Acinetobacter spc.: A major isolates of nosocomial infection’s – clinical significance and antimicrobial susceptibility.

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Abstract:
Acinetobacter spp. is ubiquitous, aerobic gram-negative coccobacilli that are now emerging as an important nosocomial pathogen. In our study over a period of one year (January 2002- December 2002) at BPKIHS, a tertiary care hospital, from a total no. of 1089 isolates from pus/aspirates of ICU, Burns, Orthopedic and other post operative wards, 146 isolates (13.4%) were Acinetobacter spp. Out of 146, 23 isolates of Acinetobacter spp. were sensitive to base line drugs. Remaining 123 strains of Acinetobacter spp. were resistant to Cefotaxime (99.2%), Ceftazidime (98.4%), Tobramycin (95.9%), Amikacin (96.7%), Netilmicin (89.43%), Ciprofloxacin (96.7%). Apart from these antibiotics none of the strains were sensitive to Piperacillin.

Introduction:
Acinetobacter spp. are ubiquitous, aerobic gram-negative coccobacilli which are opportunistic pathogens with increasing relevance in nosocomial infections. They cause a wide range of clinical complications such as septicemia, pneumonia, meningitis, wound infections and urinary tract infections (UTI) especially in immunocompromised patients. Risk factors for acquisition of these organisms include prolonged hospital stay, serious underlying disease, intravascular and intravesical catheterization and treatment with broad-spectrum antibiotics. Due to life threatening potential of such infections, empiric treatment with broad-spectrum antimicrobial agents is mandatory while awaiting organisms identification and in vitro susceptibility test results. However, increasing antimicrobial resistance in Acinetobacter spp. has effectively eliminated many treatment alternatives, raising concerns about optimum therapeutic regimens.

The purpose of the study was to determine the in vitro susceptibility of Acinetobacter isolates obtained from the indoor patients in BPKIHS, to various antimicrobial agents by disk diffusion method.

Materials and Methods:
Identification:
One hundred forty-six Acinetobacter isolates obtained from Blood, CSF, Pus, E.T.T and other body fluids from patients of ICU, Burns, Orthopedic and other post operative wards for a period of one year were taken. (Table 1).

<table>
<thead>
<tr>
<th>Nature of sample</th>
<th>Nos. of Acinetobacter Isolates</th>
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<tbody>
<tr>
<td>Pus</td>
<td>62</td>
</tr>
<tr>
<td>E.T.T</td>
<td>47</td>
</tr>
<tr>
<td>Blood</td>
<td>19</td>
</tr>
<tr>
<td>CSF</td>
<td>05</td>
</tr>
<tr>
<td>Others</td>
<td>13</td>
</tr>
</tbody>
</table>

Preparation of inoculum and antimicrobial susceptibility testing:
Fine similar looking colonies of the test organism were picked up with sterile loop and suspended into peptone water and incubated at 370C for 2-4 hours. The turbidity of the suspension was adjusted to McFarland’s Nephelometer standard tube no. 0.5 (1.5x108CFU/ml).
Commerically prepared antibiotic discs (Hi-Media Ltd., India) of 6 mm. in diameter were used to determine the susceptibility pattern of Acinetobacter species in Muller Hilton Agar (MHA) media. Kirby-Bouer’s disk diffusion susceptibility testing (6 antimicrobial discs/plate) was performed for the following antimicrobial agents with their concentration given in parenthesis: Ampicillin (10ig), Amikacin (30ig), Cefazolin (30ig), Cefotaxime (30ig), Ceftazidime (30ig), Ciproflaxacin (05ig), Gentamicin (10ig), Tobramicin (10ig), Netilmicin (30ig), Piperacillin (100ig).

The plates were incubated at 370C for overnight and the results were determined.

For control, the organisms Escherichia coli (ATCC 25922 and Pseudomonas aeruginosa (ATCC 27853) were used.

Zone of inhibition (diameter of the circular inhibition zone including the antimicrobial disc) was measured by using Vernier Caliber and interpreted as per National Committee for Clinical Laboratory Standards (NCCLS) guidelines.

**Results:**

A total 146 isolates were identified as a genus Acinetobacter. First these isolates were subjected for the sensitivity against the base line drugs and only 23 out of 146 isolates were sensitive to them, and the remaining 123 base line resistant isolates subjected to the sensitivity against the 2nd line drugs.

**Table-3**

<table>
<thead>
<tr>
<th>Group of Antibiotics</th>
<th>Antibiotics</th>
<th>Resistance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd Gen. Cephalosporins</td>
<td>Cefotaxime</td>
<td>99.2</td>
</tr>
<tr>
<td>Aminoglycosides</td>
<td>Gentamicin</td>
<td>96.6</td>
</tr>
<tr>
<td>Quinilones</td>
<td>Tobramicin</td>
<td>95.9</td>
</tr>
<tr>
<td>ß-lactam</td>
<td>Amikacin</td>
<td>96.6</td>
</tr>
<tr>
<td>Piperacillin</td>
<td>Netilmicin</td>
<td>89.4</td>
</tr>
<tr>
<td>Ciproflaxacin</td>
<td>96.6</td>
<td></td>
</tr>
<tr>
<td>Piperacillin</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

The resistant pattern of these isolates are as follows (Table 3). 3rd generation Cephalosporins (98.4-99.2%), Aminoglycosides (90.0-97.0%), and Quinilones (97.0%). Apart from these none of the strains were found sensitive to Piperacillin.

**Discussion:**

Nosocomial bacterial pathogen show resistance pattern which may vary widely from time to time and place to place and within the same place over time. Only due to this, regular surveillance of nosocomial pathogen for resistograms is needed for every hospital in order to guide the appropriate selection of antimicrobials for empiric therapy. Monitoring the resistance of nosocomial pathogen could also be a primary pointer for the emergence of an outbreak. Detection of resistance in a particular pattern may suggest a currently occurring epidemic in hospitals, but antibiogram alone may not be sufficient to distinguish two strains that were responsible for outbreak.

*Acinetobacter spp.* which is generally multi drug resistant, is involved in several outbreaks more often than any other species of *Acinetobacter*. The incidence of nosocomial infection caused by *Acinetobacter* is rarely reported in Nepal, as compared to other south Asian countries. Antibiotic resistance is a major problem for patients infected with all *Acinetobacter* spp., especially those with *A. baumannii*. This effect the appropriate antibiotic selection for treating such patient. In India also only few authentic data are available regarding in vitro susceptibility of clinical isolates of *Acinetobacter* spp.

By the disc diffusion method it was clear that aminoglycosides were relatively more active than 3rd generation cephalosporins and ß-lactam against the *Acinetobacter* spp. But quinilones (97.0% resistance) have shown almost the same results as compared to 3rd generation cephalosporins and ß-lactam with aminoglycosides. Increasing resistance for cephalosporins was observed mainly in strains belonging to *A. baumannii*. The ranges of these antibiotics against *Acinetobacter* spp. are, 3rd generation Cephalosporins (98.4-99.2%), Aminoglycosides (90.0-97.0%), and Quinilones (97.0%). Now it seems clear from this data that all group of antibiotic has nearly the same antibiogram with >90.0% resistance against *Acinetobacter* spp. Ê and ß-lactam Piperacillin was 100% resistant to *Acinetobacter* spp., suggesting that most of the first generation drugs were ineffective. Thus the agents which were used two decades earlier to treat *Acinetobacter* infections were now inactive against this bacterium and consequently these antibiotics are not useful in treating *Acinetobacter* infection.

The isolates of *Acinetobacter* spp. showed maximum level of activity with Netilmicin whose susceptibility is 10.6%. Netilmicin was superior to other aminoglycosides especially Amikacin. Cefotaxime and Ceftazidime showed almost the similar pattern of resistance against the *Acinetobacter* spp. *i.e.* 99.2% and 98.4% respectively. Only 3.0% isolates of *Acinetobacter* spp. were found sensitive to Ciproflaxacin. But Piperacillin (ß-lactam) was 100.0% resistant to these isolates.

High level of resistance were noticed for Ceftazidime 98.4%, this is different from the results reported from Turkey and Greece, where in 67.5% and 96.0% was witnessed respectively for Ceftazidime.13,14 And was extremely different with an Indian report according to which the resistance pattern is 37.0% for Ceftazidime against *Acinetobacter* spp. Amikacin showed 96.6% resistance, in contrast, Chang et al. reported higher susceptibility rates (74.5%) among *Acinetobacter* spp. strains for Amikacin.12 High percentage of strains belonging to *Acinetobacter* spp. were resistant to Ciproflaxacin (97.0%) by disc diffusion method. *Acinetobacter* strains were more resistant to quinolones when compared to other studies in Chile. While very similar to the results seen in Germany.

In summary, Strains of *Acinetobacter* spp. from patient in our Hospital were generally more resistant to quinolones, ß-lactam antibiotics, first second and third generation Cephalosporins and aminoglycosides. However, dispute such resistance pattern, combination therapy could be the best choice for treating *Acinetobacter* infections in our hospitals.
References:


