

Incidence of urinary tract infection during pregnancy

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معدل وقوع التهاب المسالك البولية أثناء الحمل

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خلاصة: يهدف البحث لمعرفة معدل وقوع عدوى المسالك البولية أثناء الحمل بين الباكستانيات. فتم جمع عينات من وسط تيار البول من 250 حامل ومئة امرأة شاهدة، وزرعت في أطباق غراء دموي بطريقة التلقيم ثم وضعت في محضنة. واعتبر النمو ذا دلالة إحصائية عند وجود ما يساوي أو يزيد عن 10^5 من الجراثيم في المليلتر. ولقد ثبت وجود التهاب المسالك البولية لدى 28.5% من الحوامل و30.0% من الحالات الشاهدة. ووجدت أعراض التهاب المسالك البولية بين 24.4% من الحوامل و20.0% من الحالات الشاهدة، مثل السلس والتبول الليلي واستعمال التبول. ولم يكن هناك ارتباط بين وجود الأعراض وبين وجود الالتهاب. كما لم يكن هناك ارتباط يعتد به بين الحالة الاجتماعية الاقتصادية والتصحح الشخصي ومستوى التعليم ومدة الحمل والغسل بعد الجماع واستعمال وسائل منع الحمل وارتداء الملابس الداخلية وبين وقوع التهاب المسالك البولية. ولكن وجود قصة إصابة سابقة بمشكلات بولية كان يرتبط بارتفاع معدل التهاب المسالك البولية أثناء الحمل.

ABSTRACT Incidence of urinary tract infection (UTI) during pregnancy among Pakistani women was examined. Midstream urine was collected from 250 pregnant and 100 control women and streaked on blood agar and incubated. Growth was considered significant if $\geq 10^5$ /mL bacteria were present. Among the pregnant women, 28.5% had UTI; 30.0% of controls had UTI. Among the pregnant and control women, 24.4% and 20.0% respectively had UTI symptoms, such as incontinence, nocturia and urgency. Symptoms did not correlate with incidence. Socioeconomic status, personal hygiene, education level, pregnancy duration, postcoital washing, contraceptive use and use of underclothing had no significant association with UTI occurrence. A history of past urological problems was associated with an increased incidence of UTI in pregnancy.

Incidence des infections urinaires pendant la grossesse

RESUME L'incidence des infections urinaires pendant la grossesse chez les femmes pakistanaïses a été examinée. Les urines du milieu de jet ont été recueillies chez 250 femmes enceintes et 100 femmes témoins puis diluées dans une gélose au sang et incubées. La croissance était considérée comme significative si $\geq 10^5$ /mL de bactéries étaient présentes. Chez les femmes enceintes, 28,5% avaient une infection urinaire; 30,0% chez les témoins. Chez les femmes enceintes et témoins, 24,4% et 20,0% respectivement avaient des symptômes d'infections urinaires tels que l'incontinence, la nycturie et une miction impérieuse. Il n'y avait pas de corrélation entre les symptômes et l'incidence. La situation socio-économique, l'hygiène personnelle, le niveau d'éducation, la durée de la grossesse, la toilette post-coïtum, l'utilisation de contraceptifs et l'utilisation de sous-vêtements n'avaient aucune association significative avec la survenue de l'infection urinaire. Des antécédents de problèmes urologiques sont associés avec une augmentation de l'incidence des infections urinaires au cours de la grossesse.

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Introduction

Bacteriuria associated with pregnancy has a direct bearing not only on the health of the woman, but also on the pregnancy [1,2]. The incidence of bacteriuria during pregnancy in Western populations is 2.5%–8.7%, which is almost equivalent to the 4%–6% incidence of the general population [3]. Some parameters that are commonly associated with increased incidence of urinary tract infection (UTI) are poor socioeconomic status, duration of pregnancy and multiparity [4]. Other factors, such as sexual intercourse and use of condoms with spermicidal jelly, increase the incidence of UTI [5,6]. Although frequent washing and postcoital washing may reduce the incidence of UTI, in areas where the water supply is contaminated, this may not be the case.

We conducted a prospective study to determine the incidence of UTI in the Pakistani population of pregnant and non-pregnant women in relation to local hygiene practices.

Subjects and methods

This was a collaborative study between the Department of Gynaecology and Obstetrics and the Pakistan Medical Research Council, Jinnah Postgraduate Medical Centre, Karachi. Patient selection was made at the Department of Gynaecology and Obstetrics. The Department has an annual outpatient attendance of over 53 000 patients. The patients come from all areas, including a large metropolitan city and other cities, towns and villages. Most of the patients are of lower and lower-middle class economic status.

Systematic sampling was performed at randomly selected antenatal clinics during

a 9-month period. Further randomization was carried out by including in the study every 10th patient. Controls were matched for age to the group of pregnant women. The control population was of the same socioeconomic standard as the pregnant women. Controls were attendants of other patients.

A questionnaire was prepared including all parameters to be studied. Patient history and physical examination were conducted according to this proforma.

Midstream urine samples were collected using sterilized bottles at the antenatal clinic. All the patients were Muslims and practised ablution. Urine samples were immediately transported to the laboratory. With a calibrated wire loop, urine was streaked on blood agar and incubated at 37 °C for 24 hours. Biochemical analysis of urine was carried out by the dipstick method. For microscopy, 5–7 mL of urine were centrifuged and the sediment studied. Colonies were identified by biochemical test. Growth was considered significant if $\geq 10^5$ /mL bacteria were present. The organisms were further tested for antibiotic sensitivity using a disc diffusion method.

Chi-squared and Fisher exact tests were used for statistical analysis.

Results

Of 250 pregnant women, 72 (28.8%) had UTI, while of 100 controls, 30 (30.0%) had UTI. The difference was not significant. Symptoms of the pregnant and control women and the correlation of urological symptoms with UTI are given in Tables 1 and 2.

In the pregnant group, 61 women had symptoms. Among those with symptoms, the incidence of UTI was 29.5% while among those who were symptom-free,

Table 1 Symptoms of urinary tract infection (UTI) in pregnant and non-pregnant women

Symptom	Pregnant women			Controls		
	Symptomatic No.	UTI-positive No.	%	Symptomatic No.	UTI-positive No.	%
Frequency	43	14	32.6	11	3	27.3
Dysuria	33	7	21.2	10	5	50.0
Incontinence	54	15	27.8	1	0	0
Nocturia	31	8	25.8	1	1	100
Urgency	16	5	31.3	—	—	
Fever	1	0	0	1	0	0
Haematuria	—	—		—	—	
Total	61		100	20		100

Differences between the pregnant women and controls and symptomatic and UTI-positive were not statistically significant

Table 2 Incidence of symptoms and urinary tract infection (UTI)

Group	UTI-positive		UTI-negative		Total
	No.	%	No.	%	
<i>Pregnant</i>					
Symptom-positive	18	29.5	43	70.5	61
Symptom-negative	54	28.6	135	71.4	189
Total	72		178		250
<i>Control</i>					
Symptom-positive	7	35.0	13	65.0	20
Symptom-negative	23	28.8	57	71.2	80
Total	30		70		100

28.6% had UTI. The difference was not significant. Similarly in the control group, the incidence of UTI among symptomatic and asymptomatic women was 35.5% and 28.8% respectively. UTI-positive symptoms like incontinence (28%), nocturia (26%) and urgency (50%) were commoner in pregnant women than controls but these were not significant (Table 1).

The majority of the women belonged to the middle and lower socioeconomic classes. There was no significant difference between socioeconomic status and UTI in the two groups.

The women were divided into two groups on the basis of their personal hygiene, i.e. satisfactory and unsatisfactory personal hygiene. Among the pregnant

women with satisfactory personal hygiene, the incidence of UTI was 24.7%, whereas it was 32.3% among those with unsatisfactory hygiene. The control group showed an incidence of UTI of 27.4% and 41.2% among those with satisfactory and unsatisfactory personal hygiene respectively. This was not statistically significant.

To establish the relationship between level of education and UTI incidence, the women were divided into uneducated and educated groups. However, we found no correlation between level of education and the occurrence of UTI in the two groups.

Evaluation of UTI incidence in relation to trimester of pregnancy found that the incidence of UTI in the first trimester was 25.0%; in the second trimester, 31.2%; and in the third trimester, 29.3%. Statistically this variance was not significant.

Among the pregnant women with a past history of urological problems, 42.0% had UTI.

Of the pregnant group, 200 women practised postcoital washing and of the control group, 85 women practised it. The incidence of UTI was 29.0% and 32.0% respectively.

Incidence of UTI was compared with the use of contraceptives, e.g. condoms. The incidence of UTI was 27.3% and 30.0% respectively in pregnant and control women using condoms. This difference was not significant.

The incidence of UTI and the use of underclothing was not significant. There was no difference in the incidence of UTI among those who wore undergarments and those who did not in either group. However, the incidence of UTI was greater among those wearing polyester undergarments than in those wearing cotton.

The urinary pathogens isolated from the pregnant and control groups are given in

Table 3 Frequency of urinary pathogens

Organism	Pregnant group		Control group	
	No.	%	No.	%
<i>Escherichia coli</i>	11	15.3	6	20.0
<i>Staphylococcus albus</i>	14	9.4	2	6.6
<i>Pseudomonas</i>	9	2.5	1	3.3
<i>S. aureus</i>	8	11.1	1	3.3
<i>Sarcina</i>	8	11.1	3	10.0
<i>Enterococcus</i>	7	9.7	2	6.6
<i>Klebsiella</i>	6	8.3	0	0.0
Other	9	12.5	15	50.0

Table 3, and the sensitivity pattern of the common urinary pathogens isolated in the two groups to various antibiotics is given in Table 4. In the pregnant women, the primary infecting organisms were found to be *Staphylococcus albus*, *Escherichia coli* and *Pseudomonas* species. In the control women, *E. coli* and *Sarcina* species were most common (Table 3). Regarding antibiotics, the organisms exhibited significant sensitivity to quinolones and aminoglycosides, while sensitivity to ampicillin was observed in approximately half the women (Table 4).

Discussion

The physiological changes associated with pregnancy, such as the relaxation of the ureter under the effect of hormones which are trophoblastic in origin and the increased urinary output, result in urinary stasis. The chemical composition of urine is also affected and results in increased urinary concentration of substances, e.g. glucose and amino acids, which may facilitate bacterial growth. Furthermore, the enlarg-

Table 4 Sensitivity of urinary pathogens to antibiotics

Drug	Pathogens in the pregnant group				Pathogens in the control group			
	Sensitive No.	%	Resistant No.	%	Sensitive No.	%	Resistant No.	%
Ampicillin	29	42.6	39	57.4	13	52.0	12	48.0
Cefotaxime	44	66.7	22	33.3	22	84.6	4	15.4
Ceftazidime	17	26.2	48	73.8	9	33.3	18	66.7
Aztreonam	16	23.9	51	76.1	11	42.3	15	57.7
Amikacin	53	76.8	16	23.2	25	96.2	1	3.8
Gentamicin	55	79.7	14	20.3	24	92.3	2	7.7
Tobramycin	43	63.2	25	36.8	19	73.1	7	26.9
Norfloxacin	58	83.0	12	17.0	25	92.6	2	7.4
Ciprofloxacin	56	82.4	12	17.6	23	95.8	1	4.2
Ofloxacin	58	83.0	12	17.0	25	92.6	2	7.4

ing uterus compresses the ureter as pregnancy advances.

The relationship between the incidence of UTI and pregnancy has always been a subject of interest. In extensive studies by Sweet, the incidence of UTI during pregnancy was 2.5%–8.7%, which was the same as that of non-pregnant females of the same age group [2]. In our study, the incidence of UTI was significantly high, among both pregnant and non-pregnant women (28.8% and 30.0% respectively). This higher rate may be due to the fact that the majority of the women belonged to the lower and middle socioeconomic groups. This is supported by a study from Saudi Arabia, which found that UTI was higher among women of poor socioeconomic status (14.2%) [7]. Similarly, the incidence of UTI among pregnant women in Nigeria has been reported as 23.9% [8]. These studies suggest that the higher standards of living in the in-

dustrialized world may contribute to the lower incidence rates of UTI there.

The results of our study show that symptoms are poor markers of UTI during pregnancy and therefore antenatal care should include direct questioning and urine examination. The complications associated with UTI during pregnancy not only result in increased morbidity of expectant mothers, but also have detrimental effects on the fetus. Kinningham found that asymptomatic bacteriuria associated with pregnancy results in the development of acute pyelonephritis, preterm labour and low-birth-weight infants [9]. Another study found that the fetal mortality rate among UTI-associated pregnancies was 2.4 times the normal [1].

The incidence of UTI is high among those who have a past history of UTI. Al-Sibai et al. found that almost half (45.8%) of pregnant women suffering from UTI had

a past history of such infections [7]. Similarly, we found that 42% had a past history of UTI.

It is well recognized that urinary stasis increases with advancing pregnancy and thus the incidence of UTI would be expected to increase in the last trimester, but observations have not supported expectations. Maciolek et al. noted that in the second trimester of pregnancy, the incidence of UTI was higher than in any other trimester, but their group of patients was diabetic [10]. Similarly, we saw no statistical difference in the incidence of UTI in the three trimesters.

It was suspected that various parameters, such as level of education, personal hygiene, use of underclothing, postcoital washing, frequency of coitus and use of condoms could be related to the incidence of UTI, but we found no significant effect on its incidence. Similar findings have been reported by Attiulah et al. [11].

The bacterial spectrum has changed over the years and new organisms are being isolated in UTI, e.g. *S. saprophyticus* [12], although *E. coli* is still the dominant organism responsible for UTI among women [13]. This was seen to be the most common organism in our control group.

Although the overall percentages among pregnant (28.8%) and non-pregnant (30.0%) women were almost the same, the bacterial flora was totally different. This suggests that the underlying circumstances were different. The frequency of ever suffering from cystitis for Muslim women attending an outpatient clinic in Karachi has been reported as 27% [11]. The majority (63%) of these women had the first episode during pregnancy.

The sensitivity of the urinary pathogens seen in pregnancy in our study was significantly high for the quinolone family (83%), followed by aminoglycosides (76%–79%) and ampicillin (43%).

Because we saw a significant percentage of patients with UTI during pregnancy, it is recommended that urine examination be performed as part of antenatal care. If this is not economically possible, at least women who have a past history of UTI should be examined as UTI is higher among such women. The changing pattern of bacteria should be noted. In nearly half the patients, the organisms showed sensitivity to ampicillin, and also to a greater degree to quinolones. It has been reported that quinolones can also be given in pregnancy in a controlled fashion after weighing the benefits and risks [14].

References

1. McGrady GA, Daling JR, Peterson DR. Maternal urinary tract infection and adverse fetal outcomes. *American journal of epidemiology*, 1985, 121:377–81.
2. Debaun M et al. Selected antepartum medical complications and very-low-birth-weight infants among black and white women. *American journal of public health*, 1994, 84:149–57.
3. Sweet RL. Bacteriuria and pyelonephritis during pregnancy. *Seminars in perinatology*, 1977, 1:25–40.
4. Patterson TF, Andriole VT. Bacteriuria in pregnancy. *Infectious disease clinics of North America*, 1987, 1:807–22.
5. Fihn SD et al. Association between diaphragm use and urinary tract infections.

- Journal of the American Medical Association*, 1985, 254:240-5.
6. Peddie BA, Gorrie SI, Bailey RR. Diaphragm use and urinary tract infection. *Journal of the American Medical Association*, 1986, 255:1707.
 7. Al-Sibai MH, Saha A, Rasheed P. Sociobiological correlates of bacteriuria in Saudi pregnant women. *Public health*, 1989, 103:113-21.
 8. Olueanaya O, Ogunledun A, Fakoya TA. Asymptomatic significant bacteriuria among pregnant and non-pregnant women in Sagamu, Nigeria. *West African journal of medicine*, 1993, 12:27-33.
 9. Kiningham RB. Asymptomatic bacteriuria in pregnancy. *American family physician*, 1993, 47:1232-8.
 10. Maciolek-Blewniewska G, Wilczynski J, Woch G. Bezobjawowy bakteriomocz u ciężarnych z cukrzyca insulinozależna. [Asymptomatic bacteriuria in pregnant women with insulin-dependent diabetes.] *Ginekologia Polska*, 1994, 65:171-5.
 11. Atiullah N, Fikree FF, Hussain I. An epidemiologic study of cystitis among Muslim women attending an outpatient clinic in Karachi. *Journal of the Pakistani Medical Association*, 1998, 48:35-7.
 12. Hovelius B, Mardh P. *Staphylococcus saprophyticus*: a common cause of urinary tract infection. *Review of infectious diseases*, 1984, 6:328-37.
 13. Tan JS, File Jr TM. Urinary tract infections in infections in obstetrics and gynecology. *Journal of reproductive medicine*, 1990, 35:339-42.
 14. Berkovitch M et al. Safety of the new quinolones in pregnancy. *Obstetrics and gynecology*, 1994, 84:535-8.