

Urinary Tract Infections among Pregnant Women in Makkah, Saudi Arabia

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ABSTRACT

Urinary tract infection represents a serious health problem in pregnant women. Scarce information is available about the profile of urinary tract infections among pregnant women in Makkah, KSA. The aim of the current study was to study the prevalence of UTI among pregnant women in Makkah, KSA and to investigate the most frequent causative agents and drug resistance profiles associated with such infections. A total of 200 pregnant women that visited maternity and children hospital in makkah were investigated. Personal data as well as medical history were collected using a well structured questionnaire. Midstream clean catch urine samples for urinalysis, and urine culture were collected from all investigated cases. The results revealed that 20% of investigated pregnant women were positive for UTI (12% with symptomatic UTI and 8% were asymptomatic). *Escherichia coli* was the most frequently isolated bacterial agent (25%) from both symptomatic and asymptomatic bacteriuria. Amoxicillin, cefoxitin, celtaxidime, fusidic acid, norfloxacin, ofloxacin and penicillin showed the least resistance frequency (2.6%). In conclusion, high rate of UTI infection (20%) was recorded among pregnant women with *E. coli* being the most frequently encountered causative agent. Although symptoms are good markers of UTI during pregnancy, special care has to be directed towards asymptomatic cases. Finally, Amoxicillin, cefoxitin, celtaxidime, norfloxacin, penicillin and fusidic acid are the most useful antibiotics for treatment of UTI as they were able to inhibit most of the currently isolated UTI pathogens.

Key words: UTI, Pregnant women, Makkah.

INTRODUCTION

Urinary tract infection (UTI) is one of the most common infections where one or more part of urinary system become infected usually after bacteria overcome the natural defence mechanism of urinary tract (Al-Dujaily, 2000). Although UTI could affect both sexes, women are more frequently affected than men due to short urethra, loss of prostatic secretion, ease of urinary tract contamination by faecal flora and various other reasons. In women however, the incidence of UTI is more frequent in pregnant women as compared to non pregnant ones due to the pregnancy-associated physiological changes, extended abdomen and difficulty of personal hygiene (Awanes et al., 2000).

Clinically, UTI have two principle presentations; symptomatic and asymptomatic bacteriuria (MacLean, 2001; Warren, 1996). Symptomatic UTI could be accompanied with a variety of clinical signs including dysuria, pyuria, strong urge to urinate frequently, even immediately after the bladder is emptied, painful burning sensation, discomfortable pressure and bloody urine, which may have a strong smell (Ferry et al., 1988; Ryan, 2004). In asymptomatic bacteriuria, urine culture reveals significant growth of pathogen (greater than 10^5 bacteria/ml) without showing clinical manifestation (Gilbert et al., 2005). Asymptomatic bacteriuria could be found in pregnant and non pregnant women but pregnancy enhances the progression from asymptomatic to symptomatic form which could lead to pyelonephritis

and adverse obstruction (Connolly and Thorp *et al.*, 1999).

The diagnosis of UTI may be made on the basis of clinical signs and symptoms in combination with urinalysis results. Urine culture remains an important test in the diagnosis of UTI, because it helps in the documentation of the infection, by determining the identity of infecting bacteria and its antimicrobial susceptibility (Stamm and Hooton *et al.*, 1993; Wing *et al.*, 2000).

Urinary tract infections are most often caused by a single bacterial pathogen, frequently originating in the patient's commensally enteric or skin flora. *Escherichia coli*, which is part of the normal gut flora accounts for approximately 85% of community-acquired UTIs and 50% of hospital acquired UTIs. Other common organisms include *Enterococcus faecalis*, *Klebsiella pneumoniae*, and *Staphylococcus saprophyticus*. (Hooton *et al.*, 1996).

The aim of the current study was to study the prevalence of UTI and to investigate the most frequent causative agents and drug resistance profiles associated with such infections among pregnant women attending Obstetrics and Gynecology clinics at the main Maternity and Children Hospital in Makkah, KSA.

MATERIALS AND METHODS

Study population and samples

A total of 200 women with age range of 18 – 45 years were subjected to the study after obtaining their consent. Pregnant women were selected from the Clinic of Obstetrics and Gynecology of Maternity and Children Hospital. Mecca, KSA during the period from May 2010 April 2011. Sterile urine samples for urinalysis and urine culture were collected from all studied cases. Urinalysis and urine cultures were used for the detection of UTI.

Sampling

Selected data related to the presence of suspected UTI-related clinical symptoms were collected by using of structured questionnaire. These symptoms included hematuria, dysuria,

frequent urination, painful burning sensation, abdominal pain or pressure and abnormal urine smell. All women were instructed how to give a clean-catch midstream urine specimen. Briefly, they were asked to clean the area around urethral opening with clean water and alcohol swab, dry it and then collect a midstream urine sample by discarding the first part of urine and collecting 10-20 ml of the midstream in clean and sterile containers. Each sample of urine was divided into 2 parts and were properly labeled and sent to the laboratory with a request for complete urinalysis and urine culture.

Urine examination

The first part of urine sample was examined by dipstick tests using Comber 10 reagent test strips (Analyticon, Germany) that have panels to detect protein, blood, nitrite and leukocyte esterase in urine (Smith *et al.*, 2003). In addition, wet preparations were made from sediment of each urine sample after centrifugation and were microscopically examined at X40 for detection of white blood cells as an indicator of pyuria. Samples with ≥ 10 WBC/field were regarded as pyuric. The second part of urine sample was cultured on plates of blood, MacConkey and CLED (cystine-lactose-electrolyte-deficient) agar with standard calibrated loop delivering 0.01 mL of urine. After streaking, plates were incubated at 37°C for 24 to 48 hours. The plates were then examined macroscopically and microscopically for bacterial growth. Urinary tract infection was positive diagnosed by growth of $\geq 100,000$ colony forming unit (CFU) of urinary tract pathogen per ml in culture of midstream urine sample, regardless of the presence or absence of leukocytes (Stamm and Hooton *et al.*, 1993). Urine cultures with one pathogen were regarded as suspected infections. Cultures with more than one species were considered contaminated, while cultures with no growth of bacteria were said to be negative. Identification of bacterial pathogens was confirmed by observation of Gram staining and biochemical analysis using MicroScan Walk-Away® (DADE BEHRING INC., West Sacramento, CA). In addition Germ tube test was used for identification of *Candida albican*, which produce germ tubes when placed in liquid nutrient environment. Briefly, small inoculums of yeast cells obtained from an isolated colony were suspended

in 0.5 ml of serum. The tubes were incubated at 35°C for 2.5-3 hours. A drop of the incubated serum was placed on a microscope slide and examined at X40 objective for the presence of germ tubes (Forbes *et al.*, 2002).

Antibiotic sensitivity testing

The antibiotic sensitivity profile of isolated pathogens was carried out using MicroScan Walk-Away® (DADE BEHRING INC., West Sacramento, CA) as instructed by the manufacturer. Result were reported qualitatively as either Susceptible (S), Intermediate (I), or Resistant (R).

RESULTS

Prevalence of UTI and among pregnant women:

Out of 200 pregnant women, 40 women (20%) were positive for UTI. Based on the clinical symptoms, 24 (12%) UTI-positive cases were associated with symptoms and classified as

symptomatic UTI, while 16 (8%) cases were not associated with symptoms and considered as asymptomatic UTI (Table 1).

Frequency of UTI-associated microbial agents

Out of the 24 symptomatic UTI cases, *E. coli* was the most frequently isolated pathogen (25%) followed by *Klebsiella pneumonia* (16.7%). On the other hand, *E. coli* and *staph. aureus* were the most frequently isolated pathogens (25% each) from the 16 asymptomatic UTI cases (Table 2).

Anti-bacterial Resistant of Isolated UTI-causative Bacterial Agents

In the current study, antibiotic sensitivity tests were carried out for the recovered bacterial isolated from UTI cases. The outcome of the sensitivity tests were shown in (Table 3). The study revealed that amoxicillin, cefoxitin, celtaxidime, norflaoacin, penicillin and fusidic acid are the most useful antibiotics for treatment of UTI followed by

Table 1: Prevalence of UTI among pregnant women

Investigated population	Symptomatic UTI		Asymptomatic UTI		Total	
	n	%	n	%	n	%
Pregnant women (200)	24	12	16	8	40	20

Table 2: Frequency of UTI-associated microbial agents among pregnant women

Associated Microbial Agents		UTI cases					
		Symptomatic		Asymptomatic		Total	
		n	%	n	%	n	%
Microbial agents associated with UTI cases	<i>Escherichia coli</i>	6	25	4	25	10	25
	<i>Klebseilla pneumonia</i>	4	16.7	2	12.5	6	15
	<i>Staphylococcus aureus</i>	1	4.2	4	25	5	12.5
	<i>Proteus mirabilis</i>	3	12.5	1	6.2	4	10
	<i>Staph. hemolyticus</i>	2	8.3	2	12.5	4	10
	<i>Entrobacter gergovi</i>	3	12.5	0	0	3	7.5
	<i>Streptococcus aglactia</i>	2	8.3	1	6.2	3	7.5
	<i>Candida spp.</i>	1	4.2	1	6.2	2	5.2
	<i>Acinetobacter loffi</i>	1	4.2	0	0	1	2.5
	<i>Enterococcus fecalis</i>	1	4.2	0	0	1	2.5
	<i>Proteus valgaris</i>	0	0	1	6.5	1	2.5

Table 3: Anti-bacterial drug resistance of isolated UTI-causing bacteria

Anti-bacterial Agents	Asymptomatic UTI -15		Symptomatic UTI -23		Total -38	
	n	%	n	%	n	%
Amikacin	1	6.7	1	4.3	2	5.3
Amox/K clav	1	6.7	3	13.04	4	10.5
Amoxicillin	1	6.7	0	0	1	2.6
Amp/Sulbactam	3	20	7	30.4	10	26.3
Ampicillin	6	40	15	65.2	21	55.3
Augmentin	1	6.7	2	8.7	3	7.9
Azithromycin	0	0	2	8.7	2	5.3
Cefazolin	4	26.7	6	26	10	26.3
Cefoxitin	1	6.7	0	0	1	2.6
Ceftriaxone	4	26.7	2	8.7	6	15.8
Cefuroxime	2	13.3	1	4.3	3	7.9
Ceftaxidime	1	6.7	0	0	1	2.6
Cotrimoxazole	1	6.7	3	13.04	4	10.5
Erythromycin	0	0	3	13.04	3	7.9
Fusidic acid	1	6.7	0	0	1	2.6
Gentamicin	2	13.3	4	17.4	6	15.8
Norf	1	6.7	2	8.7	3	7.9
Norfloxacin	1	6.7	0	0	1	2.6
Ofloxacin	1	6.7	0	0	1	2.6
Oxacillin	3	30	2	8.7	5	13.2
Penicillin	1	6.7	0	0	1	2.6
Tetracycline	4	26.7	9	39.13	13	34.21
Ticnam	1	6.7	2	8.7	3	7.9
Trimeth/Sulfa	3	20	7	30.4	10	26.3

amikacin and azithromycin as they showed the least resistance frequency (2.6% and 5.3%, respectively) and were able to inhibit most commonly isolated UTI pathogens. On the other hand, ampicillin and tetracycline, commonly used antibiotics, were poorly effective against the majority of pathogens isolated in the current study with a resistance rate of 55.3% and 34.21%, respectively.

DISCUSSION

The aim of the present study was to investigate the prevalence of UTI among pregnant women attending Maternity and Children hospital in Makkah along with studying of the frequently associated causative agents and the drug resistance profile of such infections.

Interestingly, the overall prevalence of UTI among pregnant women was (20%), which is relatively higher than what was recorded earlier (14.2%) in Saudi Arabia (Al-Sibaie *et al.*, 1989) despite of the medical advancement and improved health care over the past years. Moreover, lower rates (4.8% and 6.1%) were recorded in neighbor countries as UAE and Iran, respectively (Abdullah and Al-Moslih *et al.*, 2005; Hazhir *et al.*, 2007). The high rate reported in the current study could be attributed to the type of the studied population whose ages lie within the most sexually active period of their lives (age mean 29.7 ± 6.5 SD) (Murry *et al.*, 1998). Asymptomatic UTIs were confirmed among 8% out of the investigated cases. The prevalence of asymptomatic bacteriuria varies from one community to another. For example in Asian studies,

while the asymptomatic bacteriuria was 4.3% among Filipino pregnant women (Sescon *et al.*, 2003), it reaches up to 12% in rural areas in Bangladesh (Ullah *et al.*, 2007), in Karachi in Pakistan 28.5% (Sheikh *et al.*, 2000). Similarly, in Africans studies the prevalence of asymptomatic bacteriuria in Ethiopia, Ghana and Nigeria was 9.3%, 7.3% and 45.5%, respectively (Okonko *et al.*, 2009; Turpin *et al.*, 2007; Uncu *et al.*, 2002). Also, in western studies the same differences were recorded. For example while the prevalence of asymptomatic bacteriuria in the USA was 2-7% (Delzell and Lefevre *et al.*, 2000), 4-7% in Canada (Nicolle *et al.*, 1994), it reached up to 16% among Spanish pregnant women (Akinloye *et al.*, 2006). This variation can be attributed to several factors such as the geographical variation, ethnicity of the subjects, setting of the study (primary care, community based, or hospitals), and the variation in the screening tests (urine dipstick, microscopy and culture). In general, asymptomatic bacteriuria in young women is common but rarely persists; however, it is a strong predictor of subsequent symptomatic urinary tract infection (Hooton *et al.*, 2000).

Regarding the causative agent of UTI, the current study revealed that *E. coli* was the most frequently (25%) isolated pathogen from all UTI cases followed by *Klebsella pneumonia* (15%) and *Staphylococcus aureus* (12.5%). The current findings is in general agreement with the majority of the reported studies, which reported *E. coli* as the most common UTI-associated pathogen with a rates of 41.5%, 44%, 47.2%, 63%, 37.5% and 42.1% in Yemen, Ethiopia, Tanzania, Philippines, Ghana and Nigeria, respectively (Al-Haddad *et al.*, 2005; Assefa *et al.*, 2008; Masinde *et al.*, 2009; Okonko *et al.*, 2009; Sescon *et al.*, 2003; Turpin *et al.*, 2007). The predominance of *E. coli* is usually attributed to the urinary stasis, which is common in pregnancy (Delzell and Lefevre, 2000). Moreover, the anatomical and the functional changes that occur during pregnancy that results in a high risk of acquiring UTI from *E. coli* (Abdullah and Al-Moslih *et al.*, 2005).

The antibiotic sensitivity studies conducted on the isolated UTI-causative bacterial agent during the current study revealed that

amoxicillin, cefoxitin, celtaxidime, norfloxacin, penicillin and fusidic acid are the most useful antibiotics for treatment of UTI followed by amikacin and azithromycin as they showed the least resistance frequency (2.6% and 5.3%, respectively) and were able to inhibit most commonly isolated UTI pathogens. On the other hand, ampicillin followed by tetracyclin, which are commonly used antibiotics, were poorly effective against majority of the organisms isolated in this study with a resistance rate of 55.3% and 34.21%, respectively. This differ from the studies and findings in Caucasian women where ampicillin and septrin remain the most useful antimicrobial agents (Ronald *et al.*, 1987) and the findings by Ebie *et al.*, (2001) among patients in Military Hospital, Jos, Nigeria where the isolates were highly susceptible to nitrofurantoin. The efficacy of amoxicillin, cefoxitin, celtaxidime, norfloxacin, penicillin and fusidic acid as reported in the current study could be attributed to the fact that these drugs are relatively expensive when compared to most antibiotics frequently used. This probably had restricted their procurement and indiscriminate use, therefore making the organisms susceptible to them. This is similar to other reports where expensive antibiotics as quinolones are the most effective choice (Ebie *et al.*, 2001; Ehinmidu *et al.*, 2003; Mbata *et al.*, 2007). On the other hand, the high resistance to other drugs may be due to the practices of self medication and indiscriminate use of these antibiotics with the subsequent resistance acquirement.

In conclusion, the current results show that urinary tract infection in pregnancy is a very frequent medical problem in Makkah. Although symptoms are good markers of UTI during pregnancy, antenatal care should include direct questioning and urine examination to discover asymptomatic cases. The important infecting organisms were found to be the commensals of perianal and vaginal regions as *E. coli*, *Staphylococcus* and *Candida* species, which indicate fecal contamination and low personal hygiene. The current findings highlighted the need for constant monitoring of susceptibility of specific pathogens in different populations to commonly used anti-microbial which will significantly assist clinicians in the rational choice of antibiotic therapy to prevent misuse, or overuse of antibiotics.

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