

# Prevalence and Predisposing Factors of Urinary Tract Infections among Pregnant Women in Abha General Hospital

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## Abstract

This study aimed to assess the prevalence of urinary tract infection (UTI) in pregnant women, to identify infectious agents causing the infection, and to explore relationship of specific socio-cultural factors with UTI. This study was conducted at the antenatal clinic of Abha General Hospital, Saudi Arabia from September 2012 to January 2013 on 402 pregnant Saudi women. Midstream urine sample was obtained. A urine analysis test and culture were done as well as socio-demographic data sheet was completed. Among the 402 studied pregnant women, 12.7% were affected with UTI. The main causative agent was escherichia coli(e-coli) followed by staphylococci. It was found that UTI was strongly affected by the presence of previous history of reproductive tract inflammation, history of previous UTI attacks, the presence of UTI related complaints, washing and drying the perineum area, the direction of washing and drying the perineum area, frequency of changing diaper during menstruation and the average of cleaning the bathtub (P= 0.002, 0.000, 0.000, 0.000, 0.05, 0.000 and 0.002 respectively). Our study showed a significant percentage on prevalence of UTI among Saudi pregnant women.

*Keywords:* Escherichia coli; Hygienic practices; Predisposing factors; Pregnant women; Prevalence; Urinary tract infection

## 1. Main text

Urinary tract infection (UTI) is a very frequent and common pathology that can occur at any age. Considering adulthood, 48% of women show at least one occurrence of UTI as well as one occurrence of symptoms suggestive of bacterial cystitis which is a frequent occurrence in the general practice setting. One in three women develops a UTI during their lifetime (compared to 1 in 20 men)[6].

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Higher susceptibility is due to shorter urethra, closer proximity of the anus with *vaginal vestibule* and urethra and the beginning of sexual activity[17, 13]. Other risk factors include immune response, fecal–perineal–urethral contamination[4] altered vaginal biota[3] family history of UTI in a first–degree relative[26], menopause[7], diabetes and pregnancy[23].

UTIs are the most common bacterial infections of pregnancy[24]. Although the prevalence of asymptomatic bacteriuria (ASB) is known to vary between populations, generally, pregnant women are at risk the most [5]. UTI is a major health problem, it has been reported among 20% of the pregnant women and it is the most common cause of admission in obstetrical wards[14]. Symptomatic and asymptomatic bacteriuria has been reported among 17.9% and 13.0% pregnant women, respectively[1].

Recently various risk factors of UTI during pregnancy have been reported; perhaps these are varied according the geographical, social and biological settings[11]. *Escherichia coli* (E–Coli) with its multidrug resistant strains have been found to be the most common cause of UTI among pregnant women. It is accountable for 75% to 90% of uncomplicated UTI isolates[25]. UTIs are usually diagnosed on the basis of history, physical examination, urinalysis and urine culture. Collection of urine specimens for quantitative culture before initiation of antimicrobial therapy is considered the gold standard for the diagnosis of bacterial UTIs[3].

Untreated asymptomatic or symptomatic bacteriuria in pregnancy is associated with a 50% increase in the risk of low birth weight and a significant increase in the risk of premature delivery, pre–eclampsia, hypertension, anemia, and postpartum endometritis[15]. UTI (if untreated) can lead to serious obstetric complications, poor maternal and perinatal outcomes like intrauterine growth restriction, pre–eclampsia, caesarean delivery and preterm deliveries [8].

Safe antimicrobial agents in pregnancy are nitrofurantoin,  $\beta$  lactam antibiotics including both penicillins and cephalosporin and fosfomycin trometamol [18]. An acute uncomplicated urinary tract infection (UTI) is one of the most common bacterial infections in women [19]. It is estimated that 60% of all women report having a UTI at least once in their lifetime [2].

The need for studying the problem in Saudi Arabia is great as there is no available database on the regional or the national level on the prevalence, risk factors, and socioeconomic related factors. The aims of this study are to assess prevalence of urinary tract infection (UTI) in pregnant women, to identify infectious agents causing the infection, to explore relationship of specific socio–cultural factors with UTI and to explore needs for health care and health education.

### *1.1. Materials and methods*

This is a cross-sectional study conducted at the antenatal clinic of Abha General Hospital (AGH) during the period from September 2012 to January 2013. A total of 402 Saudi pregnant women were enrolled in the study. An approval was taken from the Ethical Committee of King Khalid University (KKU) and Director of the mentioned hospital. Informed consents were secured from participating patients.

A comprehensive questionnaire was designed and used which includes the following data: socio demographic profile, present and past history of pregnant women, factors predisposing to UTI, UTI related complaints and hygienic practices of pregnant women.

Mid-stream urine (MSU) specimen was collected from each pregnant woman and tested for presence of UTI using urine analysis and culture. Urine examinations were performed macroscopically and microscopically through direct visual observation followed by urine dipstick chemical. A positive nitrite test indicated that bacteria might be present; E–coli were likely to give a positive test and leukocyte esterase.

The urine samples with high bacteria, white blood cells (WBC) counts, positive nitrate and Leucocytes esterase were directly inoculated on Cystine Lactose Electrolyte Deficient (CLED) agar in 37°C for 24–48 hours. The plates were checked for growth. After colony counting, bacterial colonies were diagnosed by culturing on differential suitable biochemical media. All positive cultures were kept about 48 hours for possible workup.

In the culture results interpretation, the plates were observed after 18 to 24 hours incubation for growth and number of colonies. Each colony represented 1000 organisms per cu mm in the original specimen. The identification and sensitivities were done based upon numbers of colonies and numbers of species of bacteria isolated.

All statistical analyses were performed using SPSS. Descriptive statistics was expressed using mean, mode and frequency. The Levene's test was used to compare between mean of different numerical values while for categorical data, chi-square test ( $X^2$ ) was used. The differences are considered significant when P value is equal to or less than 0.5 and considered highly significant when P. value was equal to or less than 0.002.

### 1.2. Results

The present study included a total sample of 402 pregnant women recruited from AGH. Table 1 discusses age, level of education, occupation, presence of a second wife, number of children, and family income in Saudi Riyal (SR). The age of pregnant women in the study sample ranged from 19–29 years old for 253 subjects (62.9%) with a mean age of 27.17±5.18 years. Half of the sample (201, 50%) had secondary school education, 36.8% had university education and the minority (13.2%) had only primary education. The majority of the study sample were housewives (300, 74.6%). Only 102 (25.3%) women were working as teachers. Three hundred fifteen (78.4%) of the sample had a number of children from 1 to 3 with a mean of 1.67±1.14 child. In relation to the polygamy marriage, 340 women (84.6%) stated that their husbands had no other wives. Regarding family income in SR, the same table displays that 304 (75.6%) of the sample had monthly income between 7 to 10 thousand SR with a mean of 9.97±1.65 thousand SR.

Table 1. Socio-demographic profile of the study sample (N=402)

Socio-demographic profile	Frequency	%
Age group (years)		
19– 29	253	62.9%
30– 40	149	37.1%
Mean age and Std. deviation	27.17±5.18 year	
Level of education		
Primary education	53	13.2%
Secondary education	201	50%
University education	148	36.8%
Occupation:		
House wife	300	74.6%
Teacher	102	25.4%
Polygamy marriage		

Yes	62	15.4%
No	340	84.6%
Number of Children		
No children	63	15.7%
1– 3 children	315	78.4%
More than 3 children	24	5.9%
Mean and std. deviation	1.67±1.14 child	
Family monthly income in SR		
From 7–10 thousand	304	75.6%
11– 15 thousand	98	24.4%
Mean and std. deviation	9.97±1.65 thousand SR	

The presence of UTI infection among pregnant women and its causative agent are shown in Table 2. The presence of bacteria was found to be 12.7% (51 out of 402). As for the causative agent, 32 (62.7%) revealed no-growth in urinary culture, 10 (19.6%) had e-coli then, followed by staphylococci for 7 (13.7%) subjects while equal number of subjects (1 subject/each) proved the presence of Candida and Lactobacilli.

Table 2. Prevalence and causative agent of current UTI among pregnant women

Variable	Frequency	%
Presence of bacteria(No=402):		
Yes	51	12.7%
No	351	87.3%
Total	402	100%
Causative agent evidenced by urine culture(No=51):		
No growth	32	62.7%
E- Coli	10	19.6%
Staphylococci	7	13.7%
Candida	1	2%

Lactobacilli	1	2%
Total	51	100%

Table 3 shows no significant difference as regards pregnant women with current UTI (51) and of pregnant women without current UTI (351) ( $X^2= 0.088, 0.326, \text{ and } 0.309, P= 0.621, 0.909, \text{ and } 0.512$ ). Moreover, the level of education and polygamy marriage in both pregnant women with current and without UTI also shows no significant differences ( $X^2= 0.205 \text{ and } 0.784, P= 0.902 \text{ and } 0.406$ ).

Table 3. Comparison of socio–demographic data in pregnant women with and without current UTI

Item	With Current UTI		Without Current UTI		Exact Levene's test	P
Mean Age in years	27.51±5.18		27.13±5.18		0.088	0.621
Mean number of children	1.69±1.06		1.67±1.15		0.326	0.909
Mean monthly family income	1.51±9.82		1.66±9.99		0.309	0.512
Level Of Education:	Frequency	%	Frequency	%	Exact Pearson $X^2$ test value  0.205	0.902
Primary (100%= 53)	7	13.2%	46	86.8%		
Secondary (100%=201)	24	11.9%	177	88.1%		
University (100%= 148)	20	13.5%	128	86.5%		
Polygamy marriage:					Exact Pearson $X^2$ test value  0.784	0.406
Yes (100%= 62)	10	16.1%	52	83.9%		
No (100%=340)	41	12.1%	299	87.9%		

Table 4 displays that past history of inflammation in the reproductive tract as regards the women with current UTI and without UTI is found highly significant difference ( $X^2= 13.08, P= 0.002$ ). On the other hand, regarding previous abortions; 3.9% of pregnant women with current UTI stated that they had previous history of abortion while 96.1 % of them did not. Whereas, the prevalence of UTI as to previous history of abortion is found not statistically significant ( $X^2= 0.835 \text{ and } P= 0.556$ ). Finally, the mean number of previous pregnancies is ( $1.69 \pm 1.068$  and  $1.67 \pm 1.154$  respectively) have shown no statistically significant difference (Levene's test= 0.785 and  $P= 0.982$ ).

Table 4. Relationship between past obstetric history and pregnant women with and without UTI

Item	With Current UTI		Without Current UTI		Exact Levene's test	P
	Frequency	%	Frequency	%		
Past history of inflammation in reproductive tract:					Pearson $\chi^2=13.08$	0.002**
Yes	9	17.6%	16	4.5%		
No	42	82.4%	335	95.5%		
Previous abortions:					Pearson $\chi^2=0.835$	0.556
Yes	2	3.9%	26	7.4%		
No	49	96.1%	325	92.6%		
Mean of previous pregnancies	1.69 ±1.068		1.67±1.154		Levene's test= 0.785	0.982

Table 5 shows prevalence of UTI in terms of the presence of history of previous attack of UTI and presence of UTI related complaints, the results showed highly significant difference ( $\chi^2= 58.129$ ,  $P= 0.000$ ). In the same context, it shows that all pregnant women with current UTI experience a UTI related complaints while none of the pregnant women without current UTI experience any UTI related complaints, with regard to this, the results have shown a highly significant statistical difference ( $\chi^2= 402$  and  $P= 0.000$ ).

Table 5. Presence of past history of UTI and UTI Complaint in pregnant women with and without current UTI

Item	With Current UTI		Without Current UTI		Exact Chi-Square test value	P
	Frequency	%	Frequency	%		
Presence of UTI past history:					58.129	0.000**
Yes	12	23.5%	0	0.0%		
No	39	76.5%	351	100%		
Presence of UTI related complaints:					402.0	0.000**
Yes	51	100%	0	0.0%		
No	0	0.0%	351	100%		

Table 6 shows that 342 out of 402 pregnant women (85.1%) experienced difficulty when trying to express their UTI related complaints to their physicians: 136 (33.8%) felt shy, 29 (26%) stated that the gender of their doctor (male) was the cause, 98 (24.4%) stated that language was the barrier and only 19 (4.7%) found that is limited time of the doctor. Of these 60 (14.9%) pregnant women, nobody receive any education related to this subject in the clinic either by a doctor or a nurse educator.

Table 6. UTI related complaints expression, reasons of complaints and health education received by pregnant women

Item	Frequency	%
Presence of difficulty in UTI related complaints expression:		
Yes	342	85.1%
No	60	14.9%
Reason for UTI related complaints in expression (100%=342):		
Being shy of telling	136	33.8%
Physician's language	98	24.4%
Physician gender	89	26%
Limited physician's time	19	4.7%
Health education delivery related to UTI:		
Yes	0	0.0%
No	60	100%

With regard to the comparison of different hygienic practices in pregnant women with and without UTI, Table 7 illustrates that pregnant women with and without current UTI are found to be of highly significant with regard to: washing and drying perineum area after urination and defecation, direction of drying, frequency of cleaning the bathtub and frequency of changing diaper during menstruation, results show that the difference is highly significant ( $X^2= 62.44, 5.675, 12.381$  and  $31.406$  respectively and  $P= 0.000, 0.05, 0.002$  and  $0.000$  respectively).

Table 7. Comparison of different hygienic practices in pregnant women with and without UTI

Item	With Current UTI		Without Current UTI		Exact Chi-square value	P. Value
	Frequency	%	Frequency	%		
Washing and drying premium after urination and defecation:	No.= 51	100%	No.=351	100%	62.44	0.000**
Yes	18	35.3%	13	3.7%		
No	33	64.7%	338	96.3%		
Direction of drying premium after urination and defecation:	No.= 18	100%	No.= 13	100%	5.675	0.05*
Backward	1	5.6%	5	38.4%		
Forward	6	33.3%	4	30.8%		
Non-specific direction	11	61.1%	4	30.8%		
Frequency of bathtub cleaning:					12.381	0.002**
Before bathing	10	19.6%	158	45%		
Daily	12	23.5%	47	13.4%		
Weekly	29	56.9%	146	41.6%		
Frequency of diaper changing During menstruation:					31.406	0.000**
Once daily	16	31.4%	220	62.7%		
Twice daily	8	15.7%	67	19.1%		
When needed	27	52.9%	64	18.2		

### 1.3. Discussion

Low socioeconomic level, high parity and advanced age, among others, are factors associated with urinary infection during pregnancy [6]. But in this study, the age of the majority (62.9%) of the subjects is between 19–29 years old and the mean is 27.17±5.18 year (Table 1). Researchers do not find it strange that the pregnant population is within certain age limits. When the same phenomenon was investigated it was found that pregnant women were young, presenting average and median age of 25 years[6]. In Sudan, all studies about the epidemiology of UTIs and antibiotics sensitivity among pregnant women at Khartoum North Hospital concluded that the mean age of the sample was 27.5 years old[27].



Half of the sample (201, 50%) had a secondary school education, 36.8% had university education and 13.2% had only primary education (Table 1). This is different from the results of a similar study that stated that maternal educational level of pregnant women was 44.7%. Most of these women completed their elementary education. In the same mentioned study, researchers reported a low economical level of their subjects [12]. In our study, the high level of education of the subjects is due to the fact that education is completely free for all Saudi citizens from elementary school to university level.

Almost three quarters of the sample (74.6%) were housewives (Table 1), and this was also surprisingly found in a similar study in western countries where 54.3% of the samples were unemployed [12]. The mean number of children for subjects was  $1.67 \pm 1.14$  child (Table 2). Even though, Saudi fertility rate was (2.26 child/woman) [16], this result could be seen normal in relation to the age of the subjects. Similar to other research findings that 70% were primiparous women or had only one child [12].

Regarding prevalence of UTI among the sample subjects, 12.7% had current UTI infection (Table 2). This result is evidential of the geographical difference in relation to prevalence of UTI among pregnant women. Prevalence rate of UTI among pregnant women in Asir region, Saudi Arabia was 4 times higher than those of which was 4.3% only [12], more than of the results of western countries [22], lower than Qatar prevalence (16.99%) [12], lower than Sudani prevalence rate (14%) [27], lower than Uganda rates (13.1%) and far lower than those of eastern southern Asia (51.1%) [20].

Surprisingly, the urinary culture of 62.7% of the pregnant women who had UTI in the current study revealed no-growth (Table 2). However in a study of antibiotic screening of urine culture it was found that (1.13%) had no growth even though bacteria was found in the urine analysis [9]. This finding indicates that (a) the history was not taken properly; (b) the patients were unwilling to give proper history. In similar study in Sudan, researchers stated that the on-growth culture is either a viral infection or an acute urethral syndrome which is a condition in which there are complaints suggesting UTI, but when cultured, organism is below the number that could be effectively cultured [27].

Considering the organism causing UTI in this study we found that 19.5% was caused by E.Coli followed by staphylococci with 13.7% (Table 2). E-Coli has been well known as the classical number one causative agent of UTI [22, 9, 20]. Staphylococci cocci was usually thought of as a rare cause of UTI except in Sudan and Uganda [27] which need more light to be shed on the similarities between Khartoom (Sudan), Uganda, and Asir (Saudi Arabia) that leads to having the same pattern of prevalence.

*Candida albicans* and *Lactobacilli* were responsible for 4% of UTI (Table 2). As both are normal flora in the perineum and vagina [7], it could be understood that by a certain way ascending of such agents to urethral meatus was the start point to start the infection. In the current study there was no relationship between age, number of children and UTI prevalence (Table 3). Even though it was stated in literature that these factors have an association with UTI prevalence [10], but in this study, the age has affected the parity and was affected by the fact that the subjects were pregnant women. Also, monthly income was not clearly a factor that might affect the UTI prevalence because all subjects were recruited from AGH visited by patients not economically able to use private sector health facilities.

The history of inflammation in the reproductive tract among pregnant women with current UTI was 17.6% while it was only 4.5% among pregnant women with no current UTI showing a highly significant statically difference between them ( $X^2 = 13.08$ ,  $P = 0.002$ ). Previous abortions rate was 3.9% among pregnant women with current UTI, and 7.4% among pregnant women with no current UTI, with no significant statistically difference ( $X^2 = 0.835$  and  $P = 0.556$ ). The mean number of previous pregnancies was  $1.69 \pm 1.068$  and  $1.67 \pm 1.154$  respectively among women

with and without current UTI with no statistically significant difference between the 2 groups (Levene's test= 0.785 and P= 0.982) (Table 4). In relation to inflammation of reproductive tract, this result is similar to what is stated in literature that virginity is among risk factors that increases prevalence of UTI while for the parity and history of abortion, the results of the study at hand does not match the literature as it is well known that these two factors are among risk factors that increases prevalence of UTI[21].

The history of previous UTI attack was 23.55% among pregnant women with current UTI, none among pregnant women without current UTI with a highly statistical difference ( $X^2= 58.129$  and  $P= 0.000$ ). Also, it was found that all pregnant women with current UTI experienced a UTI related complaint while none of the pregnant women without current UTI experienced any UTI related complaints. This factor is of a highly statistical difference ( $X^2= 402$  and  $P= 0.000$ ) (Table 5). This result is completely similar to the results of previous similar researches [6, 27, 12].

About 85.1% of the sample experienced difficulty when trying to express their UTI related complaints to their physicians. None of the pregnant women who expressed their UTI related complaints to their physicians received any education related to this subject in the clinic either by a doctor or a nurse educator (Table 6). It is thus necessary for physicians and nurses to spend time speaking with patients reporting UTI symptoms in order to gain a better understanding of the causes of the UTI[7].

Hygienic practices of pregnant women with and without current UTI proved to be an effective factor affecting the prevalence of UTI. When pregnant women with and without current UTI were compared using  $X^2$  with regard to: washing and drying perineum area after urination and defecation, direction of drying, frequency of cleaning the bathtub and the frequency of changing diaper during menstruation, results showed that there was a difference between the two groups that is highly significant (except for direction of drying perineum area which was only significant statistically) with  $X^2= 62.44, 5.675, 12.381$  and  $31.406$  respectively and  $P= 0.000, 0.05, 0.002$  and  $0.000$  respectively (Table 7). The results of the direction of washing and drying premium area were found to be a factor that increases prevalence of UTI among pregnant women and it explains the 19.7% of E-Coli cultured organism in this study as E-Coli is an intestinal normal flora that might be entered to urethra through washing or drying premium area backwardly.

As for the relation between frequency of changing diapers during menstruation and cleaning the bathtub before bathing, we can say that as researchers we could not find any similar studies that have ever introduced these two factors to be studied in relation to UTI. However, we all know from literature that sitting in the bathtub for female is a factor that may contribute to UTI[7]. While, as researchers, we think that it is very logical to occur among females who are not frequently changing diapers during the menstruation which gives proper media (with humidity and highly contaminated area as premium) for bacterial growth and gives it a higher chance to enter the urinary tract.

UTI is one of the major health problems among pregnant women attending the antenatal clinic in AGH. Among the 402 pregnant women studied, it affected 12.7% of them regardless of age, parity, or educational level. The main causative organism was E-Coli and the second is Staphylococci. The possibility of the occurrence of UTI and the possible maternal and perinatal consequences carry out urine cultures routinely at the beginning of pregnancy. Even though UTI is the second cause all over the world for antibiotic prescription and even though it might have serious connotations on both the pregnant woman and her fetus, UTI is a preventable disease that could be easily controlled through health education to target groups about its nature, causes, risk factors and preventive measures.

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