

Hygiene practices and sexual activity associated with urinary tract infection in pregnant women

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ممارسات النظافة الشخصية والنشاط الجنسي المصاحبة لعدوى المسالك البولية في الحوامل
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الخلاصة: أجرى الباحثون دراسة للحالات والشواهد للتعرف على ترافق عدوى المسالك البولية مع ممارسات النظافة الشخصية للأعضاء التناسلية، ومع النشاط الجنسي في الحوامل اللاتي يراجعن عيادات الحوامل في بابل، بجمهورية إيران الإسلامية. وقد قارن الباحثون عينة تضم مئة حامل لديهن مزارع إيجابية للبول (باعتبارهن حالات) مع مئة وخمسين من الحوامل اللواتي يماثلنهن من حيث العمر والحالة الاجتماعية والاقتصادية والثقافية والزواجية (باعتبارهن شواهد) وقد كانت الإشريكيات القولونية هي العامل المسبب للعدوى في 83٪ من الحالات. أما العوامل المرافقة لاختطار الإصابة بعدوى المسالك البولية فتشمل الجماع أكثر من ثلاث مرات أسبوعياً (نسبة الأرجحية 5.62)، ووجود عدوى حديثة في المسالك البولية (نسبة الأرجحية 3.27)، وعدم غسل الأعضاء التناسلية الظاهرة قبل الجماع (نسبة الأرجحية 2.16)، وعدم غسلها بعد الجماع (نسبة الأرجحية 2.89)، وعدم التبول بعد الجماع (نسبة الأرجحية 8.62) وغسل الأعضاء التناسلية من الخلف إلى الأمام (نسبة الأرجحية 2.96).

ABSTRACT A case-control study determined the association of urinary tract infection (UTI) with genital hygiene practices and sexual activity in pregnant women attending prenatal clinics in Babol, Islamic Republic of Iran. A sample of 100 pregnant women with positive urine cultures (cases) were compared with 150 healthy pregnant women matched for age, social, economic and education status and parity (controls). *Escherichia coli* was the infecting organism in 83% of cases. Factors associated with UTI included sexual intercourse ≥ 3 times per week (OR = 5.62), recent UTI (OR = 3.27), not washing genitals precoitus (OR = 2.16), not washing genitals postcoitus (OR = 2.89), not voiding urine postcoitus (OR = 8.62) and washing genitals from back to front (OR = 2.96)

Pratiques d'hygiène et activité sexuelle associées à l'infection urinaire chez les femmes enceintes

RÉSUMÉ Une étude cas-témoins a évalué l'association entre l'infection urinaire, d'une part, et les pratiques d'hygiène intime et l'activité sexuelle, d'une autre part, chez les femmes enceintes fréquentant les services de consultations prénatales de Babol (République islamique d'Iran). Un échantillon de 100 femmes enceintes ayant des cultures urinaires positives (les cas) a été comparé à 150 femmes enceintes en bonne santé appariées sur l'âge, la situation sociale et économique, le niveau d'instruction et le nombre d'enfants (les témoins). L'organisme infectieux était *Escherichia coli* dans 83 % des cas. Les facteurs associés à l'infection urinaire étaient les rapports sexuels trois fois par semaine ou plus (OR = 5,62), une récente infection urinaire (OR = 3,27), l'absence de toilette intime avant le coït (OR = 2,16), l'absence de toilette intime après le coït (OR = 2,89), l'absence de miction après le coït (OR = 8,62) et un lavage intime d'arrière en avant (OR = 2,96).

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Introduction

Urinary tract infection (UTI) is a bacterial infection commonly occurring during pregnancy [1]. The incidence of UTI in pregnant women depends on parity, race and socioeconomic status and can be as high as 8%. Beginning in week 6 and peaking during weeks 22–24 of pregnancy, approximately 90% of pregnant women develop urethral dilatation, which will remain until delivery. Increased bladder volume and decreased bladder tone, along with decreased urethral tone, contribute to increased urinary stasis and ureterovesical reflux. Additionally, up to 70% of pregnant women develop glycosuria, which encourages bacterial growth in the urine [2]. The prevalence of bacteriuria also rises with higher parity, older age and lower socioeconomic status, and in women with diabetes mellitus, sickle-cell trait or a past history of UTI. For example in low-income populations, the prevalence of bacteriuria is about 2% in primiparas younger than 21 years compared with 8%–10% in grandmultiparas older than 35 years [3]. Although UTIs are common in young women, the associated risk factors have not been defined [4].

The organisms that cause UTI during pregnancy are the same as those found in non-pregnant patients. *Escherichia coli* accounts for 80%–90% of infections [2]. Scholes et al. reported on 231 patients and showed that *E. coli* was the causative uropathogen for 85% of infections. Other causative organisms were *Staphylococcus saprophyticus*, *Klebsiella* spp., *Enterobacter* spp. and *Proteus mirabilis* [5].

UTIs in pregnancy may have serious consequences for both the mother and the child. These conditions may be related to pyelonephritis, low birth weight, premature labour, preterm birth, hypertension, pre-eclampsia, maternal anaemia, amnionitis

and increased incidence of perinatal death [6]. Thus the prevention, early detection and prompt treatment of UTI in pregnancy have become essential components of prenatal care [7]. Other studies have reported the high prevalence of UTI in pregnant women in developing countries in the Eastern Mediterranean Region [8,9]. Since the risk factors of symptomatic and asymptomatic UTI in pregnant women in this Region have not been fully described, the purpose of this study was to determine the association of UTI with genital hygiene practices and sexual activity in pregnant women in Babol, Islamic Republic of Iran.

Methods

This case–control study was performed on 100 women with positive urine culture (cases) and 150 healthy pregnant women (controls), matched for age, gestational age, parity, occupation and socioeconomic and education status. The women were selected consecutively from those attending 5 public clinics at Babol University of Medical Sciences for prenatal care from 1 January 2002 to 20 February 2004. The exclusion criteria were a history of > 2 episodes of UTI per year, urinary stones or urinary tract anomaly, chronic disease (diabetes mellitus, sickle-cell anaemia), consumption of any antibiotic or immune system inhibitory drugs in the previous 3 months, or the presence of any abnormal vaginal discharge.

Data on the women's genital hygiene and sexual practices were collected by questionnaire completed by the midwives in the clinics. The questionnaire asked about demographic variables, frequency of coitus (per week in the previous 30 days), genital hygiene practices, e.g. whether they usually urinated after coitus (> 15 minutes/< 15 minutes after), washing of genitals pre-

coitus and postcoitus by the woman and her husband (yes/no/sometimes) and other health/hygiene practices, e.g. direction of washing genitals (front to back/back to front), frequency of changing underwear (number of times per week), frequency of baths (number of times per week), drying after voiding urine (yes/no), voluntary delay in voiding urine (yes/no), how much liquid ($> 2/1-2/< 1$ L) drunk per day. The questionnaire also asked about urological symptoms from the beginning of pregnancy until the interview; frequency was defined as total number of daily voids > 8 [10].

The women were instructed how to give a clean-catch midstream urine specimen. The samples were sent to Babol Razi laboratory and the fresh urine was tested immediately. Urinalyses and urine cultures were used for the detection of UTI. A UTI was defined as the presence of significant bacteriuria $> 100\ 000$ colony-forming units per mL of urine. Several studies show the specificity of urine culture to be high (97% and 98%) [11,12].

This study was approved by the review board of research on humans at the University of Babol.

Statistical analysis

Descriptive statistics and the chi-squared, Fisher exact and *t*-tests were used to compare the 2 groups. $P < 0.05$ was considered as significant. A risk profile for UTI was expressed in the form of odd ratios (OR) with 95% confidence intervals (CI) for the 250 women.

Results

There was no statistically significant difference between the case and control groups with regard to attendance for regular prenatal care.

The clinical characteristics and urological symptoms of the case and control women are shown in Table 1. The most frequently reported symptoms among case patients were frequency and urgency (77% and 70% respectively); 96% of case patients reported 1 or both of these symptoms.

A history of UTI was significantly associated with UTI. In case patients, 46% had a previous history of UTI but in the control group only 20% had a previous UTI ($P < 0.0001$) (OR = 3.27; 95% CI: 1.87–5.70).

In the 100 cases with urinary isolates analysed, *E. coli* was the causative uropathogen for 83% of infections. Other causative organisms were *S. saprophyticus* (10%), *Enterococci* spp. (4%) and *P. mirabilis* (3%).

Factors associated with UTI

A number of genital hygiene practices were associated with UTI in univariate analyses. Not voiding urine after coitus was the most strongly associated variable (OR = 8.62; 95% CI: 6.66–16.66). Other genital hygiene practices were associated with UTI, including: not washing genitals postcoitus (OR = 2.89; 95% CI: 1.53–9.80), not washing genitals precoitus (OR = 2.16; 95% CI: 1.29–3.63), and husband not washing genitals precoitus (OR = 2.53; 95% CI: 1.48–4.32) (Table 2). Other practices associated with UTI included voluntary delay of evacuating the bladder which had a more than 4-fold likelihood of UTI (OR = 4.33; 95% CI: 2.51–7.47) (Table 2).

Mean frequency of sexual intercourse was also associated with UTI (Table 3). Mean frequency of sexual intercourse (per week in the previous 30 days) in case and control groups respectively were 2.63 (SD 1.01) and 1.81 (SD 0.94) ($P < 0.05$). Sexual intercourse ≥ 3 times per week was associated with greater UTI risk (OR = 5.62; 95% CI: 3.10–10.10).

Table 1 Clinical characteristic of women suffering from urinary tract infection ($n = 100$) and matched controls ($n = 150$)

Clinical symptom	Cases				Controls				OR (95% CI)
	Yes		No		Yes		No		
	No.	%	No.	%	No.	%	No.	%	
Frequency	77	77.0	23	23.0	73	43.5	77	51.7	3.45 (2.03–6.31)
Urgency	70	70.0	30	30.0	52	34.9	97	65.1	4.35 (2.50–7.50)
Lower abdominal pain	66	66.0	34	34.0	42	28.0	108	72.0	4.99 (2.89–8.62)
Dysuria	62	62.6	37	37.4	20	13.5	128	86.5	10.72 (5.75–20.00)
Change in odour of urine	62	62.0	38	38.0	25	16.8	124	83.2	8.93 (4.48–14.59)
Costal vertebral angle tenderness	45	45.0	55	55.0	34	22.8	115	77.2	2.77 (1.60–4.79)
Change in colour of urine	33	33.0	67	67.0	13	8.7	136	91.3	5.15 (2.54–10.43)
Fever	28	28.0	72	72.0	7	4.7	142	95.3	7.81 (3.29–18.93)
Chills	22	22.0	78	78.0	7	4.7	142	95.3	5.72 (2.34–13.99)

Data missing for some variables.

OR = odds ratio; CI = confidence interval.

Women with UTI took baths less often and replaced their underwear significantly less often than control women ($P < 0.05$ and $P < 0.0001$ respectively) (Table 3).

Discussion

E. coli was the predominant infecting organism in women suffering from UTI (83%), a similar proportion to that previously reported for cystitis [5,13–16].

Most risk factors we identified for UTIs were similar to those identified in previous studies of young adult women with acute and recurrent cystitis and asymptomatic bacteriuria [13,14].

Sexual intercourse ≥ 3 times per week was associated with greater frequency of UTI. This association has been reported for sporadic and recurrent cystitis [13,14,16–19]. The mechanical action of sexual intercourse may facilitate entry of *E. coli* strains into the urethra and bladder, because sexual intercourse alters the normal lactobacillus-dominant vaginal flora and facilitate *E. coli* colonization of the vagina [20,21].

Uropathogenic *E. coli* strains may in some cases be acquired by sexual transmission [22]. These exposures, by facilitating entry of *E. coli* into the bladder, may initiate events leading to UTIs.

A history of UTI, any and recent, has been a consistently reported risk factor for subsequent cystitis in both young adult and postmenopausal women [11,12,14,23,24]. Our study confirmed that a previous UTI may predispose to subsequent UTI through behavioural, microbiological or genetic factors. These findings are consistent with other studies [4,5,25].

Low intake of fluids and voluntary urinary retention were associated with UTI in women in our study, which agrees with other studies [5,7,26]. In our study, genital hygiene practices such as frequency of coitus, urinating after coitus, washing genitals pre-coitus, husband washing genitals pre-coitus, washing genitals postcoitus, taking baths, frequent replacing of underwear and washing genitals from front to back were associated with a reduced frequency of UTIs, as found in other studies [27,28]. Women

Table 2 Association of health and sexual hygiene practices with urinary tract infection for cases (n = 100) and matched controls (n = 150)

Practice	Cases				Controls				OR (95% CI)
	Yes		No		Yes		No		
	No.	%	No.	%	No.	%	No.	%	
Not washing genitals precoitus	47	47.0	53	53.0	98	65.8	51	34.2	2.16 (1.29–3.63)
Husband not washing genitals precoitus	52	52.0	48	48.0	110	73.3	40	26.7	2.53 (1.48–4.32)
Not washing genitals postcoitus	84	84.0	16	16.0	143	95.3	7	4.7	2.89 (1.53–9.80)
Washing genitals from back to front	60	60.0	40	40.0	120	81.6	27	18.4	2.96 (1.66–5.28)
Not voiding urine postcoitus	51	51.0	49	49.0	135	90.0	15	10.0	8.62 (6.66–16.66)
Delay in voiding urine (voluntary)	69	69.7	30	30.3	52	34.7	98	65.8	4.33 (2.51–7.47)
Not drying after voiding	39	39.0	61	61.0	104	69.3	46	30.7	3.53 (1.61–6.21)
Not drinking plenty of liquids	32	32.0	68	68.0	78	54.2	66	45.8	2.51 (1.45–4.24)

Data missing for some variables.

OR = odds ratio; CI = confidence interval.

who usually urinated within 15 minutes of intercourse had a lower likelihood of developing a UTI than women who did not urinate afterwards. This contrasts with the report of Beisel et al. which did not show a statistically significant difference [29]. This may be due to the small sample size in both studies and the study design; a randomized controlled trial of a larger sample

would be able to provide better evidence that postcoital voiding is an effective means of prevention of UTI.

In summary, our investigation found that UTI in our sample of women were primarily caused by bacteria from the stool (*E. coli*) and that hygiene habits and sexual behaviour may play a role in UTI in pregnant women.

Table 3 Personal hygiene and sexual habits of women suffering from urinary tract infection (n = 100) and matched controls (n = 150)

Personal habit	Cases Mean (SD)	Controls Mean (SD)	P-value
Taking a bath (No. of times/week)	3.11 (0.99)	3.41 (1.53)	< 0.05
Replacing underwear (No. of times/week)	4.14 (1.80)	5.08 (2.02)	< 0.0001
Coitus (No. of times/week in last 30 days)	2.63 (1.01)	1.81 (0.94)	< 0.0001

SD = standard deviation.

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