Microbial Profile and Antibiogram Pattern of UTI in Pregnant Women at a Saudi Hospital

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ABSTRACT

Introduction: Urinary tract infections (UTIs) are among the most common bacterial infections during pregnancy. Aims: To determine the incidence, predisposing factors, microbiological and antimicrobial resistance patterns in UTI pregnant women in a Saudi hospital and comparing the antibacterial activities of these antibiotics with a probiotic. Methodology: Urine cultures were performed to all cases (n=1045) using different media. Microorganisms were identified by colony morphology, Gram stain and biochemical profiles. BD Phoenix™ was used in confirmation of identification of all UTI Gram-negative isolates. Antibiotic susceptibility pattern of isolates was done using disk diffusion method. Antagonistic activity of six lactobacillus plantarum isolates against different indicator bacteria was determined by agar well diffusion method. Results: A total of 148 UTI women were detected. The most prevalent UTI isolates were E.coli (26.1%), followed by Klebsiella spp. (20%), Enterococcus spp. (9.5 %) CoNS (8.8%) and Pseudomonas spp. (5.4%). Lactobacillus plantarum showed inhibitory effect on the tested isolates. Conclusion: Our study revealed that 14.2% of pregnant women had urinary tract infection in their pregnancy. Doing the necessary tests for pregnant women especially urine analysis and urine culture is essential to avoid UTI. The inhibitory effect of Lactobacillus plantarum on UTI pathogens appeared promising.

Keywords: Urinary Tract Infection (UTI); pregnant women; Antibigram; Antimicrobial resistance; Lactobacilli; Saudi.

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INTRODUCTION

Urinary tract infection (UTI) is the predominant type of bacterial infection among pregnant women1-2. As many as 90% of UTIs are caused by Escherichia coli3. Hormonal and physiological changes in the urinary tract, including ureteral dilatation and changes in bladder volume and tone, may promote infection in pregnant women. Moreover, it has been observed that pregnant women have a propensity to develop recurrent UTIs2. Overall, UTI can be dangerous for both the mother and fetus. Complications that may arise include preterm delivery and increased incidence of intrauterine growth restriction. To a lesser degree, preeclampsia, caesarean delivery, anemia, sepsis, and septic shock may also be associated with UTI in these patients4.

It is worth mentioning that asymptomatic infection could be easily transfer to symptomatic infection if it is not treated probably5; and accordingly, lead to infant morbidity and mortality if poorly diagnosed6. An accurate and prompt diagnosis of UTI is important in shortening the disease course and for preventing the ascent of the infection to the upper urinary tract and renal failure. Treatment of UTI cases is often started empirically. Therapy is based on information determined from the antimicrobial resistance pattern of the urinary pathogens. However, because of the evolving and continuing antibiotic resistance phenomenon, regular monitoring of resistance patterns is necessary to improve guidelines for empirical antibiotic therapy7. This resistance problem needs a renewed effort, to search for new antimicrobial substances from various sources like probiotics.

There has been increased focus on the use of probiotics such as Lactobacillus sp. for prophylaxis and treatment of UTI8. In the present study, we have determined the prevalence of UTI in pregnant women admitted to a certain Saudi hospital and the maternal risk factors for causing UTIs. Providing information to health officials about the main pathogens responsible for UTI in those pregnant women and recognizing the most susceptible antibiotics against them were also determined. We have also measured the antibacterial activities of some probiotics on some isolates.
MATERIALS AND METHODS
The present retrospective study was conducted in MMCH, Madinah Munawarah city, located in the western part of Saudi Arabia, during one year period from 1 July 2009 to 30 June 2010. The hospital has 500 beds, and provides primary, secondary and tertiary health care. It is also the main referral hospital for Madinah region. Urine samples were collected from a total of 1045 pregnant women that were suspected of having UTIs. Urine samples were obtained by informed consent of the pregnant women included in this study. Ethical Committee of the Madinah Maternity and Children's Hospital & the Scientific Committee of Taibah University approved the study.

Isolation, Identification and Antibiotic Susceptibility Testing of Microbial Isolates from UTI Cases
After shaking each urine sample, a loopful was streaked on different plates of MacConkey agar, CLED agar, Sabaroud dextrose agar and Blood agar for microbial isolation. After incubation aerobically at 35-37°C, plates with growth were selected. The colonies were isolated using an inoculating loop and subsequently, subcultured on agar slants for use in further tests.

Identification of uropathogens was done based on colony morphology, Gram staining, test results of catalase, coagulase, oxidase, urease, germ tube, optochin, bacitracin and biochemical profiles using API tests (BioMérieux, France) specific for Gram-negative organisms. BDPhoenix™ NMIC/ID panels were also used to confirm the identification of all UTI Gram-negative isolates. Furthermore, antibiotic susceptibility testing was done according to National Committee for Clinical Laboratory Standards.

In vitro effect of lactobacillus spp. on the tested isolates by agar diffusion method
The selected (indicator) bacteria were: 2 standard strains E.coli ATCC 29922, S. aureus ATCC 29923, and the 4 most resistant isolates (E.coli, S. aureus, Enterobacter spp., Klebsiella spp.) At the same time the six lactobacillus spp. (L. planctarum), that was provided from Dr. Ola Aly Abd El-Rahman, Microbiology Department, faculty of Pharmacy, AlAzhar University. The probiotic material was inoculated into DeMan Rogosa Sharpe (MRS) broth and incubated at 37°C for 48 hours. After incubation loopful of culture was streaked on the surface of MRS plates and incubated for 24 hrs at 37°C.

Afterwards, the isolates were selected and characterized on the basis of morphological, cultural and biochemical characteristics and were identified according to Bergey's Manual of Systematic Bacteriology. Lactobacillus isolates then were cultured on MRS broth and incubated at 37°C for 24 hour. After centrifugation at10,000 rpm for 5 min, the supernatants of lactobacilli strains were monitored for antibacterial activity against indicator bacteria as described by Ashraf et al. (2009).

Table 1: Microscopic and biochemical examination of urine samples from UTI pregnant women (NO = 148)

<table>
<thead>
<tr>
<th>Microscopic analysis</th>
<th>NO of positive samples (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td>148 (100)</td>
</tr>
<tr>
<td>RBC</td>
<td>123 (83.1)</td>
</tr>
<tr>
<td>Epithelial cell</td>
<td>148 (100)</td>
</tr>
<tr>
<td>Bacteria</td>
<td>141 (95.3)</td>
</tr>
<tr>
<td>Fungi</td>
<td>7 (4.7)</td>
</tr>
<tr>
<td>Others</td>
<td>23 (15.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Biochemical analysis</th>
<th>NO of positive samples (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumin</td>
<td>44 (29.7)</td>
</tr>
<tr>
<td>Glucose</td>
<td>7 (4.7)</td>
</tr>
<tr>
<td>Acetone</td>
<td>6 (4.1)</td>
</tr>
<tr>
<td>Nitrite</td>
<td>117 (79.1)</td>
</tr>
</tbody>
</table>

WBC=White blood cell, RBC=Red blood cell, Others=Crystals, Casts, and Calcium Oxalates.

Figure 1: Incidence of UTI in relation to age distributions of the 148 pregnant women
Table 2: Incidence of UTI by gestational age (age of pregnancy) among the 148 pregnant women

<table>
<thead>
<tr>
<th>Age of pregnancy</th>
<th>No. of cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>9.4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>12.2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>13.5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>19.6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>25.7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>14.9</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4.7</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Incidence of UTI by parity (No. of pregnancy) among the 148 pregnant women

<table>
<thead>
<tr>
<th>Parity</th>
<th>No of positive cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First pregnancy</td>
<td>26 (17.6)</td>
</tr>
<tr>
<td>2nd pregnancy</td>
<td>40 (27)</td>
</tr>
<tr>
<td>3rd pregnancy and above</td>
<td>82 (55.4)</td>
</tr>
<tr>
<td>Total</td>
<td>148 (100)</td>
</tr>
</tbody>
</table>

Table 4: Different microbial isolates from the 148 UTI pregnant women

<table>
<thead>
<tr>
<th>Microbial isolates</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gram-positive organisms</td>
<td></td>
</tr>
<tr>
<td>CoNS</td>
<td>13 (8.8)</td>
</tr>
<tr>
<td>MRSA</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>MSSA</td>
<td>10 (6.8%)</td>
</tr>
<tr>
<td>Streptococcus viridans</td>
<td>4 (2.7)</td>
</tr>
<tr>
<td>Streptococcus agalactiae</td>
<td>6 (4.1)</td>
</tr>
<tr>
<td>Streptococcus pneumoniae</td>
<td>5 (3.4)</td>
</tr>
<tr>
<td>Enterococcus faecalis</td>
<td>9 (6.1)</td>
</tr>
<tr>
<td>Enterococcus faecium</td>
<td>5 (3.4)</td>
</tr>
<tr>
<td>Gram-negative organisms</td>
<td></td>
</tr>
<tr>
<td>E.coli</td>
<td>32 (21.6)</td>
</tr>
<tr>
<td>Klebsiella pneumoniae</td>
<td>24 (16.2)</td>
</tr>
<tr>
<td>Klebsiella oxytoca</td>
<td>6 (4.1)</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>8 (5.4)</td>
</tr>
<tr>
<td>Enterobacter cloacae</td>
<td>10 (6.8)</td>
</tr>
<tr>
<td>Enterobacter aerogenes</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Acinetobacter spp.</td>
<td>2 (1.4)</td>
</tr>
<tr>
<td>Proteus mirabilis</td>
<td>10 (0.7)</td>
</tr>
<tr>
<td>Fungi</td>
<td>7 (4.7)</td>
</tr>
<tr>
<td>Candida albicans</td>
<td>4 (1.3)</td>
</tr>
<tr>
<td>Candida albicans spp.</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Total no. of isolates</td>
<td>148 (100)</td>
</tr>
</tbody>
</table>

RESULTS

Microscopic and biochemical data

The overall prevalence of UTI infection among the suspected cases was 14.2% (148/1045). From table 1, WBCs and epithelial cells were detected in all urine samples. Moreover, Bacteria and fungi constituted 95.3% and 4.7% of the positive samples, respectively. UTIs were most common in pregnant women with the ages between 26-30 years (Figure 1). The highest rate of UTIs in the pregnant women was during the seventh month of pregnancy (Table 2). From Table 3, the highest incidence of UTIs was in women in third pregnancy and above.

Microbiological data

During the study period (July 2009 to June 2010), 1045 suspected UTI in pregnant women were admitted to MMCH. A total of 148 microbial isolates were isolated from the 148 cases. 70.9% of the total cases was from in-patient department, while 29.1% was from out-patient department. The most prevalent UTI isolates were E.coli (26.1%), followed by Klebsiella spp. (20%), Enterococcus spp. (9.5%) CoNS (8.8%) and Pseudomonas spp. (5.4%) (Table 4) Antibacterial resistance rate of UTI Gram-positive and negative isolates is shown in tables 5 & 6 respectively. L5 & L6 gave the best inhibitory activity against the tested organisms as seen in Table 7.

CoNS= Coagulase-negative staphylococci,
MRSA= methicillin resistance staphylococcus aureus,
MSSA= methicillin sensitive staphylococcus aureus.
Table 5: Antibacterial resistance rate of UTI Gram-positive isolates (No = 55)

<table>
<thead>
<tr>
<th>Antibacterials</th>
<th>CoNS No = 13</th>
<th>S. aureus No = 13</th>
<th>Streptococcus spp. No = 15</th>
<th>Enterococcus spp. No = 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG (10 IU)</td>
<td>11 (84.6)</td>
<td>13 (100)</td>
<td>13 (86.6)</td>
<td>14 (100)</td>
</tr>
<tr>
<td>E (15 µg)</td>
<td>10 (76.9)</td>
<td>1 (7.7)</td>
<td>5 (33.3)</td>
<td>14 (100)</td>
</tr>
<tr>
<td>AP (10 µg)</td>
<td>12 (92.3)</td>
<td>13 (100)</td>
<td>10 (66.6)</td>
<td>14 (100)</td>
</tr>
<tr>
<td>KF (30 µg)</td>
<td>7 (53.8)</td>
<td>0 (0)</td>
<td>4 (26.7)</td>
<td>14 (100)</td>
</tr>
<tr>
<td>CD (2 µg)</td>
<td>9 (69.2)</td>
<td>1 (7.7)</td>
<td>5 (33.7)</td>
<td>13 (92.9)</td>
</tr>
<tr>
<td>TS (25 µg)</td>
<td>7 (53.8)</td>
<td>1 (7.7)</td>
<td>11 (73.3)</td>
<td>10 (71.4)</td>
</tr>
<tr>
<td>VA (30 µg)</td>
<td>6 (46.2)</td>
<td>2 (15.4)</td>
<td>4 (26.7)</td>
<td>0 (0.00)</td>
</tr>
</tbody>
</table>

PG= Penicillins G, E= Erythromycin, AP= Ampicillin, KF= Cephalothin, CD= Clindamycin, TS= Cotrimoxazole, VA= Vancomycin.

Table 6: Antibacterial resistance rate of UTI Gram-negative isolates (No = 86)

<table>
<thead>
<tr>
<th>Antibacterials</th>
<th>E. coli No = 32</th>
<th>Klebsiella spp. No = 30</th>
<th>Enterobacter spp. No = 13</th>
<th>P. aeruginosa spp. No = 8</th>
<th>Acinetobacter spp. No = 2</th>
<th>Proteus mirabilis No = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA (30µg)</td>
<td>10 (31.3)</td>
<td>8 (26.7)</td>
<td>10 (76.9)</td>
<td>7 (87.5)</td>
<td>2 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>NI (300µg)</td>
<td>6 (18.8)</td>
<td>9 (30.0)</td>
<td>4 (30.8)</td>
<td>4 (50.0)</td>
<td>2 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>KF (30 µg)</td>
<td>31 (96.9)</td>
<td>30 (100)</td>
<td>11 (84.6)</td>
<td>8 (100)</td>
<td>2 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>AP (25 µg)</td>
<td>27 (84.4)</td>
<td>29 (96.7)</td>
<td>13 (100)</td>
<td>8 (100)</td>
<td>2 (100)</td>
<td>1 (100)</td>
</tr>
<tr>
<td>TS (25 µg)</td>
<td>24 (75.0)</td>
<td>22 (73.3)</td>
<td>1 (7.7)</td>
<td>8 (100)</td>
<td>2 (100)</td>
<td>1 (100)</td>
</tr>
<tr>
<td>NOR (10 µg)</td>
<td>5 (15.6)</td>
<td>8 (26.7)</td>
<td>4 (30.8)</td>
<td>5 (62.5)</td>
<td>1 (50.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>AK (30 µg)</td>
<td>0 (0)</td>
<td>1 (3.3)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (50.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>CAZ (30 µg)</td>
<td>6 (18.8)</td>
<td>11 (36.7)</td>
<td>0 (0)</td>
<td>2 (25.0)</td>
<td>1 (50.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>ATM (30 µg)</td>
<td>6 (18.8)</td>
<td>11 (36.7)</td>
<td>0 (0)</td>
<td>2 (25.0)</td>
<td>2 (50.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>IMI (10 µg)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>CIP (5 µg)</td>
<td>3 (9.4)</td>
<td>2 (6.7)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (50.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>AUG (30 µg)</td>
<td>9 (28.1)</td>
<td>17 (56.7)</td>
<td>11 (84.6)</td>
<td>8 (100)</td>
<td>1 (50.0)</td>
<td>1 (100)</td>
</tr>
<tr>
<td>GM (10µg)</td>
<td>4 (12.5)</td>
<td>8 (26.7)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (50.0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>FOX (30 µg)</td>
<td>0 (0)</td>
<td>7 (23.3)</td>
<td>12 (82.3)</td>
<td>8 (100)</td>
<td>1 (50.0)</td>
<td>1 (100)</td>
</tr>
</tbody>
</table>

NA=Nalidixic acid, NI=Nitrofurantoin, CAZ=Ceftazidime, , KF=Cephalothin, FOX=Cefoxitin, AP= Ampicillin, ATM= Aztreonam, IMI= Imipenem, AUG= Augmentin, GM= Gentamicin, Ak= Amikacin, CIP= Ciprofloxacin, TS= cotrimoxazole, NOR=Norfloxacin.

Table 7: Effect of the different Lactobacillus plantarum on the tested microorganisms

<table>
<thead>
<tr>
<th>Lactobacillus plantarum (LP)</th>
<th>E.coli ATCC 25922</th>
<th>S. aureus ATCC 25923</th>
<th>E.coli</th>
<th>S. aureus</th>
<th>Enterobacter spp.</th>
<th>Klebsiella spp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP1</td>
<td>16</td>
<td>12</td>
<td>10</td>
<td>R</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>LP2</td>
<td>17</td>
<td>7</td>
<td>15</td>
<td>1</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>LP3</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>1</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>LP4</td>
<td>16</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>12</td>
</tr>
<tr>
<td>LP5</td>
<td>17</td>
<td>17</td>
<td>15</td>
<td>14</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>LP6</td>
<td>12</td>
<td>19</td>
<td>20</td>
<td>2</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

R = resistance

DISCUSSION
Screening for and treatment of asymptomatic bacteriuria in pregnancy has become a standard of obstetric care and most antenatal guidelines include routine screening for it\(^{13}\). The overall prevalence of UTI infection among the suspected cases was 14.2% which coincides with a study from Saudi Arabia (14.2%)\(^{14}\). Moreover, lower rates (4.8% and 6.1%) were recorded in neighbor countries as UAE\(^{15}\) and Iran\(^{16}\). Other researchers
reported a higher prevalence rate in pregnant women as (50%)
(47.5%)\textsuperscript{13}, (43.1%)\textsuperscript{17}. Such a difference could be due to
geographic location and difference in environmental conditions\textsuperscript{18},
and also due to improved health care.

In the current study, the urine samples were microscopically
analyzed. All samples contained pus cells and epithelial cells
while RBCs were found in 83.1% of total cases. Bacteria also
were present in 95.3% and fungi in 4.7% of all our samples. Pus
cells (62.5%) and the yeast cells (16.7%) in UTI pregnant women
had been detected\textsuperscript{10}.
Pus cells in 26.0%, RBC in 9.7%, yeast cells in 1.6% and
Trichomonas vaginalis in 0.8% of the positive 53 pregnant women
have been revealed\textsuperscript{17}.
The highest incidence of UTIs among pregnant women within the
age group of 26-35 years (48.7%). This may be explained by the
fact that women in this age group are more sexually active. The
anatomical relationship of the female urethra to the vagina makes
it liable to trauma during sexual intercourse which could result in
increased tendency of bacteria being massaged up the urethra
into the bladder\textsuperscript{19}. Similarly, the highest incidence of UTI belonged
to age group 26-35 years (47%) was found\textsuperscript{11}. On the other hand,
age groups 38-42 showed the highest incident rate of UTI
(66.7%)\textsuperscript{17}.

In our study, there was a high incidence of UTIs among pregnant
women within the seventh (25.7%) and sixth (19.6%) pregnancy
month. Similar finding was reported who reported that women in
the 6 and 7 months of their pregnancy had the highest prevalence
of UTIs (50.0 and 71.4%, respectively)\textsuperscript{10}.
The incidence of UTIs by parity was found to be the highest during
the third pregnancy and above (55%). So, parity may be possible
factor affecting the incidence and prevalence rate of UTIs among
women. 58.3% of the women who had UTIs were in their 3rd
pregnancy and above; 43.7% were in their 2nd pregnancy and
42.5% were in their 1st pregnancy\textsuperscript{10}.
The predominant organisms associated with UTI in Saudi Arabia
are Gram negative bacteria which are highly resistant to
commonly used oral agents\textsuperscript{20}. In our study, Gram-positive, Gram-
negative and yeast accounted for 37.2%, 58.1% and 7.4% of the
total isolates, while they were 78.2%, 20.8% and 1%,
respectively\textsuperscript{21}. Detection of Gram-negative bacteria isolates were
more prevalent (78%) than gram-positive bacteria isolates (20%)
and yeast cell like candida (2%)\textsuperscript{15}.
Our finding is similar to other reports which suggested that Gram-
negative bacteria, particularly E. coli is the most common
pathogen isolated in patients with UTI\textsuperscript{22-23}. The top five isolates
in this investigation were E. coli (21.6%), Klebsiella spp. (20.3%),
Enterococcus (9.5 %), CoNS (8.8%) and Pseudomonas spp.
(5.4%). Similarly, the commonest causes of UTI were E. coli (48.7
%), K. pneumonia (23.9 %), S. aureus (19 %) and Pseudomonas
spp. (2%) were reported\textsuperscript{24}. Furthermore, Escherichia coli (43.2%),
Klebsiella species (20.8%), Enterobacter species (20.8%) and
Pseudomonas species (8.9%) as the most prevalent isolates\textsuperscript{1}.
E. coli in 56%, 15% Staphylococcus aureus, 11% Enterococci, 8%
Klebsiella, 5% Staph. saprophyticus, 2% Proteus mirabilis, 2% were
belonged to Candida albicans and single one case was due to
Citrobacter\textsuperscript{25}.
In another study, Escherichia coli (35.8%) was the most
predominant organism followed by Staphylococcus aureus
(20.8%), Coliforms (17.0%), Klebsiella pneumoniae (13.2%),
Pseudomonas aeruginosa (1.9%), Streptococcus faecalis (1.9%),
Proteus mirabilis (1.9%) and mixed culture of Staphylococcus
epidermis and Candida albicans (7.5%)\textsuperscript{17}.

Empirical antibiotic selection should be based on the knowledge of
local prevalence of bacterial organism and sensitivities rather than
on universal guidelines\textsuperscript{26}. Many, if not most, of the Gulf
Corporation Council (GCC) countries do not have well-defined
guidelines for antimicrobial use and lack policies for restricting and
auditing antimicrobial prescriptions. There are no guidelines for
the use of antimicrobials in the animal industries either. Thus, it is
not surprising that antimicrobial resistance has emerged in these
countries\textsuperscript{27}.
Gram-negative isolates in our investigation showed a very low
level of resistance to amikacin (1.4%), imipenem (2%),
ciprofloxacin (3.4%) and gentamicin (8.8%). Our results agree with
a study who found that the most effective antibiotics against
Gram-negative isolates were imipenem and amikacin\textsuperscript{21}. The most
effective antibiotics against Gram-negative bacteria were
imipenem and meropenem were reported\textsuperscript{28}.
Similarly, low level of resistance to amikacin (5.5%) and
gentamicin (15.2%) was detected\textsuperscript{24}. In another study, the overall
imipenem resistance was 8% for Klebsiella pneumoniae, whereas,
other isolates of uropathogens were found to be 100% sensitive to
imipenem\textsuperscript{7}.
In our study, E.coli showed high resistance to cephalothin
(96.9%), and to ampicillin (84.4%), but susceptible to imipenem,
amikacin and cefoxitin, while Klebsiella spp. were most resistant
to cephalothin & ampicillin. A study detected that the most
common causative pathogen E.coli was 100% sensitive to Linezolid and Imipenem; and Klebsiella was 87.5% sensitive to
linezolid, ofloxacin and imipenem\textsuperscript{13}.
In an era in which we need new ways to treat UTI, strategies may
include the use of probiotics. In female adults, probiotics have
been studied and used for the health of urogenital tract in the area
of urogenital infection\textsuperscript{29,30}. In urogenital tract, the probiotic
microflora ascend from rectal skin to urinary tract, kill
uropathogens by hydrogen peroxide and bacteriocin-like
compounds\textsuperscript{31}, and reduce iron required by uropathogens but not
tobacco. by iron-withholding system such as siderophils\textsuperscript{32}.
In our study, all the tested strains showed great activity toward
Lactobacillus plantarum used using agar well diffusion test. L.
acidophilus and L. plantarum had inhibitory properties against
E.coli, S. aureus, Streptococcus agalactiae, Streptococcus uberis,
Salmonella enteritidis and Bacillus pumilus\textsuperscript{33}.
Probiotics have shown to protect against variety of pathogens as
E. coli \textsuperscript{34}. On the other hand, none of the Lactobacillus spp. was
reported to be able to inhibit the growth of S. enteritidis, S.
typhimurium, E.coli and S. aureus\textsuperscript{35}. The in-vitro antagonistic
activity of Lactobacillus plantarum and its bacteriocins was
examined against UTI pathogens; and it showed the greater
inhibitory effect (20 mm) against Escherichia coli while the least
activity (9 mm) was found against Streptococcus sp\textsuperscript{35}.

CONCLUSION
It is concluded from the present study that UTI is common in
pregnant women (14%). UTI incidence was quiet high in the 26-35
age. Parity may be possible factor affecting the incidence and
prevalence rate of UTIs among women. E.coli was the most
common isolated organism. Thus, the present study has

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highlighted the importance of routine screening of pregnant women for UTI followed by culturing and sensitivity test for appropriate antimicrobial selection to reduce the serious complications of symptomatic UTI. The inhibitory effect of Lactobacillus plantarum on UTI pathogens appeared promising.

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