetobacter spp*. isolated from patients hospitalized in ICU.

MATERIALS AND METHODS

The study was done in the Department of Microbiology RIMS, Ranchi from Nov 2016 to April 2017.Specimens were obtained from ICU wards. Total 152 samples were collected, processed and AST was done by using Kirby Bauer method as per the CLSI guidelines

The sputum, urine and blood samples of these patients were collected. On reaching the laboratory these samples were inoculated on Mac conkey agar, Blood agar, Nutrient agar to isolate the organisms. The inoculated agar pales were incubated aerobically at 37ºC for 24 hrs. After overnight incubation the Blood Agar, MacConkey Agar and Nutrient Agar were examined for evidence of growth. The Colony characters were studied, smears were stained by Gram's stain and examined under 100x objective. The bacterial species isolated were identified by morphology, cultural characteristics and biochemical reactions according to the standard techniques. The Gram negative bacilli identified were tested for catalase, motility by hanging drop method, oxidase, oxidation fermentation test, nitrate reduction test, Alkaline/Alkaline (K/K) reaction in Triple sugar Iron (TSI) slant, urease, citrate test. Acinetobacter spp produced non lactose fermenting, smooth irregular colonies on Mac conkey agar.

Antimicrobial susceptibility testing of all *Acinetobacter spp*. isolates was done using Kirby Bauer disc diffusion technique as per recommendations of Clinical Laboratory Standards Institute (CLSI).The antibiotics used were Amikacin (30mcg), Gentamicin (30mcg), Ciprofloxacin (5mcg), Piperacillin–tazobactum (100mcg/10mcg), Imipenem (10mcg), ceftazidime (30mcg), cefotaxime (30mcg), Ampicillin (10mcg), Cefoperazone – sulbactum (75mcg/30mcg), Colistin (10mcg).

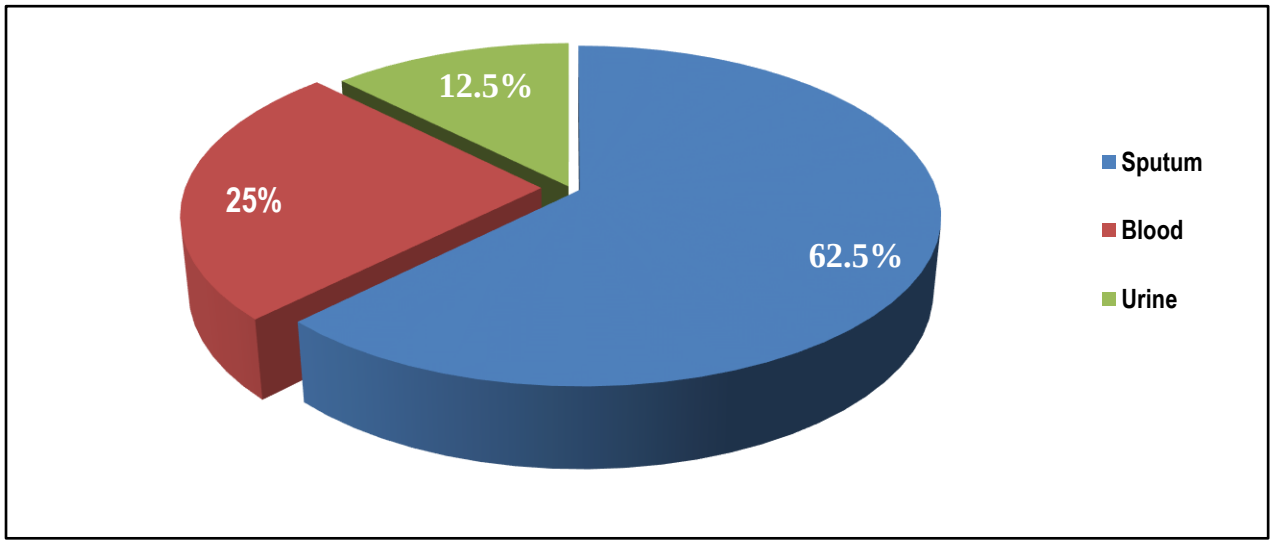

Fig 1: Distribution of different samples

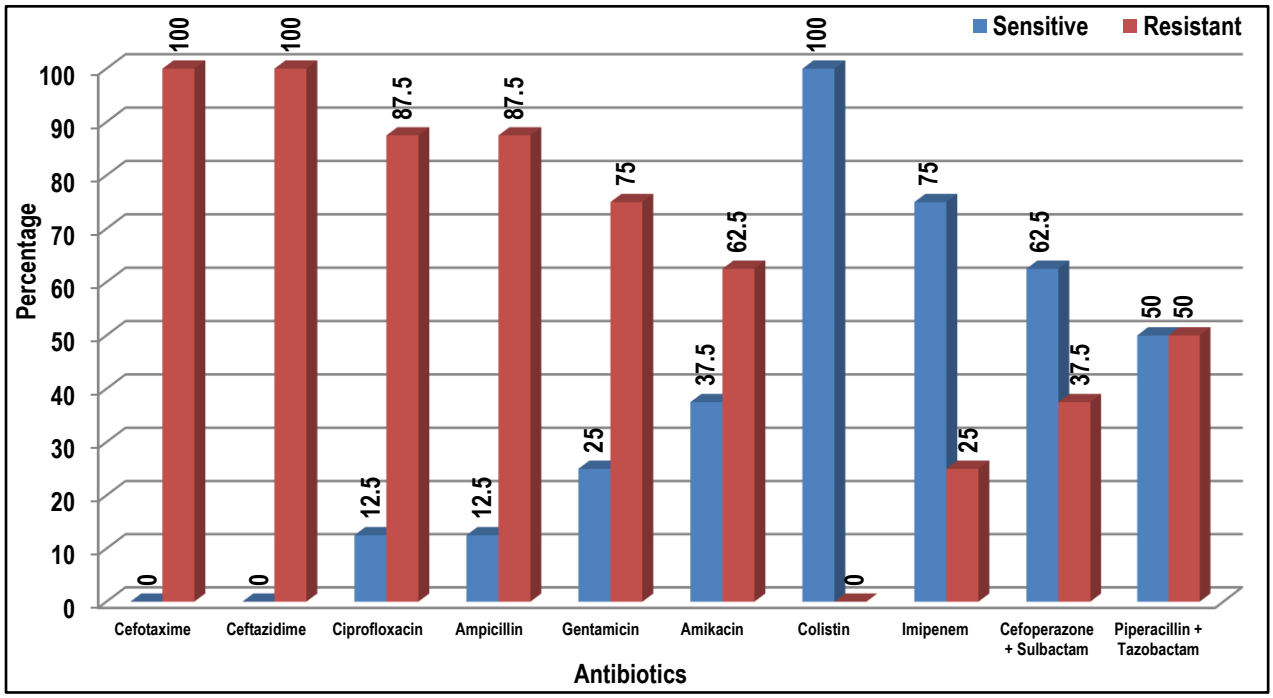

Fig 2: Antibiotic sensitivity pattern of Acinetobacter spp.

RESULTS

Among 152 samples, 51 (33.55%) were culture positive. From 51 culture positive samples, *Acinetobacter spp* .were isolated in 8 (15.68%) samples.

The age of the participants ranged from 15 to 85 years old. Majority of the patients (37.5%) were falling in 35-45 years age group, while the 15 -25 years age group constituted the least age group (12.5%).

There were 86 male (56.58%), and 66 (43.42%) females, giving a male to female ratio of 1.3:1.The number and percentage of *Acinetobacter* in various clinical sample were sputum 5 (62.5%), blood 2 (25%) and urine 1 (12.5%).

The strains showed maximum resistance to cefotaxime (100%) and ceftazidime (100%) followed by ciprofloxacin (87.5%), ampicillin (87.5%), gentamicin (75%) and amikacin (62.5%). All the strains were sensitive to colistin (100%), imipenem (75%), cefoperazone-sulbactum (62.5%) and piperacillin-tazobactum (50%).

DISCUSSION

Despite the advancement of medical technology, increased longevity and the possibility to provide intensive cares for the patients in ICU, we are faced with the emergence of nosocomial infection and the pathogens resistant to multiple antibiotics. *Acinetobacter* is one of such pathogens and the outbreak of infection caused by it has been reported in many hospitals, especially in ICUs all over the world.[6,7]

In the present study, 8 (15.68%) *Acinetobacter spp.* were isolated from different ICU samples. The incidence of *Acinetobacter* infection in this study was 15.68%, this high rate of *Acinetobacter* infection may be attributed to the poor infection control practices in the ICU of the Hospital. This finding is similar to the 14% observed by Nwadike V. Ugochukwu et al [8] and 11.7% observed by Abdullah Aedh et al.[9]

In present study males (56.58%) were more commonly affected as compared to females (43.42%). The male to female ratio in our study was 1.3:1 which correlated with the studies of Ramadevi V et al[10] and Abdullah Aedh et al[9] who have also reported male preponderance in their study.

In our study, the majority of the positive samples in terms of *Acinetobacter spp.* were isolated from the respiratory tract that is sputum (62.5%), and this finding is consistent with the findings of other similar studies done by Yadegarinia et al.[11] Blood (25%) was the second most common sample followed by urine (12.5%). This findings are consistent wih findings of study done by Ramadevi V et al[10] and Nahar et al.[12]

This study showed, *Acinetobacter spp.* were 100% resistant to cefotaxime and ceftazidime. High level of resistance was recorded for ciprofloxacin (87.5%), ampicillin (87.5%), gentamicin (75%), amikacin (62.5%). Yadegarinia et al[11] also reported high level of resistance towards cefotaxime (100%), ceftazidime (100%), ciprofloxacin (98.6%), gentamicin (94.3%), amikacin (94.30%). In another study by Kaur et al[4] also showed high level of resistance to ceftazidime (100%), ciprofloxacin (91.6%), gentamicin (93.7%), amikacin (93.7%). In our study, all isolates had multiple drug resistance. The most probable explanation for this increasing trend is the incorrect use of antibiotics to treat viral infections, incorrect diseases identifying, incorrect doses of antibiotics, inappropriate treatment duration (less or more than recommended time), arbitrary use of antibiotics, and prescription of antibiotics by unaware persons, inappropriate formulation and low quality of some of antibiotics.[6]

In our study 100% of the samples were susceptible to Colistin which is similar to the studies done by Yadegarinia et al[11], Ramadevi V et al[10] and Kaur et al.[4] The high resistance pattern seen in our isolates may be related to selective pressure of extensive usage of third generation cephalosporins and aminoglycosides.

CONCLUSION

Acinetobacter are the “superbugs” of the modern hospital environment causing significant proportion of infections in specific patient populations, especially in critically-ill patients in the ICU. The ability of *Acinetobacter* strains to adhere to surfaces is an important mechanism in the pathogenicity. It frequently causes infections associated with medical devices, e.g., vascular catheters, cerebrospinal fluid shunts or foley catheters.

Biofilm formation is a well-known pathogenic mechanism in such infections. Biofilms have clinical and therapeutic implications, because biofilms preserve bacteria from the action of host’s defensive mechanisms and antimicrobial activity against bacteria in biofilms might be substantially diminished.

The emerging resistant strains of *Acinetobacter* infections have led to fewer treatment options. Due to these limited therapeutic options, prevention and infection control measures are essential, including not only traditional measures but also antibiotic control strategies in the ICU.

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