Prevalence and Antibiogram of *Acinetobacter* spp. Isolated from Various Clinical Samples in a Tertiary Care Hospital, Bathinda

Amandeep Kaur¹, Amarjit Kaur Gill², Satnam Singh³*, Narinder Kaur⁴*, Anchal Mahajan⁵*, Vivek Mittal⁶***

¹Assistant Professor & PhD Student, ²Professor and Head, ³Assistant Professor, ⁴Associate Professor, ⁵Department of Microbiology, Adesh Institute of Medical Sciences and Research, Bathinda.  
⁶Dept of Anaesthesiology and Intensive Care, Adesh Institute of Medical Sciences and Research, Bathinda.

Corresponding Author: Amandeep Kaur

Received: 02/05/2016  Revised: 18/05/2016  Accepted: 20/05/2016

ABSTRACT

Introduction: *Acinetobacter*, once considered as an opportunistic pathogen has recently emerged as an important nosocomial pathogen. An increase in antibiotic resistance among isolates of the organism during recent years has made these infections difficult to treat.

Material & methods: The study was conducted to determine prevalence and antibiotic susceptibility pattern of *Acinetobacterspp* isolated from various clinical samples collected from patients admitted in Intensive care unit and various wards of the hospital over a period of one year (July 2015 to June 2015).

Results: Out of 950 clinical samples, 460 (48.4%) yielded significant growth and out of these positive cultures; 47 (10.2%) *Acinetobacterspp* were isolated. Majority of isolates (68.1%) were obtained from Intensive Care Unit. Maximum sensitivity of *Acinetobacter* spp was seen towards polymyxin B (97.8%), colistin (95.8%) followed by imipenem (57.4%) and meropenem (44.6%). Thirty six (76.6%) isolates were found to be multidrug resistant.

Conclusion: To avoid resistance, antibiotics should be used judiciously and empirical therapy should be determined for each hospital according to the resistance rates of the hospital.

Key words: *Acinetobacterspp*, antimicrobial resistance, Intensive care unit.

INTRODUCTION

Members of genus *Acinetobacter* are ubiquitous, free-living and saprophytic bacilli that can be obtained easily from soil, water, food and sewage. *Acinetobacter* has undergone significant taxonomic modification over last 30 yrs. It’s most important representative is *Acinetobacter baumannii* and other species such as - *Acinetobacter lwoffii*, *Acinetobacter haemolyticus* and *Acinetobacter johnsonii* are rarely isolated from patients. *Acinetobacter*, once considered as opportunistic pathogen has recently emerged as an important nosocomial pathogen world over, mostly involving patients with impaired host defense. [2] The increased risk of infection is associated with the severity of patient’s illness, length of exposure to invasive devices and procedures, increased risk of patient contact with health care personnel and length of stay in ICU. [3] Human infections caused by *Acinetobacterspp* include pneumonia, which is most often related to endotracheal tubes or tracheostomies, endocarditis, iatrogenic meningitis, skin and wound infections, peritonitis in patients receiving peritoneal...
dialysis, UTI and bacteremia. In addition to infection among hospitalised patients, community acquired Acinetobacter infection is increasingly reported. An increase in antibiotic resistance among isolates of the organism during recent years has made these infections difficult to treat. Resistance mechanisms that are expressed frequently in nosocomial strains of Acinetobacter include: β-lactamases which are either chromosomally encoded or borne on plasmids or transposons, alteration in cell wall channels (porins) and efflux pumps. Because of frequent resistance to amino glycosides, fluoroquinolones, ureidopenicillins and third generation cephalosporins, carbapenems have been the drug of choice for treating Acinetobacter infections. However, there has been alarming increase in reports of carbapenem resistant Acinetobacterspp. Over the last decade, carbapenem resistance in Acinetobacter is attributed to various causes such as reduced expression of outer membrane proteins (29kDa, 33-36kDa) and carbapenamases β-lactamases. A. baumannii is known to produce following metallo β-lactamases (MBL’s)-IMP-1, 2, 4, 5 and VIM-1 and 2.

The most active agents in vitro against multidrug resistant A. baumannii are polymyxins-Polymyxin B and Polymyxin E (colistin) and tigecycline. Clinicians abandoned polymyxins in 1960’s and 1970’s due nephrotoxicity and neurotoxicity, The emergence of multidrug resistant(MDR) gram negative bacilli has brought polymyxins back into use in lower doses and different drug formulations. There is a significant difference in behaviour and spread of MDR Acinetobacterspp recovered from various geographical locations. Since several factors cause resistance in Acinetobacterspp, treatment of infections caused by this organism should be based upon susceptibility tests. Therefore, having information regarding prevalence and pattern of bacterial resistance to various antibiotics is important. Thus the objective of the study was to determine antibiotic sensitivity pattern of Acinetobacterspp isolated from various clinical samples collected from patients admitted in ICU and various wards of hospital of Adesh Institute of Medical Sciences and Research (AIMSR), Bathinda. The study was conducted after due approval was obtained from Institutional Ethical Committee and Research Degree Committee.

**MATERIALS AND METHODS**

The present study was conducted in Department of Microbiology, Adesh Institute of Medical Sciences and Research, Bathinda and included Acinetobacterspp isolated from various clinical samples over a period of one year. (July 2014 to June 2015) A total of 950 clinical samples such as pus, urine, blood, tracheostomy and endotracheal tube tips, tracheal aspirate CSF and other body fluids were collected from patients admitted in ICU and different wards of hospital. The samples were inoculated on Blood Agar and MacConkey Agar plates. All isolates obtained were further processed and identified by routine microbiological and biochemical tests. Genus Acinetobacter was identified by Gram staining as Gram negative coccobacilli, colony morphology, non-motile, oxidase negative, catalase positive, TSI reaction K/K and citrate utilisation test positive. Speciation of Acinetobacter (A. baumannii and A. lwoffii) was done on the basis of glucose oxidation(OF test) and growth at 37 C and 44 C. Antibiotic susceptibility testing was performed by standard Kirby Bauer disc diffusion method for following antimicrobial agents-ceftazidime (30μg), cefepime (30 μg), piperacillin-tazobactam (100μg)/10 μg), Ampicillin-sulbactam (10 μg)/10 μg), Imipenem (10 μg), Meropenem (10 μg),Gentamicin (10 μg), Amikacin (30 μg), Cotrimoxazole (25 μg), Ciprofloxacin (5 μg), Norfloxacin (30 μg) (for urinary isolates), Polymyxin B (300 units) and Colistin (10 μg). The zones of inhibition were measured and interpreted.
according to CLSI guidelines. All dehydrated media and antibiotic discs were procured from Hi Media Labs, Mumbai, India.

**RESULTS**

Out of total 460 culture positive samples, 47 (10.2%) infections were due to *Acinetobacter*. [Table I] There was higher incidence of *Acinetobacter* infection in males (56%) than females (44%). *Acinetobacterspp* was more common in patients with age group of 21-40yrs (28; 59.4%). The mean age group of patients infected with *Acinetobacterspp* was 38 yrs.

A. *baumannii* (39; 87.2%) was the predominant species followed by A. *lwoffii* (6; 12.8%) [Table III]

Maximum *Acinetobacterspp* were isolated from ICU (32; 68.1%) followed by surgery ward (8; 17%), medicine ward (2; 4.25%), gynaecology ward (2; 4.25%), orthopaedic ward (3; 6.4%). Maximum resistance was recorded to ceftazidime (97.8%) and maximum sensitivity of *Acinetobacterspp* was seen towards polymyxin B (97.8%) and colistin (95.8%) followed by imipenem (57.4%) and meropenem (44.6%). Norfloxacin was tested only in urinary isolates and 66.6% isolates were resistant to this antibiotic. [Table IV]

Out of 47 isolates, 36 (76.6%) were MDR (Isolates resistant to at least one agent in three or more antimicrobial categories penicillins, cephalosporins, amino glycosides, fluoroquinolones and carbapenems) [15,16]. *Acinetobacter baumannii* was found to be more resistant than *Acinetobacter lwoffii*, therefore maximum resistance was observed in ICU isolates in comparison to wards where *A. baumannii* was more prevalent.[Table V]
DISCUSSION

In our study, from 460 bacterial isolates, 47 (10.2%) Acinetobacterspp were obtained. Similar prevalence of 14% and 9.6% was reported by Mostofi et al. in Tehran, Iran and Joshi et al. in Pune. [17,18]

Lesser prevalence rates of 3.36% and 3% of total organisms isolated was reported by Gupta et al. in Pune and Dash et al. in Odisha. [19,4] Our prevalence of Acinetobacterspp from total Gram negative bacteria is 15% which is slightly higher than Jaggi et al. (9.4%). [20] In the present study, 32 (68%) isolates were from critical care setting and source was most often respiratory samples which is similar to studies by Rekha et al. (70%) and Nahar et al. (68%) [5,21] This is probably related to increasingly invasive diagnostic procedures usedGreater quantity of broad spectrum antimicrobials used and prolonged duration of stay in hospital [4,5] 32% isolates were obtained from various wards; predominantly surgery ward. This is comparable to studies by Jaggi et al. and Rekha et al. [Table VI]

Table VI: Acinetobacterspp isolated from ICU and IPD compared with other studies

<table>
<thead>
<tr>
<th>Department</th>
<th>Jaggi et al</th>
<th>Rekha et al</th>
<th>Present study</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU</td>
<td>76.8%</td>
<td>76.5%</td>
<td>68.1%</td>
</tr>
<tr>
<td>IPD</td>
<td>23.2%</td>
<td>23.5%</td>
<td>31.9%</td>
</tr>
</tbody>
</table>

According to literature, amongst Acinetobacterspp, commonest species isolated in human clinical specimens is A. baumannii. [1] We also observed that 87.2% isolates were A. baumannii whereas remaining 12.8% isolates were A. Iwofii. This is also in concordance with study done by Parandeekr PK and Peerapur BV, Bijapur, Karnataka, who have reported 86.3% isolates as A. baumannii and 13.7% isolates as A. Iwofii [22]

In the present study, Acinetobacterspp were found to be resistant to most commonly used antibiotics. Acinetobacter isolates were extremely resistant to ceftazidime (97.8%); cefepime (95.8%) and cotrimoxazole (93.6%). Higher level of resistance was also recorded for Ampicillin-sulbactam (82.9%) Piperacillin-tazobactam (85.2%); amikacin and ciprofloxacin (92.6%). This correlates with the studies by JaggiN et al. [20] and Kalidas et al. [23] Resistance towards imipenem and meropenem was recorded to be 42.6% and 55.4% respectively. A study by Dash et al. [4] also reported more resistance towards meropenem (22%) as compared to imipenem (19%). Sinha Mand Srinivasan H reported carbapenem resistance in Acinetobacter isolates as 50% [6] Lower resistance (2.2%-4.2%) was seen in Polymyxin B and Colistin in our study. Various authors have reported resistance rates of Acinetobacter towards colistin between 1.8% to 2.0%. [4] Taneja et al. [24] Nahar et al. [21] and Kalidas et al. [23] recorded 3.5%; 10.5% and 5% resistance of Acinetobacter towards colistin respectively. In a study published by Dash et al. and Shareek et al. all isolates were sensitive to colistin. [4,25] Comparison of percentage resistance of Acinetobacterspp isolated in present study and other studies in India by Jaggi et al. in Gurgaon [20] and Kalidas et al. [23] in Eastern India is shown in Table VII
Table VII: Comparison of resistance of *Acinetobacter* spp with other studies in India

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Present study</th>
<th>Jaggi et al Gurgaon</th>
<th>Kali et al Eastern India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceftazidime</td>
<td>97.8%</td>
<td>92.1%</td>
<td>73.8%</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>95.8%</td>
<td>90.3%</td>
<td>Not tested</td>
</tr>
<tr>
<td>Imipenem</td>
<td>42.6%</td>
<td>89.6%</td>
<td>13.7%</td>
</tr>
<tr>
<td>Meropenem</td>
<td>55.4%</td>
<td>89.6%</td>
<td>Not tested</td>
</tr>
<tr>
<td>Piperacillin+ Tazobactam</td>
<td>85.2%</td>
<td>89.7%</td>
<td>62.3%</td>
</tr>
<tr>
<td>Cotrimoxazole</td>
<td>93.6%</td>
<td>Not tested</td>
<td>93.5%</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>92.6%</td>
<td>91.6%</td>
<td>80.4%</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>82.9%</td>
<td>85.8%</td>
<td>75.5%</td>
</tr>
<tr>
<td>Amikacin</td>
<td>87.3%</td>
<td>90.3%</td>
<td>37.8%</td>
</tr>
<tr>
<td>Polymyxin B</td>
<td>2.2%</td>
<td>2.0%</td>
<td>Not tested</td>
</tr>
<tr>
<td>Colistin</td>
<td>4.2%</td>
<td>2.9%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Out of total isolates 36 (76.6%) were multidrug resistant (MDR) in our study. The other studies conducted by Dash et al. in Odisha and Rekha et al in Kolar, Karnataka reported MDR isolates to be 55% and 74% respectively. [4,5] Bhattacharya et al., [26] Gupta et al. [19] and Mostofi et al. [17] reported MDR isolates to be 29%; 40% and 54% respectively.

In this study, 95% isolates obtained from intubated patients were MDR. Emine et al from Turkey reported that all isolates obtained from intubated patients were MDR. [27]

*Acinetobacter* appears to have a propensity to develop antibiotic resistance extremely rapidly, perhaps as a consequence of it’s long term evolutionary exposure to antibiotic producing organisms in soil environment. The emergence of antibiotic resistant strains in ICU is because of higher of use of antimicrobial agents per patient and per surface area. [19] Susceptibilities of *Acinetobacter* against antimicrobials are considerably different among countries, centers and even among different wards of the same hospital. Therefore, such types of local surveillance studies are around important in deciding the most adequate therapy for *Acinetobacter* infections. [21]

CONCLUSION

*Acinetobacter* is nowadays common threat in hospital acquired infections especially in critically ill patients admitted to ICU. It is a great challenge for the physicians to treat MDR *Acinetobacterspp. Acinetobacterspp* in our study were found to be resistant to most commonly used antibiotics. Emergence of carbapenem resistance is worrisome. Lower resistance was only in Polymyxin B and colistin. However, colistin resistant *Acinetobacterspp* are emerging slowly. Rational use of antibiotics is necessary to prevent microbial resistance catastrophe. Resistant antibiotics after sensitivity report should be discontinued and in place sensitive drug should be chosen. Though the organism has developed multidrug resistance, it has largely remained susceptible to disinfectants and antiseptics. Thus, the prevention involves aseptic care of vascular catheters and endotracheal tubes, proper disinfection of surfaces with which the patient comes in contact and through hand hygiene of health care workers. To avoid resistance, antibiotics should be used judiciously and empirical therapy should be determined for each hospital according to the resistance rates of the hospital.

REFERENCES

3. Fridkin SK. Increasing prevalence of antimicrobial resistance in intensive care units. JCrit Care Med 2001;29:64-68
4. Dash M, Padhi S, Patnaik S, Mohanty I, Misra P. Frequency, risk factors and


How to cite this article: Kaur A, Gill AK, Singh S et al. Prevalence and antibiogram of *acinetobacter* spp. isolated from various clinical samples in a tertiary care hospital, Bathinda. *Int J Health Sci Res.* 2016; 6(6):83-89.

************