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PREVALENCE AND RESISTANCE PATTERN OF ACINETOBACTER SPECIES IN HOSPITALIZED PATIENTS IN A TERTIARY CARE CENTRE

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ABSTRACT: BACKGROUND: *Acinetobacter* species are one of the most frequent nosocomial pathogen causing bacteremia, urinary tract infection, secondary meningitis, skin and soft tissue infections and in particular nosocomial pneumonia with high mortality rate. The infections due to these are often difficult to treat due to their high antibiotic resistance. **AIMS**: To Study the prevalence and resistance pattern of *Acinetobacter* species in hospitalized patients of Era's Lucknow Medical College and Hospital (ELMCH), Lucknow. **MATERIALS AND METHODS:** Total number of 1850 samples were taken from patients admitted in wards of different Departments of ELMCH from Sep 2012 to Sep 2013. Identification of isolates was done by colony characteristics and biochemical reactions. The resistance patterns of these isolates were studied using various antibiotics by Kirby-Bauer disc diffusion test as per CLSI (Clinical Laboratory Standard Institute) guidelines. **RESULTS AND CONCLUSION:** 46 isolates were identified as *Acinetobacter* species. High level of resistance was observed for most of the antibiotics tested. More than 80% of isolates were resistant to amikacin, gentamycin, ceftriaxone, ciprofloxacin and tetracycline. 30.43% of isolates were resistant to cefoperazone/sulbactum and resistance to imipenem and colistin was 23.91% and 19.56% respectively. *Acinetobacter* species has become a worldwide concern as a cause of serious nosocomial infections. The emergence of increasingly resistant strains causing such infections has become a public health problem. Their early detection is necessary for timely implementation of strict infection control practices and judicious treatment with susceptible antimicrobials.

KEYWORDS: *Acinetobacter*, prevalence, resistance pattern.

INTRODUCTION: *Acinetobacter baumannii* is an opportunistic nosocomial pathogen and one of the six most important multidrug-resistant microorganisms in hospitals worldwide. This human pathogen is responsible for a vast array of infections, of which ventilator-associated pneumonia and bloodstream infections are the most common, and mortality rates can reach 35%.[1]

Acinetobacter species are ubiquitous aerobic gram negative coccobacilli, emerging as an inevitable potential pathogen to establish its survival in the host environment and among debilitated patients by producing various extracellular virulence factors.[2] In recent years, *Acinetobacter* baumanni has become a worldwide concern as a cause of serious nosocomial infections. The majority of clinical isolates involved in the hospital outbreaks belongs to this species.[3]

There is increasing incidence of *Acinetobacter* infections in hospital intensive care units. It is often acquired by cross infection, but can be introduced initially by patients admitted from other hospitals[4]. In a study in the Department of Clinical Microbiology, King Edward Memorial Hospital, India, total 510 of 5391 (9.6%) of isolates were *Acinetobacter*, responsible for 71.2% (363 of 510)

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monomicrobial and 28.8% (147 of 510) polymicrobial infections.[4] The prevalence of these infections currently ranges from 2% to 10% of all gram negative bacterial infections in Europe[5] and about 2.5% in United States,[6] causing both sporadic as well as epidemic infections.

Acinetobacter is a group of organism that is ubiquitous, widely distributed in nature eg. soil, water, sewage, food and animals[7]. It is the only group of Gram negative bacteria that may be natural resident of skin, with 42.5% in healthy individuals and as high as 75% in hospitalized patients.[7]

Acinetobacter baumannii is the most common species of *Acinetobacter* causing infections in humans. *Acinetobacter* is commonly found in hospital environment and it can be transmitted to the patients via hospital personnel and contaminated instruments or devices.

Clinical isolates of *Acinetobacter* species initially retained at least partial susceptibility against the 3rd and 4th generations viz cephalosporins, fluoroquinolones, semisynthetic aminoglycosides, carbapenems and 100% susceptibility to imipenem. However, during late 1980 and 1990s, worldwide emergence and spread of *Acinetobacter* strains resistant to imipenem further limited therapeutic alternatives.[8,9]

Rational use of antimicrobial agents is critically important to prevent *Acinetobacter* infections as well as to avoid poor outcomes.[10]

Therefore early detection of such organisms is necessary for timely implementation of strict infection control practices and treatment with alternative antimicrobials.

MATERIALS AND METHODS: This cross sectional study included 1850 samples taken from patients admitted in various department of the hospital including all surgical wards, orthopedic ward, medicine wards, obstetrics and gynecology ward, pediatric ward and intensive care units of Era's Lucknow Medical College & Hospital (ELMCH), Lucknow, Uttar Pradesh, India during September 2012- September 2013. The specimens included respiratory secretions, swab (wound, conjuctive, skin), pus, urine, blood culture, bile culture, cerebro-spinal fluids, body fluids, drain fluids, endotracheal aspirate (ETA) and catheter tips.

The specimens were collected under aseptic conditions were inoculated on MacConkey agar & Blood agar. The plates were incubated aerobically at 37^0C for 24-48 hrs. Presumptive identification was done on the basis of colony characteristics, Gram staining, catalase test, oxidase test, nitrate reduction test, oxidative/fermentative test.

All these species of *Acinetobacter* were then screened for antibiotic sensitivity by Kirby-Bauer disk-diffusion method on Muller Hinton Agar according to CLSI (Clinical Laboratory Standard Institute) guidelines (2013).

Clinical details of all patients whose cultures were positive for *Acinetobacter* species was collected as given below:
1. Patients admitted in the medical and surgical wards and ICU was enrolled in this study.
2. Information regarding patient's age, sex and clinical diagnosis of disease was noted.
3. Clinical details at the time of admission of the patient was noted.
4. History of antibiotic intake was noted.
5. Informed consent was taken from each patient.

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RESULTS:

CLINICAL SAMPLES	No. of ACINETOBACTER	PERCENTAGE
1. Blood	11	23.91%
2. Pus	17	36.95%
3. Urine	7	15.21%
4. Sputum	4	8.69%
5. CSF	1	2.17%
6. Ascitic fluid	1	2.17%
7. ET tube	3	6.52%
8. BAL	2	4.34%
Total	**46**	
Table 1: Number of *Acinetobacter* species isolates from different clinical specimens (n=46)		

Table 1 Shows that Out of 1850 samples collected 1090 (58.92%) came to be culture positive. Of the 1090 culture positive specimens 46 (4.22%) grew *Acinetobacter* species. Maximum number were from pus sample 17 (36.95%) followed by blood 11 (23.91%) and urine 7 (15.21%).

WARDS	No. of ACINETOBACTER	PERCENTAGE
1. Surgery	9	19.56%
2. Orthopedics	4	8.69%
3. Gynaecology	5	10.87%
4. Paediatric	10	21.73%
5. Medicine	6	13.04%
6. ICU	12	26.09%
Total	**46**	
Table 2: Distribution of *Acinetobacter* in various wards of ELMCH (n=46)		

Table 2 Shows *Acinetobacter* isolates according to wards and ICU from where they were isolated. Highest percentage of *Acinetobacter* were from ICU (26.09%) followed by pediatric ward (21.73%) followed by surgery ward (19.56%).

AGE GROUP	No. of ACINETOBACTER	PERCENTAGE
< 1 year	10	21.73%
1-15 years	16	34.78%
16-40 years	8	17.39%
>40 years	12	26.08%
Table 3: Age wise distribution of *Acinetobacter* infected patients (n=46)		

Table 3 Shows age wise distribution of *Acinetobacter* species, having maximum infection in the age group of 1-15 years.

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SEX	No. of PATIENTS	PERCENTAGE
Male	35	76.08%
Female	11	23.91%
Table 4: Sex distribution of all *Acinetobacter* infected patients (n=46)		

Table 4 shows that infection with *Acinetobacter* species is more in males (76.08%) than in females (23.91%).

ANTIBIOTICS	SENSITIVE	INTERMEDIATE	RESISTANT
Amikacin	4 (8.69%)	3 (6.52%)	39 (84.78%)
Gentamycin	4 (8.69%)	2 (4.34%)	40 (86.95%)
Ceftriaxone	3 (6.52%)	2 (4.34%)	41 (89.13%)
Cefotaxime	5 (10.86%)	1 (2.17%)	41 (89.13%)
Ciprofloxacin	6 (13.04%)	1 (2.17%)	39 (86.43%)
Tetracycline	6 (13.04%)	2 (4.34%)	38 (82.60%)
Cefoperazone/Sulbactum	31 (67.39%)	1 (2.17%)	14 (30.43%)
Imipenem	33 (80.43%)	2 (4.34%)	11 (23.91%)
Cotrimoxazole	4 (8.69%)	2 (4.34%)	40 (86.95%)
Colistin	37 (80.43%)	0	9 (19.56%)
Table 5: Antibiotic sensitivity pattern of 46 *Acinetobacter* species isolates by Disk Diffusion Method			

Figures within parenthesis indicate percentage.

Table 5 Shows the antibiotic susceptibility pattern of *Acinetobacter* strains (n=46) for different antibiotics. >80% of isolates were resistant to amikacin, gentamycin, ceftriaxone, ciprofloxacin and tetracycline. 30.43% of isolates were resistant to cefoperazone/sulbactum and resistant to impenem and colistin was 23.91% and 19.56% respectively.

DISCUSSION: Until 1970, *Acinetobacter* spp. were considered rare cause of nosocomial infections but in recent years, the incidence of nosocomial infections has reached a point of concern and possess a threat to hospitalized populations around the world.[11, 12, 13] *Acinetobacter* species has emerged as an important nosocomial pathogen that is often multidrug resistant and associated with life-threatening infections.[14]

Multidrug resistant (MDR) *Acinetobacter* is of great concern because of its intrinsic and acquired resistance mechanisms, limiting the treatment options.[15] Carbapenems are the drug of choice for *Acinetobacter* infections and are often used as last resort.[16]

In the present study, we have demonstrated the prevalence of *Acinetobacter* species and its antibiotic susceptibility pattern in a tertiary care setup. In this study of 1090 culture positive samples from indoor patients, *Acinetobacter* was isolated in 46 (4.22%) samples while in the study of Sakata et al [17] the incidence of *Acinetobacter* was 15.52%. In India study by Oberoi et al[18] and Sinha et al[19] in tertiary care hospital incidence of *Acinetobacter* was 8.4% and 4.8% respectively indicating importance as nosocomial pathogen.

In the present study maximum number of *Acinetobacter* isolates were from pus 36.95% (17/46) followed by blood 23.91% (11) and urine 15.21% (7). Almost similar result was observed in

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a study by Mishra et al.[20] While in a study by Sinha et al[19] and Padersen et al[21] maximum number of *Acinetobacter* were isolated from urine.

In the present study highest number of isolates were from ICU 12/46 (26.09%). From this ward, in one patient, *Acinetobacter* was grown in repeated cultures from different samples of same patient. *Acinetobacter baumanni*, a clinically important species, has a tendency towards cross-transmission, particularly in ICUs where numerous outbreaks are encountered.[14]

In this study there was higher incidence of *Acinetobacter* infection among males 76.08% (35/46) which is in tandem with other studies in India.[19, 22] It is widely recognized that in many Asian communities, lower incidence in women is statistical artifact related to lower reporting to hospital and care seeking for women from traditional practitioners who do not report to public surveillance system.

Susceptibility of *Acinetobacter* against various antimicrobials being considerably different among countries, centres and even different wards of the same hospital, therefore, warranted need for local surveillance studies in deciding the most appropriate therapy.[22]

Resistance pattern of *Acinetobacter* revealed that more than 80% of isolates were resistant to third generation cephalosporins, aminoglycosides and quinolones, indicating high prevalence of multidrug resistance. Thirty percent of these isolates were resistant to cefoperazone/sulbactum. However, another study[22, 23] showed 46% resistance to cefoperazone/sulbactum.

In this study 80% of *Acinetobacter* were found to be sensitive to colistin but other study by Lopez-Hernandez etal[24] found 100% susceptibility of *Acinetobacter* to colistin. Colistin is relatively more sensitive than carbapenems for MDR *Acinetobacter* as it is newly used drug for MDR *Acinetobacter* in our setting.

CONCLUSION: After analyzing the findings of the present study it was concluded that *Acinetobacter* isolates constitute only 4.22% of all the culture positive specimens. Maximum percentage of *Acinetobacter* were from pus samples 17/46 followed by blood. Urine in spite of maximum in sample input, the isolation of *Acinetobacter* is quite low. Maximum number of *Acinetobacter* isolates were from ICU (26.09%) followed by pediatric ward (21.73%). It can be concluded from the study that *Acinetobacter* occurs as colonizer and contaminant in clinical samples of hospitalized patients.

Amikacin and ceftriaxone were the most common used antibiotics in patients. *Acinetobacter* infection were more common in male patients. No significant difference is seen in distribution of *Acinetobacter* isolates in different age groups. *Acinetobacter* isolates from clinical samples were showing high level of resistance to all groups of antibiotics viz 84.78% to amikacin, 86.95% to gentamycin, 89.13% to ceftriaxone and 86.43% to ciprofloxacin. Most *Acinetobacter* isolates were found to be MDR strain i.e. resistant to more than or equal to 3 antibiotics.

It can be concluded from this study that overall incidence of *Acinetobacter* as nosocomial pathogen in our setup is low but predominantly multidrug resistant. The increasing trends towards resistance towards antibiotic resistance reflects the extensive usage of antibiotics in hospitals which in turn exerts selective pressure on *Acinetobacter* in hospital environment.

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