

Short communication

Urinary tract infection among pregnant women in Al-Mukalla district, Yemen

A.M. Al-Haddad

عدوى المسالك البولية بين الحوامل في منطقة المُكَلَّا باليمن

أحمد محمد الحداد

الخلاصة: تمثل عدوى المسالك البولية مشكلة شائعة بين الحوامل. وتستعرض هذه الورقة تَوَاقُر عدوى المسالك البولية في عينة قوامها 137 حاملاً كُنَّ يراجعن مستشفى الولادة بمنطقة المُكَلَّا باليمن، خلال الفترة من كانون الثاني/يناير حتى حزيران/يونيو 2002. ولقد تم فحص عينات البول مجهرياً مع الزرع وإجراء اختبارات حساسية للجرثوم المستفرد المسبب لهذا المرض، باستخدام مجموعة من المضادات الحيوية. كما تم تجميع معطيات حول السن والأثلوث trimester الحُملي وعدد مرات الولادة وعدد مرات الحمل، وذلك بالنسبة لكل سيدة من المشتركات في البحث. ولقد بينت هذه الدراسة أن 30% من السيدات اللاتي تم اختيارهن للاشتراك في هذا البحث كُنَّ مصابات بعدوى المسالك البولية، كما كانت جرثومة الإشريكية القولونية *E. coli* هي أكثر الجراثيم المستفردة شيوعاً لدى هؤلاء الحوامل (41.5%)، كما كانت عالية التأثر بالكلورامفينيكول والسيبروفلوكساسين والسيفتيزوكسيم والأميكاسين. أما ما يتعلق بالمتغيرات التي تم فحصها، فقد كانت نسبة 53.7% من السيدات المصابات بالمرض ضمن الفئة العمرية من 15-24 عاماً، وكانت 48.8% منهن في أثلوثهن الثالث، وكان لدى 75.6% منهن 1-3 أطفال.

ABSTRACT Urinary tract infection (UTI) is a common problem in pregnant woman. This study examined the frequency of UTI in 137 pregnant women attending Al Mukalla maternity hospital from January to June 2002. Urine samples were examined for UTI microscopically and by culture, and sensitivity tests were done for the organisms isolated using a range of antibiotics. Information on age, trimester, parity and number of pregnancies were also collected for each woman. This study showed that 30% of the women suffered from UTI; *Escherichia coli* was the most frequently isolated organism (41.5%), and it was highly susceptible to chloramphenicol, ciprofloxacin, ceftizoxime and amikacin. Of the variables examined, 53.7% of the infected women were in the age group 15-24 years, 48.8% were in their 3rd trimester and 75.6% had 1-3 children.

L'infection urinaire chez la femme enceinte dans le district d'Al Mukalla (Yémen)

RÉSUMÉ L'infection urinaire constitue un problème courant chez la femme enceinte. La présente étude a examiné la fréquence de l'infection urinaire dans un échantillon de 137 femmes enceintes consultant à la maternité d'Al Mukalla de janvier à juin 2002. Des prélèvements d'urine ont fait l'objet d'un examen microbiologique (examen au microscope et mise en culture) à la recherche d'une infection urinaire, et des tests de sensibilité ont été réalisés avec divers antibiotiques pour les germes isolés. Des informations sur l'âge, le trimestre, la parité et le nombre de grossesses ont été également recueillies pour chaque femme. Cette étude a montré que 30 % des femmes de l'échantillon souffraient d'une infection urinaire ; *Escherichia coli* était le germe le plus fréquemment isolé (41,5 %), et il était très sensible au chloramphénicol, à la ciprofloxacine, à la ceftizoxime et à l'amikacine. Parmi les variables examinées, 53,7 % des femmes ayant une infection urinaire appartenaient au groupe d'âge des 15-24 ans, 48,8 % étaient au troisième trimestre de leur grossesse et 75,6 % avaient 1-3 enfants.

Department of Microbiology, Hadhramout University, College of Medicine (HUCOM), Al-Mukalla, Yemen
(Correspondence to A.M. Al-Haddad: ahmed_al_haddad@yahoo.com).

Received: 27/01/03; accepted: 14/04/04

Introduction

Urinary tract infection (UTI) is an extremely common clinical problem. It is important because it may involve the urethra, bladder, uterus, and kidney [1]. UTI affects all age groups, but women are more susceptible than men, due to short urethra, absence of prostatic secretion, pregnancy and easy contamination of the urinary tract with faecal flora [2]. Additionally, the physiological increase in plasma volume during pregnancy decreases urine concentration and up to 70% pregnant women develop glucosuria, which encourages bacterial growth in the urine [3,4].

Infections, particularly in pregnancy and in the elderly, can be asymptomatic [1], but asymptomatic bacteriuria is associated with an increased risk of intrauterine growth retardation and low birth weight [5]. Furthermore, untreated asymptomatic bacteriuria leads to the development of cystitis in approximately 30% of cases, and can lead to the development of pyelonephritis in about 50% of cases [6]. In addition acute pyelonephritis has been associated with anaemia [7]. Thus it is important to identify and treat UTI to avoid such complications.

Sheikh et al. demonstrated that a history of past urological problems was associated with an increased incidence of UTI in pregnancy [8]. Another study showed that oral hormone replacement therapy did not reduce the frequency of UTI and the risk factors in postmenopausal women are different from those in younger women and include diabetes, vaginal symptoms, and urge incontinence [9].

The organisms that cause UTIs during pregnancy are the same as those found in non-pregnant patients; *Escherichia coli* account for 80%–90% of infection [3,10,11] and the rest are caused by *Proteus mirabi-*

lis, *Klebsiella aerogenes*, *Pseudomonas* spp. and *Streptococcus* spp. [12].

The aim of this study was to determine if UTI is a widespread problem among pregnant woman in Al-Mukalla district and to assess its relation with some possible risk factors such as age, duration of pregnancy and parity. The sensitivity of the organisms isolated to various antibiotics was also studied.

Methods

This was a cross-sectional study of all pregnant woman attending Al Mukalla maternity hospital for the period from January to June 2002. This hospital serves the whole of Al-Mukalla district which has a population of about 500 000.

Midstream urine was collected from 137 pregnant women in sterile bottles; 10 mL were transferred to sterile centrifuge tubes and then centrifuged at 3000 rpm for 10–15 minutes. The supernatant was discarded and 1 mL of the precipitate was re-suspended in residual urine by shaking vigorously.

Wet mount preparation for general urine examination was performed. Plates of blood agar and MacConkey medium were aseptically incubated with 2–3 drops of the suspended precipitate and then incubated at 37 °C for 24–48 hours or until visible growth appeared. The isolated pathogens were identified using the Cowan and Steel method [13]. Antibiotic sensitivity testing was performed using the Kirby–Bauer disc diffusion method [14].

The media used were Muller–Hinton agar (Oxoid) or nutrient agar. The antibiotic contents of the multidiscs were ampicillin/sulbactam (20 µg), co-trimoxazole (25µg), cephalexin (30 µg), tetracycline (30 µg), cefotaxime (30 µg), ciprofloxacin (5 µg),

pefloxacin (10 µg), ofloxacin (5 µg), cloxacillin (1 µg), roxithromycin (15 µg), lincomycin (2 µg), and gentamicin (10 µg) for Gram-positive bacteria. The antibiotic contents of multidiscs for Gram-negative bacteria were piperacillin (100 µg), chloramphenicol (30 µg), ceftizoxime (30 µg) and amikacin (30 µg) in addition to ampicillin/sulbactam, co-trimoxazole, cefotaxime, ciprofloxacin, tetracycline, pefloxacin, ofloxacin and gentamicin at the same concentrations as for the Gram-positive bacteria.

Information on age, period of gestation, parity, and number of pregnancies was collected by face-to-face interview with the pregnant women. The socioeconomic status was not included in this study.

Results

Of the 137 women tested, 41 (30%) were positive for UTI, while 96 (70%) were negative. The distribution of the different isolates is shown in Table 1; *E. coli* (41.5%)

was the most frequently isolated strain, followed by *Staphylococcus aureus* (19.5%).

Most of the Gram-positive bacteria were highly susceptible to ceftizoxime and the Gram-negative to gentamicin and cefotaxime (Table 2). *E. coli*, was susceptible to ampicillin/sulbactam (71% susceptibility), cefotaxime (71%), ciprofloxacin (94%), chloramphenicol (94%), ceftizoxime (100%), ofloxacin (82%), and amikacin (100%). *S. aureus* was susceptible to ampicillin/sulbactam (75%), cephalixin (75%), cefotaxime (100%), roxithromycin (75%), lincomycin (75%), and gentamicin (100%).

The distribution of UTI among the infected women according to age group, trimester, parity and number of pregnancies is shown in Table 3. Bacteriuria was commonest in the age group 15–24 years (53.7%). There was an increase in frequency of bacteriurea with progress of pregnancy, with 48.8% of infections in the women in the 3rd trimester. Of the infected women 75.6% had 1–3 children.

Table 1 Frequency distribution of microorganism and its relation with urine analysis

Microorganism	Culture		Microscopic urine analysis (No.)				
	No.	%	Pus cells	Epithelial cells	RBC	Crystals	Bacteria seen
<i>Escherichia coli</i>	17	41.5	14	15	8	15	13
<i>Klebsiella</i> spp.	4	9.8	4	4	4	3	4
<i>Neisseria gonorrhoeae</i>	2	4.9	2	2	1	1	1
<i>Proteus</i> spp.	5	12.2	3	3	2	3	2
<i>Staphylococcus aureus</i>	8	19.5	8	6	6	5	6
<i>Streptococcus</i> spp.	2	4.9	2	2	1	1	1
<i>Candida albicans</i>	3	7.3	2	3	1	1	1
Total	41	100	35	35	23	29	28

RBC = red blood cells.

Table 2 Susceptibility of isolated Gram-negative and Gram-positive bacteria

Bacteria	Total no. isolated	Susceptibility to antimicrobial drugs (%)											
		AS	BA	CF	PC	CH	CP	CI	TE	OF	GM	AK	PF
Gram-negative bacteria													
<i>Escherichia coli</i>	17	71	6	71	41	94	94	100	24	82	71	100	0
<i>Klebsiella</i> spp.	4	75	0	50	50	100	100	100	0	50	75	75	0
<i>Neisseria gonorrhoeae</i>	2	50	0	100	100	100	0	50	0	0	50	100	0
<i>Proteus</i> spp.	5	0	20	80	0	0	80	100	80	0	100	0	20
Total	28	11	2	14	8	15	17	20	6	10	16	15	1
Gram-positive bacteria													
		AS	BA	PR	TE	CF	CP	PF	OF	CX	RF	LM	GM
<i>Staphylococcus aureus</i>	8	75	0	75	0	100	13	0	0	50	75	75	100
<i>Streptococcus</i> spp.	2	100	0	50	50	100	0	0	0	50	50	50	100
Total	10	8	0	7	7	10	1	0	0	5	7	7	10

AS = ampicillin/sulbactam (20 µg); BA = co-trimoxazole (25 µg); CF = cefotaxime (30 µg); PC = piperacillin (100 µg); CH = chloramphenicol (30 µg); CP = ciprofloxacin (5 µg); CI = ceftizoxime (30 µg); TE = tetracycline (30 µg); OF = ofloxacin (5 µg); GM = gentamicin (10 µg); AK = amikacin (30 µg); PF = pefloxacin (10 µg); PR = cephalixin (30 µg); CX = cloxacillin (1 µg), RF = roxithromycin (15 µg); LM = lincomycin (2 µg).

Discussion

UTIs are the commonest infections seen in hospital settings, and the second commonest infections seen in the general population [15]. UTIs are especially problematic for women and up to a third of all women will experience a UTI at some point in their life [15]. Appropriate treatment requires accurate classification of infection site, complexity of the infection and the likelihood of recurrence.

In this study the prevalence of UTI in our sample of pregnant women was 30% and the predominant pathogens were pathogenic *E. coli* and *S. aureus*. Our results agree with those of research workers in other countries, with minor differences, which could be due to differences in the environment, social habits of the communi-

ty, the standard of personal hygiene and differences in education [15–17].

In many studies of UTIs account for about 10% of office visits by women, and one-third of women will have a UTI at some time during their life [15]. In pregnant women, the incidence of UTI can be as high as 8% [18,19], while Baleiras et al. reported that UTI is the commonest type of infection in pregnant women, with prevalence ranging from 5% to 10% [20]. In similar studies in our Region, the prevalence was 38% in Iraq [1], 28.5% in Pakistan [8], 14.2% in Saudi Arabia [21] and 10.6% in Turkey [22].

Sheikh et al. demonstrated that socio-economic status, personal hygiene, education level, pregnancy duration, post-coital washing, contraceptive use, and use of underclothing had no significant association

Table 3 Distribution of urinary tract infection by age group, trimester, parity and number of pregnancies

Variable	Infected	
	No.	%
<i>Age group (years)</i>		
15–24	22	53.7
25–34	16	39.0
35–45	3	7.3
<i>Trimester</i>		
1st	7	17.1
2nd	14	34.1
3rd	20	48.8
<i>Parity</i>		
Nullipara	15	36.6
1	13	31.7
Multipara	13	31.7
<i>Number of pregnancies</i>		
1–3	31	75.6
4–6	8	19.5
7–9	2	4.9
Total	41	100

with UTI occurrence [8]. Krcmery et al. demonstrated that the risk factors for UTI in women include sexual intercourse, having a first UTI at an early age, and having a maternal history of UTIs [23]. Our results regarding the age of infection, gestation and parity concur with this study [23].

Women with recurrent UTI have an increased susceptibility to vaginal colonization and uropathogens, which is due to a greater propensity for uropathogenic coliforms to adhere to uroepithelial cells [23].

Ceftizoxime and amikacin were the most effective antibiotics against *E. coli*. However, Skerk et al. reported that urine culture should be performed prior to the initiation of antimicrobial therapy of UTIs [24]. It is important that antibiotics used for treating UTIs in pregnant women are carefully chosen, either in the case of monotherapy or combination therapy using more than one antibiotic to give a synergistic effect so as to decrease the dose needed, and accordingly the side-effects and toxicity of using a single high-dose drug. Also care must be taken when using potent antibiotics which may harm both the fetus as well as the mother, such as chloramphenicol or tetracycline which are totally contraindicated in pregnancy due to their harmful effects on the fetus [25].

Further studies should be performed on a larger sample of pregnant women, where the type of infection, past history of urological problems, recurrence of UTI and the relation between possible risk factors, such as socioeconomic status, personal hygiene, education level, frequency of sexual intercourse, could be examined.

References

1. Al-Dujaily AA et al. Urinary tract infection during pregnancy in Tikrit. *Medical Journal of Tikrit*, 2000, 6:220–4.
2. Awaness AM, Al-Saadi MG, Aadoas SA. Antibiotics resistance in recurrent urinary tract infection. *Kufa medical journal*, 2000, 3:159.
3. Patterson TF, Andriole VT. Bacteriuria in pregnancy. *Infectious disease clinics of North America*, 1987, 1:807–22.
4. Lucas MJ, Cunningham FG. Urinary tract infection in pregnancy. *Clinical obstetrics and gynecology*, 1993, 36:855–68.
5. Harris RE, Thomas VL, Shelokor A. Asymptomatic bacteriuria in pregnancy: antibody coated bacteria, renal function and intrauterine growth retardation. *American journal of obstetrics and gynecology*, 1976, 126:20–5.

6. Kass EH. Pregnancy, pyelonephritis and prematurity. *Clinical obstetrics and gynecology*, 1970, 13:239–54.
7. Gilstrap LC III et al. Renal infection and pregnancy outcome. *American journal of obstetrics and gynecology*, 1981, 141: 709–16.
8. Sheikh MA et al. Incidence of urinary tract infection during pregnancy. *Eastern Mediterranean health journal*, 2000, 6(2–3):265–71.
9. Brown JS et al. Urinary tract infections in postmenopausal women: effect of hormone therapy and risk factors. *Obstetrics and gynecology*, 2001, 98(6):1045–52.
10. Barr JG et al. Microaerophilic anaerobic bacteria as a cause of UTI in pregnancy. *British journal of obstetrics and gynecology*, 1985, 92:506–10.
11. McDowall DR et al. Anaerobic and other fastidious microorganisms in asymptomatic bacteriuria in pregnant woman. *Journal of infectious diseases*, 1981, 144: 114–22.
12. Chamberlin GVP. *Gynecology by ten teachers*. London, Edward Arnold, 1995.
13. Cowan SF, Steel KJ. *Manual for identification of medical bacteria*, 3rd ed. Cambridge, Cambridge University Press, 1993.
14. Bauer AW et al. Antibiotic susceptibility testing by standardized single disk method. *American journal of clinical pathology*, 1966, 45:493–6.
15. Valiquette L. Urinary tract infections in women. *Canadian journal of urology*, 2001, 8(1):6–12.
16. Coxe E. Comparison of intravenous fleroxacin with ceftazidimine for treatment of complicated UTI. *American journal of medicine*, 1991, 94(3):118–25.
17. Pummer K. Fleroxacin versus norfloxacin in the treatment of urinary tract infections: a multicenter, double-blind, prospective, randomized, comparative study. *American journal of medicine*, 1993, 94(3A):108S–113S.
18. Patterson TF, Andriole VT. Bacteriuria in pregnancy. *Infectious disease clinics of North America*, 1987, 1:807–22.
19. Mikhail MS, Anyaegbunam A. Lower urinary tract dysfunction in pregnancy: a review. *Obstetrical & gynecological survey*, 1995, 50:675–83.
20. Baleiras C et al. Infecções urinarias e gravidez. [Urinary tract infections and pregnancy.] *Acta médica portuguesa*, 1998, 11(10):839–6.
21. Al-Sibai MH, Saha A, Rasheed P. Sociobiological correlates of bacteriuria in Saudi pregnant women. *Public health*, 1989, 103(2):113–21.
22. Kutlay S et al. Prevalence, detection and treatment of asymptomatic bacteriuria in a Turkish obstetric population. *Journal of reproductive medicine*, 2003, 48(8): 627–30.
23. Krcmery S, Hromec J, Demesova D. Treatment of lower urinary tract infection in pregnancy. *International journal of antimicrobial agents*, 2001, 17(4):279–82.
24. Hooton TM. Recurrent urinary tract infection in women. *International journal of antimicrobial agents*, 2001, 17(4):259–68.
25. Skerk V et al. Antimikrobno liječenje infekcija mokraćnog sustava. [Antimicrobial therapy of urinary tract infection.] *Liječnicki vjesnik*, 2001, 123(1–2):16–25.
26. Laurence DR, Bennett PN, Brown MJ. *Clinical pharmacology*, 8th ed. Edinburgh, Churchill Livingstone, 1997: 207–10.