Association Between Sexual and Genital Hygiene Habits With the Urinary Tract Infection During Pregnancy: A Case-Control Study

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Abstract

Objectives: Urinary tract infections (UTIs) are the most common type of infection during pregnancy, which cause serious complications for the mother and baby. The present study was conducted to investigate the relationship between sexual and genital hygiene habits and UTIs in pregnant women.

Materials and Methods: This case-control study was conducted on 187 pregnant women including 97 pregnant women with symptomatic bacteriuria (case) and 90 healthy pregnant women (control). Controls were frequency matched with the cases with respect to the number of pregnancy and trimesters of pregnancy. Both groups were compared for the presence of UTI. Finally, the binary multivariate unconditional logistic regression approach was used to evaluate the association between UTI and the confounding variables.

Results: The results of this study showed a significant association between UTI in pregnancy and sexual and genital hygiene habits ($P<0.05$). Based on the binary multivariate logistic regression analysis, attributable risks for UTI included having sexual intercourse >3 times/week (adjusted odds ratio [AOR] = 3.68, 95% CI = 2.09-5.41, $P=0.001$), changing the underwear per week (AOR = 1.39, 95% CI = 1-1.76, $P=0.012$), not voiding post-coitus (AOR = 2.01, 95% CI = 1.34-2.69, $P=0.01$), washing genitalia from back to the front (AOR = 1.96, 95% CI = 1.06-2.78, $P=0.01$), and not washing genitals pre-coitus by the husband (AOR = 1.20, 95% CI = 0.54-1.9, $P=0.024$) were among the sexual and hygiene habit variables associated with UTI in pregnant women in this model.

Conclusions: In general, sexual and genital hygiene habits are vital preventive actions for controlling the UTI in pregnant women. These actions may lead to UTI complications and a preterm birth reduction. Thus, informing spouses about these practices is highly suggested.

Keywords: Sexual habits, Hygienic habits, Urinary tract infection, Pregnancy

Introduction

Urinary tract infections (UTIs) are considered as the most common type of bacterial infection during pregnancy. In addition, UTIs during pregnancy are classified into the infections of the lower (cystitis) or upper (pyelonephritis) urinary tracts. The lower UTIs are associated with a 40% increased risk of developing pyelonephritis in pregnancy, which occur in response to the physiological changes in the urinary tract during pregnancy, an increase in sex hormones, the increased bladder volume, and decreased bladder tone, along with the decreased urethral tone contributing to increased urinary stasis and vesicoureteral reflux (1,2). These changes, along with a short urethra-vagina distance increase the frequency of UTI during pregnancy (3). The prevalence of UTI is considerable among pregnant women in Asian countries such as Pakistan (12.4%), Turkey (8.5%), India (13.3%), and Iran (13%) (4-7). Further, UTI during pregnancy can have
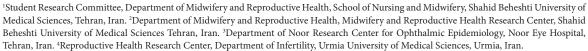
serious complications affecting the health of both mother and fetus, including preterm labor, low birth weight, intrauterine growth retardation, fetal death, or maternal systemic infection (2,8).

The UTI prevalence is considerable among Iranian pregnant women and antibiotics resistance is also high in Iran (7). Importantly, preventing UTI is essential for maternal and infant health improvement, as well as the reduction of the preterm birth risk (9). There is inadequate evidence about the influence of sexual and genital hygiene habits on UTI during pregnancy. Thus, the current study aimed to determine the association between UTI and sexual and genital hygiene habits in pregnant women.

Materials and Methods

Study Design and Selection of Cases and Controls

In this case-control study, the association between sexual and genital hygiene habits and UTI was investigated in

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pregnant women seeking care in Imam Reza Hospital in Urmia, the Northwest of Iran from February to July in 2018. In general, 187 pregnant women including 97 cases diagnosed with a symptomatic UTI were compared with 90 healthy controls who had neither symptomatic nor asymptomatic bacteriuria. The inclusion criteria for both groups were the age range between 18 and 35 years old. On the other hand, the exclusion criteria for both groups included a history of recurrent UTI, urinary tract anomalies, anemia, obesity (body mass index of $30 \geq$ kg/m^2), diabetes, urinary tract stent, urinary incontinence, neurogenic bladder, asymptomatic bacteriuria (10), kidney stones, or substance abuse, and the use of immunosuppressive drugs. The two groups were matched in terms of the number of pregnancies and trimesters of pregnancy. Furthermore, the group matching was performed to select the control group who met the inclusion criteria and was presented in the prenatal care clinic. Moreover, the case group included pregnant women within the age range of 18-35 years old who attended the prenatal care clinic complaining of UTI symptoms. Those who met the inclusion criteria were consecutively enrolled from the prenatal care clinic until attaining the calculated sample size.

Data Collection

The data were collected in the prenatal care clinic by using a self-administered questionnaire. The questionnaire included three sections. The first section was related to demographic and obstetric characteristics. The second section was about sexual habits including the number of sexual intercourses per week, pre-coitus genitals washing by the husband, and post-coitus voiding by the woman. Additionally, the third part included some questions about the genital hygiene habits including changing the underwear clothes per week, drying genitalia after washing, washing genitalia by the women, and considering the amount of the daily intake of water. The data about the history of diagnosis, treatment, and the results of laboratory analysis were extracted from medical charts in the clinics. In addition, clinical signs, urinalysis, and urine cultures were used for the diagnosis of UTI in the case group by obstetricians working in the prenatal care clinic. Further, the results of the urine cultures and urinalysis were used to confirm the diagnosis of UTI. The clinical signs of UTI were defined by dysuria, urgency, and the frequency of urination (acute cystitis), or the presence of fever (>38°C), chills, vomiting, nausea and/or loin pain in addition to the presence and absence of the symptoms of cystitis (acute pyelonephritis) (11). Furthermore, the abnormal urine analysis was characterized by pyuria (detecting more than 10 leukocytes per microscopic field), as well as the presence of red blood cells and positive nitrite test (2,11). Gestational age was estimated based on the last menstrual period. Body mass index (BMI) was calculated using height and weight measurements and stratified to four categories including normal BMI $\geq$18.5-24.9 kg/m^2, underweight BMI <18.5 kg/m^2, overweight BMI $\geq$25.0-29.9 kg/m^2, and obese BMI $\geq$30.0 kg/m^2.

Diagnostic Assessment

UTI was diagnosed by midstream urine samples in the HiChrome UTI Blood Agar plate. Moreover, the samples were incubated under aerobic conditions at 37 °C and then read after 48 hours. The growth of more than 10^5 colony-forming units of one organism per milliliter on the urine culture plate was considered positive (2).

Sample Size

The sample calculation was based on the formula used for a case-control study according to the study by Jorde et al (12). The sample size was determined considering a 95% confidence interval (Zα/2 = 1.96), 90% power (Zβ = 1.28), with a case-to-control ratio of 1:1, as well as considering a 15% non-response rate. Therefore, the final sample size was calculated as 180 (90 cases and 90 controls).

Statistical Analysis

The Kolmogorov-Smirnov test was done to evaluate the normal distribution of data. Additionally, categorical variables were evaluated using the chi-square test or Fisher exact test, as appropriate. Similarly, the continuous variables were assessed using the *t* test or the Mann-Whitney U test, as appropriate, in order to determine the association between the variables in case and control groups. A *P* value of less than 0.05 was considered statistically significant. In addition, binary multivariate unconditional logistic regression analysis was used for adjusted genital hygiene habits and sexual variables, as well as demographic characteristics to determine the association between the risk factors and UTI. Eventually, the data were analyzed in SPSS software, version 24.

Results

Overall, 187 participants were recruited, including 97 pregnant women with UTI (case group) and 90 pregnant women without UTI (control group). The demographic and obstetrical characteristics of the participants are shown in Table 1. The mean gestational age of case and control groups was 26±11.7 and 25.1±10.5 weeks, respectively. Further, the mean BMI of women in case and control groups was equal to 24.7±2.9 and 24.62±3 kg/m^2, respectively. As subjects in both groups were matched with respect to the gravid and gestational age, no significant differences were observed in this regard. However, there was a significant difference regarding the monthly income of the participants between the two groups (*P*<0.05, Table 1).

Table 2 summarizes the results of the comparison of sexual and genital hygiene habits between the participants. There were significant differences in the association

Table 1. Demographic and Obstetric Characteristics of the Participants

Variable		Case (n = 97) No. (%)	Control (n = 90) No. (%)	P Value
Maternal age (year, Mean ± SD)		26.4±4.49	27.5±4.69	0.106[a]
Monthly income	Low	72 (74.%)	53 (60%)	0.034[b]
	Moderate	20 (20.7%)	28 (29.7%)	
	High	5 (5.3%)	9 (10.3%)	
Education	University	16 (16.5%)	21 (22.2%)	0.255[b]
	High school	31 (32.4%)	35 (40%)	
	Middle school	21 (21.6%)	17 (18.3%)	
	Primary school	25 (25.4%)	14 (15%)	
	Illiterate	4 (4.1%)	3) (4.5%)	
Husband education	University	21 (21.6%)	22 (23.2%)	0.285[b]
	High school	33 (33.9%)	37 (41.3%)	
	Middle school	19 (19.6%)	20 (23.2%)	
	Primary school	22 (22.8%)	11 (12.3%)	
	Illiterate	2 (2.1%)	0	
Gravida	One	27 (28%)	23 (25.6%)	0.595[b]
	Two	38 (39.6%)	39 (43.2%)	
	Three	24 (24.4%)	21 (22.7%)	
	Four	8 (8%)	7 (8.8%)	
BMI	Normal (18.5-24.9 kg/m²)	54 (56.7%)	50 (57.8%)	0.625[c]
	Over weight (25-29.9 kg/m²)	43 (43.3%)	40 (42.2%)	
Gestational age	First trimester	22 (22.6%)	24 (26.7%)	0.570[b]
	Second trimester	26 (26.6%)	26 (28.9%)	
	Third trimester	49 (50.8%)	40 (44.4%)	

Note. SD: Standard deviation; BMI: Body mass index.
[a] Student's *t* test.
[b] Mann-Whitney values are presented as mean ± SD.
[c] Chi-square values are presented as numbers (%).

Table 2. Comparison of Sexual and Genital Hygiene Habits Between the Participants

Variable		Case (n = 97)	Control (n = 90)	P Value
Sexual intercourse per week	<3 times	55 (56.7%)	72 (80%)	0.001[a]
	≥3 times	47 (43.3%)	18 (20%)	
Changing the underwear per week	<3 times	42 (43.3%)	28 (31.1%)	0.031[a]
	≥3 times	55 (56.7%)	62 (68.9%)	
Drying genitalia after washing	Yes	81 (83.5%)	76 (84.4%)	0.833[a]
	No	16 (16.5%)	14 (15.6%)	
Washing genitals pre-coitus by husband	Yes	73 (75.4%)	81 (90%)	0.013[a]
	No	24 (24.6%)	9 (10%)	
Voiding postcoitus by the woman	Yes	74 (76.4%)	85 (94.4%)	0.007[a]
	No	23 (23.6%)	5 (5.6%)	
Washing genitals	From front to back	71 (73.3%)	80 (88.9%)	0.014[a]
	From back to front	26 (26.7%)	10 (11.1%)	
Daily intake of water (Mean ± SD)		2±1.08 glasses	2.5±1.05 glasses	0.426[b]

Note. SD: Standard deviation.
[a] Chi-square values are presented as numbers (%).
[b] Mann-Whitney U values are presented as mean ± SD.

between the UTI and some sexual and genital hygienic habits variables such as having sexual intercourse, changing the underwear per week, not voiding post-coitus by woman, not washing genitals pre–coitus by husband, washing genitals from back to front, and changing the underwear between the study groups (*P* < 0.05, Table 2). In this study, *Escherichia coli* was reported as the most common pathogen among pregnant women (70.3%),

followed by *Staphylococcus aureus* (11.1%) as the second most common pathogen (Table 3).

Table 4 presents the results of the multivariate unconditional logistic regression analysis. The association was evaluated between the confounding risk factors, namely, sexual and genital hygiene habits (i.e., Considering the frequency of intercourse per week, not voiding post-coitus, washing genitals from back to front,

Table 3. The Types of Bacteriologic Species Isolated From the Urine Culture of Symptomatic Pregnant Women With UTI

Germs	N	%
Escherichia coli	68	70.3
Staphylococcus aureus	11	11.1
Citrobacter spp.	1	1.1
Staphylococcus epidermidis	5	5.1
Klebsiella spp.	7	7.2
Pseudomonas	5	5.2
Total	97	100

Note. UTI: urinary tract infection.

not washing genitals pre-coitus by the husband, changing the underwear per week, drying genitalia per week,

and considering daily water intake) and demographic characteristics (i.e., BMI, monthly income, women's age, and the education level) and UTI. The presence of at least one of these factors was considered as a predictive of UTI: Intercourse >3 times per week (OR = 3.68, 95% CI = 2.09-5.41, $P = 0.001$), not voiding post-coitus (OR = 2.01, 95% CI = 1.34-2.69, $P = 0.001$), washing genitals from back to front (OR = 1.96, 95% CI = 1.06-2.78, $P = 0.01$), not washing genitals pre-coitus by the husband (OR = 1.20, 95% CI = 0.54-1.9, $P = 0.024$), and changing the underwear less than three times per week (OR = 1.39, 95% CI = 1-1.76, $P = 0.012$) were among the variables of sexual and genital hygiene habits that were associated with UTI in the binary multiple logistic regression model. Women's (OR = 1.29, 95% CI = 0.88-2.94, $P = 0.043$) and husbands' (OR = 1.15, 95% CI = 0.18-2.32, $P = 0.049$) primary level of education

Table 4. The Multiple Logistic Regression Analysis Adjusted for Sexual and Genital Hygiene Habits and Confounding Variables of UTI

Variable	Category	Adjusted OR (95% CI)	P Value
Sexual intercourse per week	Intercourse per week ≤3 times	1	
	Intercourse per week >3 times	3.68 (2.09-5.41)	<0.001
Voiding post-coitus by the woman	Voiding after coitus	1	
	Not voiding after coitus	2.01 (1.34-2.69)	<0.001
Washing genitals from back to front	Washing genitals from front to back	1	
	Washing genitals from back to front	1.96 (1.06-2.78)	0.01
Washing genitals precoitus by husband	Washing genitals precoitus	1	
	Not washing genitals precoitus	1.20 (0.54-1.9)	0.024
Changing underwear per week	Changing underwear more than three time per week	1	
	Changing underwear less than three time per week	1.38 (1-1.76)	0.012
Drying genitalia after washing	Yes	1	
	No	1.17 (0.51-2.64)	0.709
Daily water intake	1-2 glass	1	
	3-4 glass	1.49 (0.22-9.84)	0.67
	5-6 glass	0.62 (0.10-3.77)	0.60
	7-8 glass	1.32 (0.20-8.32)	0.76
	>8 glass	0.55 (0.8-3.63)	0.53
BMI	Normal	1	
	Over weight	1.21 (0.66-2.23)	0.528
Family income (monthly)	High	1	
	Moderate	1.41 (0.77-2.80)	0.32
	Low	5.03 (1-7.64)	0.052
Education	University	1	
	High school	0.37 (0.06-2.28)	0.28
	Middle school	0.77 (0.24-2.48)	0.66
	Primary school	1.29 (0.88-2.94)	0.043
	Illiterate	0.97 (0.35-2.76)	0.96
Age	18-23 year	1	
	24-29 year	0.57 (0.22-1.48)	0.25
	30-35 year	1.13 (0.53-2.41)	0.73
Husband's education	University	1	
	High school	0.41 (0.07-2.71)	0.33
	Middle school	0.42 (0.11-1.58)	0.20
	Primary school	1.15 (0.48-2.32)	0.049
	Illiterate	1.11 (0.38-3.18)	0.84

Note. UTI: Urinary tract infections; OR: odds ratio: CI: confidence interval; BMI: body mass index.

were also among the demographic characteristics that were significantly associated with the risk of UTI in pregnant women in this model.

Discussion

The results of this study showed that sexual and genital hygiene habits were associated with UTI in pregnant women after adjusting for the confounders. In this study, most of the identified risk factors for UTI were similar to those found in previous studies on the urogenital infections of non-pregnant women in the menstruating age (3,13). In accordance with these results, two observational studies evaluated the association between UTI and sexual and genital hygiene habits during pregnancy. Amiri et al, in a case-control study on a total of 250 pregnant women with asymptomatic bacteriuria, found that sexual and genital hygiene habits such as sexual intercourse for more than or equal to 3 times per week, not washing genitals pre-coitus, not voiding after coitus, and washing genitals from back to front may be associated with UTI in pregnant women (14). Similarly, Abdel-Aziz Elzayat et al reported that genital hygiene habits such as washing genitals from back to front and having sexual intercourse for more than or equal to 2 times per week in pregnant women were associated with the incidence of UTIs (15).

In our study, sexual intercourse for more than 3 times per week was related to UTI, attributing to the fact that the mechanical manner of sexual intercourse may increase the transfer of uropathogens into the urethra and bladder. This relationship was also reported for recurrent cystitis (3,9,16). However, washing the genital area and voiding after intercourse may have a preventive effect against the UTI. The results of our study demonstrated that women who usually did not void post-coitus were most likely to develop the UTI compared to those who did urinate after intercourse, which is in line with the results of studies by Ahmed et al and Amiri et al (14,17). UTI was also found to be prevalent among pregnant women whose husbands did not wash genitals pre-coitus. These findings are in agreement with those of Amiri et al and Mohamed et al (14,18).

Based on the results of the present study, the direction of wiping or washing the genital area after voiding was considered to be important and women who washed their genital area from back to front showed a higher incidence of UTIs. This was reported in some other studies like Ahmed et ak(17), Abdel-Aziz Elzayat (15), and Amiri et al (14). The hygiene habits related to toilet hygiene such as wiping or washing perineal area from back to front after urination or defecation are more likely to develop the anal or vaginal flora into the urethra (19). Thus, educating the women on the direction of washing the genital and suggestion for urination after sexual can decrease the prevalence of UTI in pregnant women (20).

The results of this study also revealed that women who changed the underwear less than three times per week were more at the risk of UTI. Excessive vaginal discharge due to physiological and hormonal changes during pregnancy would lead to some consequences like an increase in the amount of moisture, microbial growth, and urogenital infection risk (21,22). Previous studies suggested that the frequent changing of underwear can decrease the risk of urogenital infection (14,19).

In our study, the mean of daily water intake was low in both groups, but there was no significant difference between the groups, which was not consistent with the results of other studies (14,23). This decrease in daily water intake may be due to the intake of other liquids instead of water.

Finally, it was found that spouses with low education levels were more at risk for UTI. In other words, the risk of UTI was 1.29 times higher in the group of women who had the primary level of education compared to women who had a higher level of education. In addition, the risk of UTI was 1.15 times higher in the group of men who had a primary level of education compared to those who had a higher level of education. Additionally, some Iranian studies reported that a low educational level was associated with an increase in the UTI risk in pregnant women (24-26). Sexual hygienic habits are influenced by the knowledge, beliefs, and habits considering health improvement as the main goal (27). Therefore, educating the spouses about the effect of behavioral risk factors on UTI is very important in planning strategies for preventing UTI during pregnancy. Furthermore, educating the spouses by health professionals with respect to their culture can increase their health knowledge about the sexual and genital hygiene and reduce the risk of urogenital infection among pregnant women (28,29).

The findings of the present study revealed that *E. coli* was the most frequent organism in positive cases, followed by *S. aureus*. In this study, staphylococcal infection was related to poor personal hygiene habits. These findings corroborate with those of previous studies conducted in Pakistan, Egypt, and Iran. Based on these studies, *S. aureus* was the second most frequent organism followed by *E. coli* (18,30,31). The increased levels of amino acids and lactose stimulate *E. coli* growth in the urinary tract, which could be due to the infection through faecal contamination as a result of poor hygiene habits (32).

Inaccurate responses about the sexual and genital hygiene habits of the participants could be considered as a limitation of this study. Therefore, randomized clinical trials are needed to better investigate the efficacy of sexual and genital hygiene habits in reducing the UTI prevalence.

Conclusions

The results of this study showed that there was a relationship between sexual and genital hygiene habits and UTI in pregnant women. Our findings are very important in relation to planning the preventive strategies for UTIs during pregnancy. Therefore, it is recommended

to educate pregnant women about sexual and hygiene genital habits in prenatal sessions.

Conflict of Interests

Authors declare that they have no conflict of interests.

Ethical Issues

The study design was approved by the Ethics Committee (code 901.1396.PHNM.SBMU.IR) of Shahid Beheshti University of Medical Sciences in Tehran, Iran. All participants were informed about the purpose of the study and provided signed informed consent forms.

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