Prevalence of Multidrug-Resistant Gram-Negative Bacilli (MDR-GNBs) among Community Urinary Isolates and Impact of Patient Age on MDR-GNB Prevalence and Resistance Rates

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ABSTRACT

Background: Monitoring trends of multidrug resistance is critical for guiding appropriate therapy and for antimicrobial resistance surveillance. The purposes of this study were (1) to investigate the prevalence of community urinary multidrug-resistant Gram-negative bacilli (MDR-GNBs), and (2) to determine if these rates varied by different age groups.

METHODS: GNBs identified from positive urine cultures over a 3 year period ending in December 2010, were tested by disk diffusion against appropriate antimicrobial agents, in accordance with CLSI guidelines. MDR-GNBs were defined as GNBs non-intrinsically resistant to ≥ 3 classes of antimicrobial agents, including ESBL, ampC-phenotype, and carbapenemase-producing organisms. MDR-GNB prevalence and resistance rates against ciprofloxacin (CIP), nitrofurantoin (FM), norfloxacin (NOR) and trimethoprim/sulfamethoxazole (TMP/SMX) were determined overall and by patient age group (<1 - <18; 18 – <30; >30 - <60; >60 – >95 years). Resistance rates for CIP, FM, NOR, and TMP/SMX were determined overall and by patient age group (<1 - <18; 18 – <30; >30 - <60; >60 – >95 years). Resistance rates for CIP, FM, NOR, and TMP/SMX were determined overall and by patient age group (<1 - <18; 18 – <30; >30 - <60; >60 – >95 years).

RESULTS: Of 20,768 GNBs isolated from 136,747 urine cultures, 1,983 (9.5%) were identified as MDR. The MDR-GNB prevalence rate increased from 8.97% (2008), to 9.43% (2009), to 10.17% (2010). Of all MDR-GNBs, 66% and 40% were isolated from patients > 50 and > 65 years of age, respectively. Rates for CIP, FM, NOR, and TMP/SMX were 68%, 69%, and 74%, respectively, with FM having the lowest resistance rate in all age groups. There was a trend for higher resistance rates against CIP and NOR with increasing age.

Conclusion: Current resistance patterns indicate an increase over the past 3 years in MDR-GNB prevalence among community urinary isolates, with a trend towards higher prevalence in older patients. The yearly trend for higher resistance rates observed with CIP and NOR, but not with TMP/SMX, suggests a need for continued surveillance.

RESULTS & DISCUSSION

The 1347 urine specimens submitted for culture over the study period, a total of 20,768 GNBs (15.2%) were isolated from positive urine cultures. Of all GNBs, 1,383 (6.5%) were identified as MDR. These included Escherichia coli (n = 1,062), Proteus mirabilis (n = 360), Citrobacter koseri (n = 360), Morganella morganii (n = 87), Enterobacter aerogenes (n = 38), Serratia marcescens (n = 13) and Providencia rettgeri (n = 9). Escherichia coli, Proteus mirabilis, Citrobacter koseri, Morganella morganii, Enterobacter aerogenes and Serratia marcescens were isolated from > 30% of urine cultures in each year of the study. Escherichia coli was the most prevalent MDR-GNB, representing >50% of all MDR-GNBs identified in each year of the study. Proteus mirabilis was the second most prevalent MDR-GNB, representing >20% of all MDR-GNBs identified in each year of the study. The prevalence rate of MDR-GNBs among community urinary isolates increased over the past 3 years in MDR-GNB prevalence and resistance rates against ciprofloxacin (CIP), nitrofurantoin (FM), norfloxacin (NOR) and trimethoprim/sulfamethoxazole (TMP/SMX) were determined overall and by patient age group (<1 - <18; 18 – <30; >30 - <60; >60 – >95 years). Resistance rates for CIP, FM, NOR, and TMP/SMX were determined overall and by patient age group (<1 - <18; 18 – <30; >30 - <60; >60 – >95 years). Resistance rates for CIP, FM, NOR, and TMP/SMX were determined overall and by patient age group (<1 - <18; 18 – <30; >30 - <60; >60 – >95 years).

Table 1: MDR-GNB Cumulative Resistance Rates (2008-2010) by Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>CIP</th>
<th>FM</th>
<th>NOR</th>
<th>TMP/SMX</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 – &lt;18</td>
<td>41%</td>
<td>9%</td>
<td>5%</td>
<td>15%</td>
</tr>
<tr>
<td>18 – &lt;30</td>
<td>51%</td>
<td>9%</td>
<td>5%</td>
<td>16%</td>
</tr>
<tr>
<td>&gt;30 – &lt;60</td>
<td>67%</td>
<td>8%</td>
<td>6%</td>
<td>21%</td>
</tr>
<tr>
<td>&gt;60 – &gt;95</td>
<td>75%</td>
<td>9%</td>
<td>8%</td>
<td>27%</td>
</tr>
</tbody>
</table>

The 2008, 2009, and 2010 MDR-GNB resistance rates were compared for each antimicrobial agent in the study. The yearly resistance rate for each of the antimicrobials did not significantly change during the three year period (Figure 3). As recently observed with community urinary isolates, with a trend towards higher prevalence in older patients.

CONCLUSIONS

- Current resistance patterns indicate an increase over the past 3 years in MDR-GNB prevalence among community urinary isolates, with a trend towards higher prevalence in older patients.
- FM is the most likely of the oral agents tested in this study to have a favourable antibacterial effect against community urinary MDR-GNBs.

REFERENCES