

## Urinary tract infections among pregnant women in Mosul city

Dhukaa' A. Al-Jawadi

College of Nursing, University of Mosul.

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### ABSTRACT

**Objectives:** To determine the prevalence of urinary tract infection (UTI) among pregnant women in Mosul city and to classify the infected women according to their trimesters of pregnancy. The sensitivity of isolated organisms to various antibiotics was also examined.

**Patients and methods:** Sample of 154 pregnant women attending Al-Batool Maternity Hospital in Mosul city from Feb-April 2007 was taken. Information on age, gestational age, gravidity, parity, level of education and residence were collected for each woman. Clean midstream urine samples were examined for UTI microscopically and culture, and sensitivity tests were done for the organisms isolated using a range of antibiotics.

**Results:** Prevalence rate of UTI among the studied subjects was 47.4%. *Escherichia coli* was the most frequently isolated organism (73.5%) which was highly sensitive to nitrofurantoin, ciprofloxacin, gentamycin, ceftriaxone and amikacin. Amoxicillin, cotrimoxazole, tetracycline and ciprofloxacin are the effective antibiotics to half of isolated *Gram positive* bacteria. Of the variables examined, 79.5% of the infected participants were in the age group 20-35 years, 53.0% were in their third trimester, 41.0% had 1-4 children, 30.1% were primigravidae, 63.0% attended the antenatal care unit on need, and 71.2% were urban at 6-12 years schooling.

**Conclusion:** UTI is still a major health problem among pregnant women especially during their third trimester. *Escherichia coli* is the predominant pathogen causing UTI. All detected bacteria were sensitive to amikacin. Urinalyses with culture and sensitivity tests are mandatory for all pregnant women during the different trimesters. Health education with regular antenatal care share greatly in reducing the incidence of this infection.

**Keywords:** Prevalence, urinary tract infections, culture and sensitivity test.

### الخلاصة

**الأهداف:** لتحديد نسبة إنتشار إنتان المسالك البولية بين النساء الحوامل في مدينة الموصل وتصنيف هذا الإنتان حسب أثلوث الحمل وفحص حساسية الميكروبات المعزولة لمختلف المضادات الحيوية.

**طريقة العمل:** أخذت عينة قوامها (١٥٤) حاملا كن يراجعن مستشفى البتول التعليمي للولادة بمدينة الموصل، خلال الفترة من شباط حتى نيسان ٢٠٠٧. جمعت معطيات حول عمر الحامل والأثلوث الحملي وعدد مرات الحمل وعدد مرات الولادة والمستوى الثقافي ومنطقة السكن لكل حامل مشتركة في هذا البحث. ولقد تم فحص عينة البول مجهريا مع الزرع وإجراء حساسية الجرثومة المستفردة المسببة لهذا المرض باستخدام مجموعة من المضادات الحيوية.

**النتائج:** نسبة إنتشار إنتان المسالك البولية بين الحوامل المشتركات في الدراسة هو (٤٧,٤%). وكانت جرثومة (*E.coli*) هي أكثر الجراثيم المستفردة شيوعا لدى هؤلاء الحوامل وبنسبة (٧٣,٥%)، كما كانت عالية التأثير بالمضادات الحيوية: النيتروفورايينتين، السيبروفلوكساسين، الجنتاميسين، السيفترياكسون والأميكاسين. كما أظهرت النتائج أن نصف المعزولات الموجبة قد أظهرت حساسيتها للأموكسيسيلين، الكوتراييموكساسول، التتراسايكلين والسيبروفلوكساسين. وفيما يتعلق بالمتغيرات التي تم فحصها، فقد كانت نسبة (٧٩,٥%) من السيدات المصابات بالمرض ضمن الفئة العمرية من (٢٠-٣٥ سنة)، وكانت (٥٣%) في الأثلوث الثالث من الحمل وكان لدى (٤١%) منهن ١-٤ أطفال. والحوامل لأول مرة شكلن نسبة (٣٠,١%)، كما أن

نسبة السيدات اللواتي كن يراجعن وحدة الرعاية الصحية الأولية (عند الحاجة فقط) قد شكلت (٦٣%) . علما بأن نسبة السيدات ذوات المستوى الثقافي (الابتدائية-الثانوية) واللواتي يسكن المدينة هي (٧١,٢% لكليهما) .

**الاستنتاجات:** يشكل إنتان المسالك البولية مشكلة صحية كبيرة بين النساء الحوامل وخاصة في الأثلوث الثالث من الحمل. إن جرثومة E.coli هي اليكتريا الأكثر شيوعا والمسببة لهذا المرض. وقد أظهرت كافة المعزولات حساسيتها للاميكاسين. ولهذا فان فحص الزرع والحساسية ضروري لكل حامل تعاني من هذا المرض. ويلعب التنقيف الصحي والالتزام بالزيارات الدورية للحامل إلى شعبة الرعاية الصحية الأولية دورا مهما في التقليل من هذا المرض.

**الكلمات المفتاحية:** نسبة الانتشار، إنتان المسالك البولية، فحص الزرع والحساسية.

Urinary tract infections (UTIs) are serious health problem affecting millions of people each year.<sup>(1)</sup> Women are 30 times more likely to have UTI than men. Up to 60% of women will develop UTI at sometime in their lives.<sup>(2)</sup> However, UTIs may be more serious during pregnancy because they are more likely to spread to the kidneys.<sup>(1)</sup>

During pregnancy, the tendency of UTI increases partly due to the pressure of the gravid uterus on the ureters causing stasis of urine flow and is also attributed to the humoral and immunological changes during normal pregnancy.<sup>(3,4)</sup> Therefore, pregnant women should have a routine urine test in pregnancy.<sup>(5)</sup> UTI occurs approximately in 5-10% of all pregnancies,<sup>(6,7)</sup> and it can be seen in three different forms in pregnancy: asymptomatic bacteriuria, acute cystitis and/ or acute pyelonephritis.<sup>(1,5)</sup> The incidence of asymptomatic bacteriuria has been reported between 2-13% in pregnancy all over the world and if not treated, it will increase the frequency of premature delivery and neonates with low birth weight and is likely to cause acute pyelonephritis at a rate of 15-30%.<sup>(8-10)</sup> Numerous studies during the past 30 years have reported association between UTI during pregnancy and adverse outcomes.<sup>(11)</sup>

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. Other Gram-negative rods such as *Proteus mirabilis* and *Klebsiella pneumoniae* are also common. Gram-positive organisms such as group-B streptococci and *Staphylococcus saprophyticus* are less common causes of UTI, in addition to *Gardnerella vaginalis*, *Ureaplasma urealyticum* and *Mycoplasma hominis*.<sup>(6,2)</sup> Urinalysis for detection of pyuria by microscope has a sensitivity of 80-90% and a specificity of 50% for predicting UTI. Urine culture is more

expensive and requires 24-48 hours for results.<sup>(12)</sup>

The American College of Obstetric and Gynecology stated that, a urine culture be obtained at the first prenatal visit and repeat urine culture should be obtained during the third trimester, because the urine of treated patients may not remain sterile for the entire pregnancy.<sup>(6)</sup>

The aims of this study are to determine the prevalence of UTI among pregnant women in Mosul city and to classify the infected women according to their trimesters of pregnancy. The sensitivity of isolated organisms to various antibiotics was also examined.

## PATIENTS AND METHODS

Cross-sectional study design was adopted and Al-Batool Maternity Hospital was the focal setting of this study. This hospital serves a population of different strata at right side of Tigris district in Mosul. For a period of three months (Feb-April 2007), a random sample of 154 pregnant women attending the antenatal care (ANC) unit at the study setting was taken. Information on maternal age, gestational age, parity, gravidity, child spacing, educational level, residence and employment was collected by face-to-face interview with the study subjects. Clean catch midstream urine was collected from the studied sample in sterile bottles. General urine examination was carried out for each woman. Accordingly, for the infected women, urine culture and sensitivity test was done. Plates of blood agar and MacConky medium were aseptically inoculated with 2-3 drops of the urine precipitate and then incubated for 24-48 hours. The isolation of the pathogens were identified using Cowan and Steel method.<sup>(13)</sup> The Kirby-Bauer disc diffusion method was adopted to perform the antibiotic sensitivity testing.<sup>(14)</sup> The medium used for this purpose was Muller-Hinton agar. The antibiotic

contents of the multidiscs were amoxicillin, rifampicin, cotrimoxazole, cefaloxine, tetracycline, nitrofurantoin, ciprofloxacin and gentamycin in different concentrations for Gram-positive bacteria. The antibiotic contents of multidiscs for Gram-negative bacteria were amoxicillin, rifampicin, nitrofurantoin, amikacin, nalidixic acid, cotrimoxazole, ceftriaxone, ciprofloxacin, tetracycline and gentamycin at the same concentrations as for the Gram-positive bacteria. Most of the essential materials used in this work were purchased personally from the local markets.

## RESULTS

Of the 154 women tested, 73 women (47.4%) were positive for UTI, while 81 women (52.6%) were negative. The distribution of UTI among the infected women according to the sociodemographic and obstetric characteristics is shown in **Table 1**. The highest proportion (79.5%) of UTI is seen among women aged 20-35 years. Housewives constituted 91.8% of the studied sample, 71.2% of them were urban at 6-12 years schooling. Only 28.8% attend ANC unit regularly while, 63.0% attend it on need. Regarding the obstetric history, 69.9% of the infected women were multigravidae and those who have 1-4 children constituted 41.1% while, the grandmultiparous (>5 children) women shared by nearly one quarter (24.7%). Short child spacing (<2 years) was seen among 42.5% of the studied patients. According to the trimesters of pregnancy, the present study showed that, 30.0% of the infected women were in their first trimester, 44.0% in their second trimester and 53.0% in their third trimester with no significant statistical relationship ( $p=0.15$ ), (**Table 2**).

Of the total infected participants, bacteriuria was seen among 76.7%, while pyuria was found among only 49.3%, (**Table 3**). In relation to the culture and sensitivity test, positive growth of different bacteria was found among 46.6% of the infected patients, while the negative growth was seen among 53.4% of them. The highest proportion (73.5%) of the positive growths was related to *Escherichia coli*, while *Staphylococcus aureus*, *Proteus mirabilis* and *Pseudomonas aeruginosa* shared by lesser proportions (17.6%, 5.9% and 2.9% respectively), **Table 4**. All detected bacteria were sensitive to amikacin. Nitrofurantoin, gentamicin and nalidixic acid were effective agents against all isolates

except *Pseudomonas* species. For Gram positive bacteria higher sensitivity percentages (83.0% and 67.0%) were noted in case of gentamicin and nitrofurantoin. However, half of them were sensitive to amoxicillin, cotrimoxazole, tetracycline and ciprofloxacin (**Table 5**).

**Table 1.** Distribution of sociodemographic and obstetric characteristics among the study sample.

Characteristic	Infected women (n=73)	
	No.	%
1. Age (years)		
<20	6	8.2
20-35	58	79.5
>35	9	12.3
2. Employment		
housewives	67	91.8
employed	6	8.2
3. Residence		
rural	21	28.8
urban	52	71.2
4. Education (years of schooling)		
no formal	17	23.3
6-12	52	71.2
>12	4	5.5
5. Antenatal care visit		
regular	21	28.8
on need	46	63.0
not present	6	8.2
6. Gravidity		
primigravida	22	30.1
multigravida	51	69.9
7. Parity		
Nullipara	25	34.2
1-4	30	41.1
≥ 5	18	24.7
8. Child spacing		
< 2 years	31	42.5
≥ 2 years	42	57.5

**Table 2.** Distribution of UTI according to the three trimesters of pregnancy.

Trimester of pregnancy	Among total women (n=154)		Among infected women (n=73)		P-value
	No.	%	No.	%	
First	20	13.0	6	30.0	0.157
Second	39	25.0	17	44.0	
Third	95	62.0	50	53.0	

**Table 3.** Distribution of the items of urinalysis among the infected subjects.

Item	No.	%
Bacteria	56	76.7
Pus	36	49.3
Crystals	18	24.7
Protein	6	8.2
Red Blood Cells	3	4.1

**Table 4.** Results of urine culture among the studied women.

Type of Bacteria	Positive Culture (n=34)	
	No.	%
<i>Escherichia coli</i>	25	73.5
<i>Staphylococcus aureus</i>	6	17.7
<i>Proteus mirabilis</i>	2	5.9
<i>Pseudomonas aeruginosa</i>	1	2.9

**Table 5.** Percentage of the susceptibility of the isolated bacteria to antimicrobial drugs.

Bacteria	No. of Isolates	Susceptibility of the isolated bacteria to antimicrobial drugs (%)										
		AM.	RI.	CO.	CE.	TE.	NI.	CI.	GE.	AMI.	NA.	CEF.
<i>Escherichia coli</i>	25	12	12	12	0	8	48	48	44	24	12	40
<i>Proteus mirabilis</i>	2	0	0	0	0	0	50	0	50	50	50	0
<i>Pseudomonas aeruginosa</i>	1	0	0	0	0	0	100	0	100	0	0	0
<i>Staphylococcus aureus</i>	6	50	33	50	0	50	67	50	83	33	33	0

Am.=Amoxicillin, Ri.=Rifampicin, Co.=Cotrimoxazole, Ce.= Cefaloxine, Te.= Tetracycline, Ni.= Nitrofurantoin, Ci.=Ciprofloxacin, Ge.=Gentamicin, Ami.= Amikacin, Na.= Nalidixic acid, Cef.= Ceftriaxone.

## DISCUSSION

UTIs are the widely spread infections seen in hospital settings, and the second commonest infections seen in the general population.<sup>(15)</sup> In this study the prevalence of UTI among the studied pregnant women was 47.4%. These results nearly corresponded with those of research workers in other countries, with minor differences, which could be due to variation in the environment, social habits of the community, and the standard of personal hygiene and education.<sup>(16)</sup> In similar studies in our region, the prevalence was 38.0% in Iraq,<sup>(17)</sup> 28.5% in Pakistan,<sup>(18)</sup> and 10.6% in Turkey.<sup>(19)</sup> The present study showed that, the highest proportion of UTIs was detected among women aged 20-35 years with high parity. This concurs with the study done by Krcmery et al,<sup>(20)</sup> who stated that, the risk factors for UTI in women include: sexual intercourse, having first UTI at an early age, and having a maternal history of UTIs. UTI in the current study is frequently seen with increasing gestational age, which coincides with the findings of Sheik et al.<sup>(18)</sup> The most common uropathogen isolated from urine of infected subjects of the present study was *Escherichia coli* which constituted 73.5%. This is in agreement with the findings of Jonathan et al,<sup>(21)</sup> who found

that, *Escherichia coli* represents 80.0% of bacterial growth of infected women. *Staphylococcal* infection was seen among 17.6% of the infected women of the present study. Louise et al stated that, *staphylococcus aureus* is the second most common cause of UTI especially in young women. *Proteus mirabilis* and *Pseudomonas aeruginosa* are responsible for the remainders of uncomplicated UTIs.<sup>(22,23)</sup> Based on the fact that the most offending pathogen is *Escherichia coli*, cephalosporine, amoxicillin or nitrofurantoin are reasonable choices. Trimethoprim is a folic acid antagonist therefore, it is generally avoided during organogenesis.<sup>(21,24,25)</sup>

## CONCLUSION

It is concluded that, UTI is still a major health problem among pregnant women especially during their third trimester. *Escherichia coli* is the predominant pathogen causing UTI. All detected bacteria were sensitive to amikacin. Urinalysis with culture and sensitivity tests are mandatory for all pregnant women during the different trimesters. Health education with regular antenatal care share greatly in reducing this infection.

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