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MULTIDRUG-RESISTANT ACINETOBACTER BAUMANNII :A RAPIDLY EMERGING PATHOGEN IN THE HEALTH CARE SETTING.

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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. In addition, carbapenem-resistant A. baumanii is one of the critical-priority pathogens on the World Health Organization priority list of antibiotic-resistant bacteria for effective drug development.1,.2 **AIM:** To Study the prevalence and resistance pattern of Acinetobacter species in hospitalized patients of Dr.Rajendra Prasad Medical college Kangra at Tanda. Himachal Pradesh. **Method:** A retrospective analysis of drug susceptibitity pattern of samples of all patients admitted in our institute, between June 2018 to July 2019, which,yielded A. baumannii was performed. A.baumannii was isolated from 122/6900 (1.8%) of clinical specimens About 30(24.6%) of the A.baumannii were from tracheal aspirates, Urine 27(22.7%), 20(16.4%) in sputum, 5(4%) Sterile aspirates and none detected in CSF. High level of antibiotic resistance was observed for tracheal isolates. More than 70% of isolates were resistant to cefotaxime, ceftriaxone, cefepime, ciprofloxacin, gentamycin and cotrimoxazole. 66%,resistant to Ampicillin sulbactum,, 58% Levofloxacin ,54.4%. cefoperazone/sulbactum and resistant to impenem,Meropenem and colistin was 33 % 28% and 0% respectively.**Conclusion:**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 :

INTRODUCTION:

Acinetobacter spp. are Gram negative, strictly aerobic, non-fastidious, non-fermenting encapsulated coccobacilli causing mostly hospital acquired infections. Acinetobacter has undergone significant taxonomic modification over the last 30 yrs. It's most important representative is Acinetobacter baumanniiand other species such as-Acinetobacter lwoffii,Acinetobacter haemolyticus and Acinetobacter johnsonii are rarely isolated from patients.2.3

Acinetobacter species are opportunistic pathogens predominantly found in immunocompromised patients. They are widespread in nature and regarded as commensal microbes of human skin and respiratory tract, however, they may cause serious infections, such as endocarditis, urinary tract infections, pneumonia, wound infections, meningitis and septicemia, especially in individuals with impaired host defences . The increased risk of infection is associatedwith 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. Acinetobacter baumannii is one of the ESCAPE organisms, a group of clinically important, predominantly health care-associated organisms that have the potential for substantial antimicrobial resistance 4-.7

For Acinetobacter species the mechanisms of resistance generally fall into 3 categories : antimicrobial-inactivating enzymes, reduced access to bacterial targets, or mutations that change targets or cellular functions. Wilks et al. reported a recent outbreak of multidrug-resistant Acinetobacter infection, with environmental contamination found on curtains, laryngoscope blades, patient lifting equipment, door handles, mops, and keyboards thus emphasizing the need for special attention to disinfection of shared items and extra caution with respiratory care and wound care procedures8.10

Multidrug-resistant Acinetobacter infections have an extremely high crude mortality rate and occur most frequently in severely ill patients. 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 Carbapenems and colistin are the agents of choice for the most drug-resistant infections. The role of other agents and combination therapy remains unclear.10

Rational use of antimicrobial agents is critically important to prevent Acinetobacter infections as well as to avoid poor outcomes.Therefore early detection of such organisms is necessary for timely implementation of strict infection control practices and treatment with alternative antimicrobials.11

METHODS This study was conducted in the Department of Microbiology, Dr.Rajendra Prasad Medical college &Hospital,Kangra at Tanda ,Himachal Pradesh over a period of one year. A total of 6900 clinical samples such as blood tracheal aspirates, urine, catheter tips, sputum,conjunctival swabs and other body fluids(excluding blood) were collected from patients of all age groups admitted in critical care units and different wards of hospital from June 2018 to July 2019. The

samples received in the laboratory were inoculated on 5% Sheep Blood Agar and MacConkey agar and incubated overnight aerobically at both 37◦C. All isolates obtained were further processed and identified by routine microbiological and biochemical tests. Genus Acinetobacter was identified by characteristic colonies (Non Lactose-fermenting, glistening, small mucoid colonies), Gram staining pattern as Gram negative coccobacilli, Motility as non-motile, and standard biochemical reactions (Catalase, oxidase, oxidation-fermentation test, indole production, citrate utilization, urease activity, reaction in triple sugar iron medium), speciation of Acinetobacter (A. baumannii) was done on the basis of glucose oxidation (OF test) and citrate utilization test.12,13

After identification by phenotypic methods, antibiotic susceptibility was performed for each isolate by the Kirby-Bauer disc diffusion method on Mueller-Hinton agar using 0.5 MacFarland turbidity standard and comparing zone sizes with control strain Pseudomonas aeruginosa ATCC 27853.9 The antimicrobial agents used were-ceftazidime (30µg), cefepime (30µg)), ceftriaxone(30µg)), piperacillin -tazobactam (100µg)/10µg),cefoperazone-sulbactum (30µg/10µg),ampicillinsulbactum,(100µg)/10µg),imipenem(10µg)), meropenem(10µg), amikacin(30µg), gentamycin (10µg), cotrimoxazole (1.25/23.75µg), ciprofloxacin (5µg), Levofloxacin (5µg), and tetracycline (for urinary isolates), and colistin (10µg). Antibiotic susceptibility results were interpreted by measuring the zone diameters produced and correlating them withthe CLSI standards. 14,15,

RESULTS During the study period, out of 6900 specimens received from hospital of which 122(1.8%) were culture positive for Acinetobacter spp. Among all the 122isolates, 116(95%)are Acinetobacter baumanni and 5 (4%) are Acinetobacter lwoffii.and 1(0.8%)Acinetobacter haemolyticus 1 Table 1 shows the distribution of the isolates in various clinical samples. Maximum isolates were isolated from tracheal aspirates 30(24.6%), blood 24(19.7%), Urine 27(22.3%)Sputum 20(16.4%)pus swabs12(9.8%),BAL4(3.4%) sterile aspirates5(4.1%)

Acinetobacter infection mainly occurred in population aging between 41-60 yrs.73 were malesand gender ratio was 1.2:1 (Male:Female) thus, a slight male preponderance was observed in our study.

Table 1: Number of Acinetobacter species isolates from different clinical specimens

Clinical Samples	No. Of Acinetobacter =122(%)
1.Blood	24(19.7%),
1.Urine	27(22.3%)
1. Sputum	20(16.4%)
1. ET tube	30(24.6%)
Pus swabs	12(9.8%),
1. Sterile fluid aspirates	5(4.1%)
1. BAL	4(3.4%)

ET tube=endotracheal tube,, BAL=Broncho alveolar lavage

Table 2Shows the antibiotic susceptibility pattern of Acinetobacter strains for different antibiotics. More than 70% of isolates were resistant to cefotaxime, ceftriaxone, cefepime, ciprofloxacin, gentamycin and cotrimoxazole. 66%,65%resistant to Ampicillin sulbactum, and piperacillin sulbactum 58% Levofloxacin 54.4%. of isolates were resistant to cefoperazone/sulbactum and resistant to impenem,Meropenem and colistin was33 % 28% and 0% respectively.

Table 2Antibiotic sensitivity pattern of Acinetobacter

ANTIBIOTICS	RESISTANT
Cefotaxime	89.3%
Ceftriaxone	84.6%
Ciprofloxacin	86.7 %
Gentamycin	78.9%
Cotrimoxazole	79%
Cefepime	74%
Amikacin	69%
Tetracycline	68.60%
Piperacillin tazobactum	65%
Ampicillin -sulbactum	66%
Levofloxacin	58%
Cefoperazone/Sulbactum	54.4%
Imipenem	33%.
Meropenem	28.7%
Colistin	0%

DISCUSSION:

Acinetobacter species has emerged as an important nosocomial pathogen that is often multidrug resistant and associated with life-threatening infections.10

Multidrug resistant (MDR) Acinetobacter is of great concern because of its intrinsic and acquired resistance mechanisms, limiting the treatment options. Carbapenems are the drug of choice for Acinetobacter infections and are often used as last resort.11,12

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 various samples from indoor patients, Acinetobacter was isolated in 122(1.8%) . In India study by Oberoi et al16 and Sinha et al17 , Sana et al 18in tertiary care hospital incidence of Acinetobacter was 8.4% and 4.8%, 4.22% respectively indicating importance as nosocomial pathogen.

In the present study maximum number of Acinetobacter isolates were from endotracheal tube30.(24.6%)from ICUs. Almost similar result was observed in a study by Mishra et al.19Sana et al18 While in a study by Sinha et al17 and Padersen et al20 maximum number of Acinetobacter were isolated from urine. Acinetobacter baumanni, a clinically important species, has a tendency towards cross-transmission, particularly in ICUs where numerous outbreaks are encountered.14

In the present study, Acinetobacter species were found to be resistant to most commonly used antibiotics more than 70% of isolates were resistant to cefotaxime, ceftriaxone, cefepime, ciprofloxacin, gentamycin and cotrimoxazole. 66%,resistant to Ampicillin sulbactum54.4%. of isolates were resistant to cefoperazone/sulbactum. viz which correlates with the studies by Kumari M et al,21Guckan R et al.22 Resistance to levofloxacin 58% is found less in comparison to other fluoroquiniolones in our study and similar finding was also found by Bhattacharya et al 23in their study.18 Resistance towards imipenem and Meropenem was recorded to be33% and 28.7% respectively. A study by Dash et al 24also reported more resistance towards Meropenem (22%) as compared to imipenem (19%).No resistance was seen in Colistin in our study which is similar to the study published byKumari M et al, 21 Dash et al24 and Shareek et al,25 whereas isolates were sensitive to colistin.

Most Acinetobacter isolates were found to be MDR strain i.e. resistant to more than or equal to 3 antibiotic groups. Out of total isolates69 (56. 5%) were multidrug resistant (MDR) in our study. The other studies conducted by Dash et al,24 in Odisha and Rekha et al in Kolar,26 Karnataka reported MDR isolates to be 55% and 74% respectively.4,6 Bhattacharya et al,23Gupta et al, 27and Mostofi et al, 28reported MDR isolates to be 29%; 40% and 54% respectively.18,11,14 In ICUs most, sensitive drug was colistin (100%) followed by meropenem and and cefaperazone sulbactum. Acinetobacter appears to have a propensity to develop antibiotic resistance extremely rapidly, perhaps as a consequence of its 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. 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. Greater emphasis on the prevention of health care-associated transmission of multidrug-resistant Acinetobacter infection are essentialthrough implementation of infection control policies, well-controlled clinical trials of existing regimens and antimicrobial combinations.

CONCLUSION:

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

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