Frequency and Distribution of Gram Negative Bacteria among Hospital and Community Acquired UTI Patients

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Abstract

Gram negative bacteria create a great problem during the treatment of urinary tract infection patients. This study was undertaken to determine the frequency and distribution of Gram negative bacteria among the UTI patients. This cross sectional study was carried out in the Department of Microbiology at Sir Salimullah Medical College, Dhaka from June 2007 to May 2008 for a period of 1(one) year. All the patients presented with the clinically suspected UTI at any age with both sexes were selected as study population. Patients who were hospitalized for at least 2 days or more received different antibiotics were designated as hospital acquired UTI; on the other hand patients who were attended in OPD for the first time were considered as community acquired UTI patients. All urine samples were inoculated in Blood agar and MacConkeys agar media. Gram negative bacteria were isolated and identified by colony morphology, Gram staining and biochemical tests. A total of 220 urine samples were collected from patients suspected to urinary tract infections of which 116 samples were from hospitalized patients and 104 samples were from community acquired UTI patients. Among 220 samples, 132(60.0%) Gram negative bacteria were isolated of which 88(66.7%) isolates were from hospitalized acquired UTI and 44(33.3%) bacteria were isolated from community acquired UTI patients. The difference was statistically significant (p=0.0001). In hospitalized patients out of 88(75.9%) isolated Gram negative bacteria, 67(76.1%) isolates were Escherichia coli, 10(11.4%) isolates were Klebsiella species, 5(5.7%) isolates were Proteus species and 6(6.8%) isolates were Pseudomonas species. Among the isolated bacteria 44(42.3%) bacterial isolates were from community patients of which 36(81.8%) isolates were Escherichia coli, 4(9.1%) isolates were Klebsiella species, 2(4.5%) isolates were Proteus species and 2(4.5%) bacteria were Pseudomonas species. In the present study, it was observed that considerable numbers of Gram negative bacteria were detected from urinary tract infection cases. [Bangladesh J Infect Dis 2014;1(2):24-26]

Keywords: Gram Negative Bacteria, Hospital Acquired UTI; Community Acquired UTI

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Introduction

Urinary tract infection is now a major problem in both hospital and community level cases\(^1\). Most commonly found bacteria are *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus* species, *Salmonella* species, other members of *Enterobacteriaceae* and *Pseudomonas aeruginosa*\(^2,5\). Long term antibiotic exposure, prolonged ICU stay, severe illness, nursing home residents, catheterization or instrumentation are the major risk factors for colonization of different hospital acquired bacteria\(^6\). Some bacteria can cause both community and hospital acquired infection which can be very difficult to treat with common drugs\(^3\). Therefore, this study was undertaken to determine the frequency and distribution of Gram negative bacteria among the hospital and community acquired UTI patients.

Methodology

This cross sectional study was carried out in the Department of Microbiology at Sir Salimullah Medical College, Dhaka from June 2007 to May 2008 for a period of 1(one) year. All the patients presented with the clinically suspected UTI at any age with both sexes were selected as study population. Patients who were hospitalized for at least 2 days or more received different antibiotics were designated as hospital acquired UTI; on the other hand patients who were attending in OPD for the first time were considered as community acquired UTI patients. Urine was collected from all patients in a sterile container. All urine samples were inoculated in Blood agar and MacConkeys agar media. All the plates were incubated at 37°C aerobically for 24 hours and Gram negative bacteria were isolated and identified by colony morphology, Gram staining and biochemical tests. Data were collected as per pre-designed data collection form. Data were analyzed by Statistical Package for Social Science (SPSS), Version -13. The qualitative data were expressed as frequency and percentage. The association was measured by Chi-square test. In 95% confidence interval \(P\) value less than 0.05 was taken as level of significance.

Result

A total of 220 urine samples were collected from patients suspected to urinary tract infections of which 116 samples were from hospitalized patients and 104 samples were from community patients. Among 220 samples, 132\((60.0\%)\) Gram negative bacteria were isolated of which 88\((66.7\%)\) isolates were from hospitalized acquired UTI and 44\((33.3\%)\) bacteria were isolated from community acquired UTI patients. The difference was statistically significant \((p=0.0001)\) (Table 1).

<table>
<thead>
<tr>
<th>UTI</th>
<th>Culture</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>HA</td>
<td>88(66.7)</td>
<td>28(31.8)</td>
</tr>
<tr>
<td>CA</td>
<td>44(33.3)</td>
<td>60(68.2)</td>
</tr>
<tr>
<td>Total</td>
<td>132(100.0)</td>
<td>88(100.0)</td>
</tr>
</tbody>
</table>

*figure within parenthesis indicates percentage; Chi-square test was done to see the level of significance; \(P\) value=0.0001; HA=Hospital acquired; CA= Community acquired

In hospitalized patients out of 88\((75.9\%)\) isolated Gram negative bacteria, 67\((76.1\%)\) isolates were *Escherichia coli*, 10\((11.4\%)\) isolates were *Klebsiella* species, 5\((5.7\%)\) isolates were *Proteus* species and 6\((6.8\%)\) isolates were *Pseudomonas* species. Among the isolated bacteria 44\((42.3\%)\) bacterial isolates were from community patients of which 36\((81.8\%)\) isolates were *Escherichia coli*, 4\((9.1\%)\) isolates were *Klebsiella* species, 2\((4.5\%)\) isolates were *Proteus* species and 2\((4.5\%)\) bacteria were *Pseudomonas* species (Table 2).

<table>
<thead>
<tr>
<th>Bacteria Name</th>
<th>UTI</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em></td>
<td>67((76.1%))</td>
<td>36((81.9%))</td>
</tr>
<tr>
<td><em>Klebsiella</em></td>
<td>10((11.4%))</td>
<td>4((9.1%))</td>
</tr>
<tr>
<td><em>Proteus</em> spp.</td>
<td>5((5.7%))</td>
<td>2((4.5%))</td>
</tr>
<tr>
<td><em>Pseudomonas</em></td>
<td>6((6.8%))</td>
<td>2((4.5%))</td>
</tr>
<tr>
<td>Total</td>
<td>88((75.9%))</td>
<td>44((42.3%))</td>
</tr>
</tbody>
</table>

*HA=Hospital acquired; CA= Community acquired; \(P\) value=0.900; figure within parenthesis indicates percentage

Discussion

ESBLs have become widespread throughout the world\(^7\) and are now found in a significant percentage of *Escherichia coli* and *Klebsiella pneumoniae* strains in certain countries\(^8\). ESBLs are responsible for resistance to many classes of antibiotics resulting in treatment failure\(^8\). In this study, out of 220 urine samples, 132\((60\%)\) bacterial strains were isolated. Of them, 88 \((75.9\%)\) were from hospitalized patients and 44\((42.3\%)\) from community patients. In the hospitalized patients, total 116 urine samples were studied. Of them, 88
Among the community patients, total 104 urine samples were collected of which 44(42.3%), bacterial strains were isolated and 3 (6.8%) strains were ESBL producers. This is very high frequency as ESBLs are rarely seen in the community patients. This is probably due to reason that in society extended spectrum cephalosporins are used indiscriminately in community patients. In this study majority bacterial isolates from hospitalized patients are isolates *Escherichia coli* (76.1%). The finding of the study agrees with the result of different studies. In another study it has been reported that *E. coli* is the most predominate bacteria in both community acquired and hospital acquired UTI which is consistent with the present study. Interestingly *Klebsiella* species are the second most common bacteria infecting both community acquired (4.5%) and hospital acquired (5.7%) UTI.

In this study *Proteus* species and *Pseudomonas* species are also isolated from both the community acquired and hospital acquired UTI. It has been previously reported that *Pseudomonas* species is the hospital acquired bacteria especially catheterized patients. Regarding this context *Pseudomonas* species is also isolated from this study group. Therefore, the isolated bacteria from UTI patients are changing.

### Conclusion

In conclusion it has been found that the most common isolated Gram negative bacteria is still *Escherichia coli* that causes both community acquired and hospital acquired UTI with a very high rate. *Klebsiella* species, *Pseudomonas* species and *Proteus* species also isolated from all types of UTI patients. Therefore, routine urine culture should be performed to see the frequency of bacteria causing UTI; furthermore, antimicrobial sensitivity should be carried out to see the resistant pattern of antibiotic towards these bacteria.

### References