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# "Evaluation on Acinetobacter Species Frequency and Their Sensitivity Pattern in a Tertiary Care Hospital: A Hospital Based Study"

Microbiology

**KEYWORDS:** Acinetobacter species, antibiotics & multidrug resistance.

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## ABSTRACT

Acinetobacter species has been increasingly reported as the cause of nosocomial infections and possess a serious threat to the health care system because of its multi-drug resistance. My aim was to determine the Frequency, and antibiotic resistance pattern of Acinetobacter species from various clinical samples. A total of 850 patients clinical samples were included in present study, out of which 40(4.7%) showed growth of Acinetobacter species. Acinetobacter species were isolated highest from blood 20(50%), followed by pus 1(27.5%), CSF 4(10%), urine 2(5%), sputum 2(5%), plural fluid 1(2.5%) and tracheal aspirate 0 (0%). The study will help to implement better infection control strategies and improve the knowledge of antibiotic resistance patterns of Acinetobacter species in our region.

**Introduction:**

Acinetobacter spp. are Gram Negative, strictly aerobic, non-fastidious, non-fermenting encapsulated coccobacilli causing mostly nosocomial infections. According to most recent scientific literature, Acinetobacter spp. are the second most common non-fermenting Gram negative pathogen isolated from clinical samples after Pseudomonas aeruginosa.[1] 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.[2] They are usually considered to be opportunistic pathogens, and of recent have been reported to cause a number of outbreaks of nosocomial infections in hospitalized patients like septicaemia, pneumonia, wound sepsis, endocarditis, meningitis and urinary tract infection.[3,4] Although acknowledged to be an opportunist in hospitalised patients, community acquired infections are reported and they can cause infections in virtually every organ system.[5] 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.[6] My aim was to determine the Frequency, and antibiotic resistance pattern of Acinetobacter species from various clinical samples.

**Material and Methods:**

The present study was conducted in the departments of Department of Microbiology, Heritage Institute of medical Science and hospital, Varanasi during the period from October, 2015 to February 2016. Total 850 clinical samples received in our laboratory from patients treated at HIMS, Varanasi were included in this study. All the clinical samples were inoculated on MacConkey agar and blood agar. Inoculated plates were incubated at 37°C for 24 - 48 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.[7,8] 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.[9] 'Multidrug resistant (MDR) Acinetobacter spp.' is defined as isolate that is resistant to at least three classes of antimicrobial agents - all Penicillins and Cephalosporins (including inhibitor combinations), Fluoroquinolones and Aminoglycosides. 'Extensive drug resistant (XDR) Acinetobacter sp.' shall be the MDR isolate that is also resistant to Carbapenems.[10]

**Results and Discussion:**

A total of 850 patients clinical samples were included in present study, out of which 40(4.7%) showed growth of Acinetobacter species. Table-1 shows the Acinetobacter species were isolated highest from blood 20(50%), followed by pus 1(27.5%), CSF 4(10%), urine 2(5%), sputum 2(5%), plural fluid 1(2.5%) and tracheal aspirate 0 (0%). Number of Acinetobacter species were more from paediatric ward followed by surgical ward. Fig.-1 shows the most of the isolates from paediatric ward was from preterm babies. Acinetobacter infection was found nearly equal in male 19(47.5%) and female 21(52.5%). Table-2 shows the Antibiotic Sensitivity Testing, highest resistance was observed to Cefepime (85.5%) and lowest to Meropenem (39.6%).

**Table 1: Frequency of Acinetobacter in various clinical samples:**

| Clinical Sample | Isolation rate (n=40) |
|---|---|
| Blood | 20(50%) |
| Pus | 11(27.5%) |
| CSF | 4(10%) |
| Urine | 2(5%) |
| Sputum | 2(5%) |
| Pleural fluid | 1(2.5%) |
| Tracheal aspirate | 0 (0%) |

**Fig.-1 shows the ward wise distribution of Acinetobacter Species:**

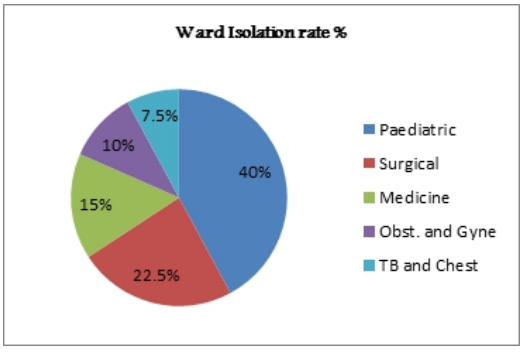


**Table 2. Resistance pattern of Acinetobacter Species to different antibiotics:**

| Drug | Resistance pattern |
|---|---|
| Ampicillin Sulbactam(A/S)10/10ug/disc | 62.5% |
| Ceftazidime(CAZ) 30ug/disc | 77.7% |
| Levofloxacin(LE)5ug/disc | 66.5% |
| Meropenem(MRP)10ug/disc | 39.6% |
| Gentamicin(GEN)10ug/disc | 60.5% |
| Amikacin(AK)30ug/disc | 50.09% |
| Piperacillin Tazobactam(PIT)100/10 ug/disc | 56.3% |
| Piperacillin(PI)100ug/disc | 62.5% |
| Cefepime(CEP)30ug/disc | 85.5% |
| Cefotaxime(CTX)30ug/disc | 73.0% |
| Tetracycline(TE)30ug/disc | 64.6% |
| Cotrimoxazol(COT)1.25/23.75ug/disc | 60.5% |

Acinetobacter spp. are the second most common Non-fermenting bacteria after Pseudomonas species that are isolated from human specimens, especially among nosocomial infections.[11] In recent years, this species has emerged as the causative agent of important

nosocomial infections in the ICUs, 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.[12] Isolation rate of Acinetobacter species in present study was 4.7%, which is quite comparable with Lone et al (4.8%) [13] and Mindolli PB et al (4.25%)[14]. Higher prevalence rates of 14% and 9.6% among hospital isolates were observed by Mostofi et al. (Iran) and Joshi et al. (India), respectively.[15,16] Acinetobacter spp. can colonize skin, wounds, respiratory and gastrointestinal tracts.[17] It is a pathogen of tropical and humid environment, but some species can survive environmental desiccation for weeks, a characteristic that promotes transmission through fomite contamination in hospitals.[18]

In present study Acinetobacter species were isolated highest from blood 20(50%), followed by pus 1(27.5%), CSF 4(10%), urine 2(5%), sputum 2(5%), plural fluid 1(2.5%) and tracheal aspirate 0 (0%). Highest isolation was from blood, most of them were from preterm babies, where due to lower immunity, more chances of bacterial infection. In a study conducted by A. Asensio et al in 2008 Acinetobacter was isolated from respiratory tract (42.2%), surgical wound (15.1%), urinary tract (12.9%), skin (11.7%).[19] In my study, 18.3% isolates were MDR & 18.3% isolates were XDR. The other studies conducted by Bhattacharyya et al. in West Bengal[20] and Mostofi et al. in Tehran[15] reported the MDR isolates to be 29% and 54%, respectively. 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.[21,22] Most of the patients who were admitted in our hospital had previously attended primary and secondary care hospitals and usually received combination of -lactam antibiotics like third and fourth generation Cephalosporins along with Aminoglycosides or Fluoroquinolones. Majority of the isolates in our study were resistant to commonly used antibiotics such as Ceftazidime(77.7%), Cefepime(85.5%), Gentamicin(60.5%), Amikacin(50.09%), Levofloxacin(66.5%), and Ampicillin/sulbactam(62.5%). This suggest that MDR isolates are increasing, probably due to indiscriminate use of these antibiotics in healthcare settings. It is reemphasized that broad spectrum antibiotics should be used with caution. We found that, Meropenem(39.6%) and Piperacillin/Tazobactam(56.3%) were also showing resistance against this pathogen suggesting increased XDR isolates. Mostofi et al. in their study had reported resistant drug Meropenem (31%) and Piperacillin/Tazobactam (40%).[15] Differences observed between the different studies, could be due to the methods, the resistance patterns and and the antimicrobial patterns used.[23] 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[24] 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.[25] Carbapenems have been the drug of choice for treating Acinetobacter infections, but unfortunately, Carbapenem resistant Acinetobacter is becoming common worldwide.[26,27]

**Conclusion**

In conclusion, the Acinetobacter spp. accounted for 4.7% of total culture. Notably, our findings show that Resistance observed to Meropenem was (39.6%), Piperacillin -Tazobactam (56.3%), Amikacin (50.09%), Ceftazidime (77.7%), Gentamicin (60.5%)%, Levoflaxacin (66.5%) which suggested that Acinetobacter isolated from hospital exhibit resistance to multiple antimicrobial drugs. 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.

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 antibiotic, especially with relation to hospital environment and nosocomial infections.

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