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SPECTRUM OF ANTIMICROBIAL SENSITIVITY TO ACINETOBACTER SPECIES IN SPUTUM IN A TERTIARY MEDICAL CARE CENTRE IN KOLKATA, WEST BENGAL, 7 YEARS EXPERIENCE

Medicine

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ABSTRACT

Aims and objectives: Acinetobacter, gram-negative non-motile bacilli 1st isolated from soil responsible for nosocomial and opportunistic infection in hospital demonstrates multidrug resistance for last 2 decades due to irrelevant use of different broad spectrum antibiotics. This present study tried to demonstrate spectrum of antimicrobial sensitivity of acinetobacter to different antibiotics.

Materials and methods: In this retrospective study sputum was isolated from the 1078 patients suffering from lower respiratory tract infection of K P C Medical College & Hospital, Jadavpur, and Kolkata and sent to bacteriology department for isolation of the organism followed by antimicrobial sensitivity.

Results: Total number of acinetobacter spp. positive patients was 110 (10.20%). These bacteria was more than 90% sensitive to polymixin B and colistin, 56.36% positive to tigicycline and 37.27% to 39.09% to carbapenem, 23.63% to 26.36% to aminoglycosides. Rest of the antibiotics demonstrated high resistance.

Conclusions: Due to increasing resistance of these bacteria to different broad-spectrum antibiotics, one should not use this antibiotic to start with. In that case we have no option other than to use polymixin B or colistin or tigicycline. So it may be a resolution that only after getting proper sensitivity report we can use proper antibiotics, only this can prevent the creeping of resistance to antibiotics.

KEYWORDS

Antimicrobial sensitivity, Acinetobacter Spp. Sputum, Tertiary Medical Centre, Kolkata

Introduction:

In 1911 Acinetobacter was 1st isolated from soil using minimal media enriched by calcium acetate by Dutch Microbiologist Beijerinck and was originally described as Micrococcus calco-aceticus[1]. Genus Acinetobacter, responsible for outbreaks of nosocomial as well as opportunistic infection, like pneumonia, soft tissue and skin infection, urinary tract infection, endocarditis, meningitis bacteremia are living small aerobic gram negative non-motile, oxidase-negative and catalase positive cocco-bacilli[2, 3, 4]. They like moist environment and can be found in soil, water, food, sewage etc[5]. They are usually commensal microbes colonized on the skin and respiratory tract of the health care workers (HCW) as opportunistic pathogens and in debilitated immunocompromized patients they will spread from the HCW and produce outbreaks[6]. There are many risk factors for nosocomial Acinetobacter infection, like, increased duration of hospital stay, Casual broad spectrum antibiotic therapy, recent surgery, parenteral nutrition, improper procedure intravenous or urinary catheterization, endotracheal intubation and mechanical ventilation whereas heavy smoking, chronic alcoholism, diabetes, chronic obstructive or restrictive pulmonary diseases, chronic kidney disease are the risk factors for community acquired infection[7, 8, 9]. In previous outbreaks colonization in oropharynx, respiratory tract and digestive tract are well documented[10, 11].Now-a-days due to unethical, irrelevant, inadvertent use of broad spectrum antibiotics is responsible for development of muti-drug resistant Acinetobacter spp. Since there are various methods of antibiotic resistance and they survive for long time in hospital environment as well as they transmits from patient to patient via human reservoir and inanimate materials they should be treated effectively with combined therapies[12]. But till now different microbiologists of India are very confused with the taxonomic status of this organism hence they fail to recognize the importance of this organism. In 2008 number of deaths due to lower respiratory infections in India were 35.1 per 100000 populations of which 20% was due to infectious diseases. Although most common bacteria is streptococcus pneumoniae but in different studies the percentages varies. Again, sensitivity of Acinetobacter varies in different regions of World.

Objectives:

Here we tried to demonstrate in patients with lower respiratory tract infections the spectrum of antibiotic sensitivities to Acinetobacter spp. in K P C Medical College & Hospital, Kolkata, and West Bengal.

Materials and methods:

This was a retrospective 7 years' study conducted by Medicine and microbiology departments of this Medical College after getting permission from our local Ethical committee. Clinical specimen were collected from 1078 patients suffering from lower respiratory tract infection aseptically and transported to microbiology department with all aseptic precautions without delay. The entire specimen was examined under direct microscopy cultured on 5% sheep-blood agar and MacConkey agar media for overnight incubation at 37°C. Typical colonies were isolated and Gram staining and different biochemical tests, like, Oxidase test, hanging drop test, catalase test, citrate utilization test, glucose oxidation in Krigler Iron Agar media were performed to detect acenetobacter spp. Then antibiotic sensitivity was performed by Kirby-Bauer disk diffusion technique according to guidelines of Clinical Laboratory Standards Institute (CLSI) 2010[13]. Here commercially available sterile antibiotics discs (BD, BBL, and DIFCO) were used. Antibiotics used in the discs were ampicillin, oxacillin, ampicillin, piperacillin-tazobactum, cefoperazone-salbactam, aminoglycosides, cefuroxime, ceftazidime, cefotaxime, cefoxitin, ceftriaxone, cefepime, azithromycin, erythromycin, aztreonam, Imipenem, ertapenem, meropenem, ciprofloxacin, ofloxacilin, levofloxacin, chloramphenicol, tetracycline, tigicycline, clindamycin, vancomycin, teicoplanin, linezolid, polymixin B, colistin and ticaracillin.

Statistical analysis:

In case of male and female affection by Acinetobacter spp p value was measured to show any statistical significance. The data were analyzed by percentage of sensitivity and then comparisons were done.

Results:

Male patients were 69 and females were 41. p-value of 0.00

Total number of patients 1078 out of which Acinetobacter positive sputum are 110 (10.20%)

Table 1: Antimicrobial sensitivity of Acinetobacter spp. (n=110):

Antibiotics	Acinetobacter Spp.	Percentage
Amoxicillin	5	4.54
Oxacillin	0	0
Ampicillin	0	0
Piperacillin-Tazobactum	23	20.90
Cefoperazone-salbactam	16	14.54
Cefuroxime	3	2.72
Cefotaxime	2	1.81

Cefoxitin	0	0
Ceftazidime	2	1.81
Ceftriaxone	3	2.72
Cefepime	5	4.54
Azithromycin	1	0.9
Erythromycin	0	0
Aztreonam	1	0.9
Ertapenem	14	12.72
Imipenem	43	39.09
Meropenem	41	37.27
Gentamicin	26	23.63
Tobramycin	28	25.45
Netilmicin	29	26.36
Amikacin	29	26.36
Ciprofloxacin	9	8.18
Ofloxacin	16	14.54
Levofloxacin	24	21.81
Cotrimoxazole	15	13.63
Chloramphenicol	15	13.63
Tetracycline	22	20
Tigicycline	62	56.36
Clindamycin	0	0
Vancomycin	0	0
Teicoplanin	0	0
Linezolid	0	0
Polymyxin B	101	91.81
Colistin	102	92.72
Ticarcillin	5	4.54

Acinetobacter spp were highly sensitive to polymixin B and colistin (91.81% and 92.72% respectively), moderately sensitive to tigicycline (56.36%) and mildly sensitive to Imipenem and meropenem (39.09% and 37.27% respectively). Moreover this bacteria is completely resistant to clindamycin, vancomycin, teicoplanin, linezolid, erythromycin, oxacillin, cefoxitin, ampicillin, nearly resistant to amoxicillin, 4th generation cephalosporin, cefoperazone-salbactum (less than 15% sensitive), Piperacillin-tazobactum (20.90% sensitive) [Table 2].

Discussion:

In last 20 years acenetobacter spp. Proved to be the most important antibiotic resistant nosocomial pathogen in the health care settings. In the study done by Manisha Sharma et al. percentage of Acenetobacter spp. Isolated in sputum was 0.99% (129 out of 12970), in the study of Raina Dimple et al percentage of this bacterial spp was 4.17 (53 out of 1272), whereas in our study the incidence was 10.20%[14, 14]. Percentage in our study (10.20%) was nearly to the value in the study of Muhammad Sohail et al. (8.4%)[16].

In our study, Acinetobacter spp. Were more than 90% sensitive to polymixin B and colistin (91.81% and 92.72% respectively), moderately sensitive to tigicycline (56.36%) but less than 15% sensitive to cephalosporin and semi-synthetic penicillin group and nearly 25% sensitive to aminoglycosides and 100% resistant to vancomycin, clindamycin, teicoplanin, linezolid and oxacillin. This is similar to the study done by Sohail et al where sensitivity to polymixin B, colistin and tigicycline were 100%, 99.9% and 99.3% respectively[16]. Again, in the study done by Sohail et al. sensitivity to aminoglycoside antibiotics were 5.4% to 6.4% which was very much less that found in our study (23% - 26.36%)[16]. In this study sensitivity to carbapenem group observed as 37% to 39%, whereas in the study of Sohail et al sensitivity was only nearly 9%[16].

In the study done by Rekha S et al. acinetobacter spp. was resistant to aminoglycosides and cephalosporins and fluoroquinolones (29.4%) whereas in the present study this bacteria demonstrated much more resistance to fluoroquinolones (8.14% - 14.54%) except levofloxacin (21.81%) but nearly same as this study[17]. This resistance to aminoglycosides and fluoroquinolones are mediated by the production of aminoglycoside modifying enzymes and mutations in the gyrA and parC genes respectively[18]. Usually in the hospital, doctor uses carbapenem as a drug of last choice in case of multi-resistant gram negative bacilli[19,20]. In the same study other studies, like Sinha M et al., Den LL et al and Setarch S et al nearly 29.4% sensitivity was shown in case of acinetobacter but the present study demonstrated 37% to 39% sensitivity to this bacteria[17]. So these published works suggest judicious use of this drug otherwise only available drugs are polymixin B, colistin and tigicycline[18]. Again this present study demonstrated only 20% sensitivity to tetracycline whereas in the study of Rekha S et al, Goel et al and Looveren MV et al these bacteria demonstrated much more sensitivity to tetracycline[17,19,21]. In view of the above studies it can be decided that "Hodge test" can be performed in the laboratory to test the presence of carbapenemase[13].

In 30 European centers resistance to ampicillin/salbactam, Imipenem and meropenem of acinetobacter were 51.6%, 26.3% and 29.6% respectively, but in this present study ampicillin was 100 % resistant and Imipenem and meropenem were nearly 60% to 62% resistant[22]. In last two decade Colistin and polymixin B remains the treatment of choice of multi-drug resistant acinetobacter spp. According to previous studies these bacteria were 0.7% and 0.1% resistant to tigicycline and colistin respectively[22, 23]. But with the use of these antibiotics the resistance has been growing against these antibiotics with increasing frquency[22, 24]. Surveillance study in Europe resistance of acinetobacter was demonstrated as 2.7%, in Greece resistance to colistin was 3%, in Germany resistance to tigicycline and colistin were 6% and 2.8% respectively and in Turkey tigicycline was as high as 25%[22, 25, 26, 27]. This present study demonstrated only 8% resistance to colistin (92.72% sensitivity) but very high resistance to tigicycline (only 56.36% sensitivity).

Conclusion:

This present study demonstrated a huge resistance of acinetobacter spp. to large number of antibiotics except polymixin B, colistin, tigicycline, to some extent carbapenem. Since these bacteria have the capabilities of rapidly growing resistance to newer antibiotics and reports regarding the resistance already came from different countries all over the world, hence healthcare workers restrict the pace of the resistance of this organism to newer and newer antibiotics by restriction of the use of antimicrobials prior to antimicrobial sensitivity to these bacteria.

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