Urinary tract infection in a Saudi Arabian Hospital: Prevalence and antimicrobial susceptibility pattern

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Abstract

Background. The main aim of this study was to analyze the antimicrobial sensitivity pattern of bacterial isolates from suspected urinary tract infection (UTI) patients in Al-Kharj, Saudi Arabia.

Methods. Mid-stream urine specimens submitted to the Microbiology Laboratory by 1076 patients at the Military Hospital were collected. The specimens were cultured and the isolates were identified using standard microbiological techniques. The antibiotic susceptibilities of the isolates were also determined.

Results. The number of patients with urinary tract infection who yielded positive cultures from their mid stream urine specimens was 114 out of 1076 (10.6%). The commonest isolates were Escherichia coli (49.1%), Klebsiella pneumoniae (30.7%) and Enterococcus faecalis (13.2%). Other bacterial pathogens were Proteus mirabilis (3.5%) and Pseudomonas aeruginosa (3.5%).

Conclusions. The types of urinary tract pathogens and their antibiotic susceptibilities in addition to the rate of isolation from male and female patients are reported. In vitro drug sensitivity tests showed Norfloxacin and Nalidixic acid to be very effective for most of the strains of the bacterial pathogens and may be used in the empirical treatment of UTIs, in Al-Kharj. Imipenem may be used in cases un-responsive to commonly used antibiotics.
Introduction:
Urinary tract infection (UTI) is the second most common clinical indication for empirical antibiotic treatment in primary and secondary health care settings, and urine samples constitute the largest single category of specimens examined in most medical microbiological laboratories. There are an estimated 150 million urinary tract infection (UTI) per annum worldwide. These are the most common bacterial infections in women and account for significant morbidity and health care costs. UTI may be asymptomatic in many cases, while it may be accompanied by dysuria, cystitis and pyelonephritis in other patients. UTI are responsible for considerable morbidity and when associated with urinary obstruction or renal papillary damage, can lead to serious kidney damage.

UTI are a serious health problem affecting millions of people each year. The prevalence of asymptomatic bacteriuria reported in Saudi Arabia was 5.3%. The most common organisms causing UTI are _E. coli_ while _Proteus, Klebsiella, Streptococcus_ and _Staphylococcus_ epidermis also commonly the causative agents. The predominant organisms associated with UTI in Saudi Arabia are Gram negative bacteria which are highly resistant to commonly used oral agents.

Vesico-ureteral reflux is the most commonly associated abnormality and reflux nephropathy is an important cause of end stage renal disease in children and adolescents. However, when reflux is recognized early and managed appropriately, renal insufficiency is rare. Some adolescents who present with an apparently uncomplicated first urinary tract infection turn out to have considerable reflux. Subclinical infections can sometimes lead to severe bilateral renal scarring. Therefore, even a single documented urinary tract infection in an adolescent must be
taken seriously. In this study, we determined the incidence of urinary tract infections in adolescents in Al-Kharj, Saudi Arabia; identified the uropathogens responsible for the infection; and studied the patterns of antibiotic sensitivity of the uropathogens and correlated these with patient symptom profile. This was all done in order to ascertain appropriate antibiotic treatment therapy.

The main aim of this study was to look at the different organisms that cause UTIs, and their antimicrobial susceptibilities, among Saudi military personnel and their families at Military Hospital in Al-Kharj, Saudi Arabia.

**Material and Methods.**

One thousand and seventy six (1076) mid-stream urine (MSU) specimens were submitted by the patients attending military Hospital in Al-Kharj, Saudi Arabia. during the period 1*st.* October, 2011 to 8*th.* December, 2011. Of these 840 specimens were obtained from females and 236 were from males. Standard microbiological techniques were used in the culture of all MSU specimens and in the identification of the isolates.⁹

Antibiotic sensitivity testing was performed using the disc diffusion method on Mueller-Hinton agar plates. The antibiotics tested on each disc were Ampicillin 25 µg, Cotrimoxazole (1.25/23.75 µg), Ceftriaxone 30 µg, Augmentin (20/10 µg), Cefuroxime 30 µg, Cefotaxime 30 µg, Piperacillin 100 µg, Nalidixic Acid 30 µg, Nitrofurantoin 300 µg, Norfloxacin 30 µg, Ciprofloxacin 30 µg, Gentamicin 10 µg, Amikacin 30 µg and Imipenem 30 µg. Results of disk diffusion method were interpreted in accordance to the Clinical and Laboratory Standards Institute (CLSI, 2009).
Results:

The microbiology laboratory of Military Hospital at Al-Kharj, in the central province of Saudi Arabia received 1076 urine specimens, 840 females and 236 males between October, 2011 and December, 2011. All the specimens were processed in the Microbiology Laboratory of College of Applied Medical Sciences, Salman bin Abdul Aziz University, Al-Kharj. Of the 1076 specimens, 114 (10.6%) showed positive urine culture. Among those who gave a urine sample for culture a slightly higher proportion of females; 60 (52.6%) had a positive urine culture as compared with males 54 (47.4%).

Most of the isolates were Gram-negative organisms 99 (86.8%), and Gram positive organisms were 15 (13.2%) of all the isolates (Table I).

Among Gram negatives all isolates showed high sensitivity to Norfloxacin and Nalidixic acid. Cefuroxime sensitivity was low in *Pseudomonas, Klebsiella, E. coli* and *Proteus*. Almost all were resistant to Ampicillin, Cotrimoxazole, and variably sensitive to Amoxiclav, Gentamicin and Piperacillin. *Pseudomonas aeruginosa* were found to be 100% sensitive to Imipenem, piperacillin and norfloxacin followed by Ciprofloxacin(75%), Gentamicin (75%), Amikacin (75%) and Ceftazidime (75%). *Enterococcus faecalis* were found to be 100% sensitive to Augmentin. All isolates were sensitive to Imipenem(100%) (Table 2).

Discussion:

This study shows the organisms causing UTI among the patients attending the military Hospital in Al-Kharj. The rate of isolation of the urinary tract pathogens was in general agreement with others. The number of female patients with UTI was more than the males, but the difference
was not statistically significant. Higher prevalence of UTI among females\textsuperscript{11} is due to the factors that predispose women to UTI more than men. The most predominant urinary tract pathogen in both sexes in this investigation was \textit{E. coli} and \textit{Klebsiella pneumoniae} in concordance with other studies from Saudi Arabia reported by Shamweel and Farooque.\textsuperscript{12}

In vitro drug sensitivity demonstrated a high prevalence (~70\%) of resistance among the strains of \textit{E.coli} and \textit{Klebsiella pneumoniae} to Cotrimoxazole, a drug considered to be of choice in urinary tract infection. The high prevalence of resistance to the commonly used antibiotics such as Cotrimoxazole and Ampicillin have caused considerable alarm. The factors favouring development of antibiotic resistance include previous use of an antibiotic by the individual or wide spread use of antibiotics in the community. Antibiotic misuse is very common in developing countries, mainly because of failure to restrict the use of antibiotics in hospitals.\textsuperscript{13} \textit{Pseudomonas aeruginosa}, a common cause of hospital-acquired UTI, was found to be less sensitive to the common antibiotics but sensitive to Imipenem (100\%) and Amikacin (75\%). corroborating with the results of others.\textsuperscript{14} \textit{Pseudomonas aeruginosa} were highly resistant Augmentin, Nalidixic acid and Gentamicin. This may be due to widespread use of common antibiotics in the hospital and cross-resistance among different bacteria. The other antibiotics showed high level of resistance against all the isolates in this study.

\textbf{Conclusion}

Norfloxacin or Nalidixic acid may be used in the blind treatment of UTIs, in Al-Kharj. Imipenem may be used in cases un-responsive to commonly used antibiotics. Antibiotic resistance patterns need to be to monitored in the community and antibiotic resistance patterns should guide the empirical treatment of patients in the future.
Acknowledgements. We are highly thankful to our supervisor Dr. Shamweel Ahmad, Associate Professor of Microbiology, College of Applied Medical Sciences, Salman bin Abdul Aziz University for his guidance and supervision. We are also thankful to Mr. Mohammad Al-Eissa, Lab. Specialist at Military Hospital, Al-Kharj for providing us urine specimens used in this study.
### Table 1 Uropathogens isolated from MSU in Al-Kharj City

<table>
<thead>
<tr>
<th>Organism</th>
<th>Number (Percent)</th>
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<tbody>
<tr>
<td><em>Escherichia coli</em></td>
<td>56 (49.1)</td>
</tr>
<tr>
<td><em>Klebsiella pneumoniae</em></td>
<td>35 (30.7)</td>
</tr>
<tr>
<td><em>Proteus mirabilis</em></td>
<td>4 (3.5)</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>4 (3.5)</td>
</tr>
<tr>
<td><em>Enterococcus faecalis</em></td>
<td>15 (13.2)</td>
</tr>
</tbody>
</table>

### Table 2 Antimicrobial susceptibility pattern of uropathogens.

<table>
<thead>
<tr>
<th>Organism</th>
<th>No.</th>
<th>Percent sensitive against</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NOR</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>56</td>
<td>85.7</td>
</tr>
<tr>
<td><em>Klebsiella pneumoniae</em></td>
<td>35</td>
<td>88.6</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td><em>Proteus mirabilis</em></td>
<td>4</td>
<td>75.0</td>
</tr>
<tr>
<td><em>Enterococcus faecalis</em></td>
<td>15</td>
<td>0</td>
</tr>
</tbody>
</table>

NOR= Norfloxacin, AMP=Ampicillin, AUG= Augmentin, GEN=Gentamicin, AK=Amikacin, CXM=Cefuroxime, CEF-TAZ=Cefazidime, COT= Co-trimoxazole, PIP=Piperacillin, NIT= Nitrofurantoin, NA= Nalidixic Acid, CIP=Ciprofloxacin, IMP= Imipenem, CEFTRI= Ceftriaxone
References:


