

Prevalence of Urinary Tract Infection and Associated Factors among Pregnant Women Attending the Obstetric Clinic of Baghdad Teaching Hospital, 2023–2024

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Abstract

Background: Urinary tract infections (UTI) are considered one of the most prevalent infections that affect pregnant women. Their prevalence estimated to be around 4–47%. They may present as symptomatic infection in form of acute cystitis or pyelonephritis, or they may present as asymptomatic bacteriuria. **Objectives:** Determine the prevalence and the associated factors of urinary tract infection in pregnant women attending the obstetric clinic of Baghdad Teaching Hospital. **Methods:** A cross sectional study was carried out in the outpatient obstetric clinics of Baghdad Teaching Hospital, Baghdad, Iraq, from December 2023 to the end of February 2024. It included a convenient sample of pregnant women. A questionnaire was used for the collection of data, and urines cultures were sent to identify women with UTI. **Results:** A total of 243 women were included in the study, the prevalence of UTI was found to be 31%, asymptomatic bacteriuria 7%. The presence of diabetes, a previous history of catheterization and history of UTI in the previous year were found in 18.4%, 10.5% and 42.1% of the participants with positive urine cultures respectively, which were significantly higher than that found in the participants with negative urine cultures (4.8%, 3% and 21.6% respectively) where P -values were < 0.05 . Women having ≤ 1 sexual intercourse per week were observe to have higher rate of negative urine cultures (62.9%) than those having ≥ 2 sexual intercourse per week (P -value < 0.001). There were no significant statistical associations between UTI diagnosis and the age, occupation, educational level, residence and income, trimester of pregnancy, number of parities, number of abortions, presence of hypertension, anemia, nor antenatal care where all the p values were > 0.05 . **Conclusions:** UTI is frequently encountered in pregnancy, implementation of screening program is recommended.

Keywords: Urinary tract infection, pregnant women, *E. coli*

INTRODUCTION

Urinary tract infections (UTIs) are considered one of the most prevalent infections that affect women of all ages. It was estimated that nearly 40% of women would have UTI during some point of their life time.^[1] In pregnancy, UTIs are also common. They may present as symptomatic infection in the form of acute cystitis or pyelonephritis, or they may present as asymptomatic bacteriuria. The prevalence of symptomatic UTI in pregnant women all over the world, depending on existing evidence, was found to be around 4%–47%,^[2] while the prevalence of asymptomatic bacteriuria was reported to be between 2% and 10%.^[3] In Iraq, the UTI rates in pregnant women were observed to be near 47% in Mosul governorate and 65% in Babil governorate.^[4,5]

The risk to the emergence of UTI starts occasionally at the 6th week of pregnancy, and then it peaks at the 22nd to 24th week.

The acquisition of bacteriuria in pregnancy is impacted by several physiological, mechanical, and hormonal changes that increased the risk of developing UTI.^[6] These changes include increased bladder volume, decreased urethral tone, and urethral dilatation, due to the smooth muscle relaxation effect of progesterone, which result in urinary stasis and vesicoureteral reflux.^[7] Moreover, 70% of pregnant women develop glycosuria due to the decreased threshold of urinary

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glucose excretion during pregnancy.^[6] The presence of short urethra and its proximity to the anal orifice facilitates the contamination of women's urinary tract with bacteria.^[8,9]

UTIs whether they present as symptomatic or asymptomatic infection can complicate the pregnancy and lead to poor neonatal and maternal outcomes such as preterm birth, low birth weight, sepsis, maternal anemia, pyelonephritis, and amnionitis. Hence, it is crucial to early diagnose and treat all forms of UTI to prevent complications.^[10,11]

Escherichia coli is the most common bacteria that are isolated from urine cultures of pregnant women in all the three spectrums of UTI; it accounts for 70%–90% of the infection rates.^[2,7,8]

Aims of the study

1. Determine the prevalence of UTI in pregnant women attending the obstetric clinic of Baghdad Teaching Hospital, 2023–2024
2. Identify the associated factors of UTI in pregnancy
3. Identify the most common bacterial isolates responsible for UTI in pregnancy.

SUBJECTS AND METHODS

A cross-sectional study was carried out in the outpatient obstetric clinics of Baghdad Teaching Hospital, Baghdad, Iraq, from December 2023 to the end of February 2024.

The study subjects were a convenient sample of pregnant women attending the outpatient obstetric clinic of Baghdad Teaching Hospital which offers the primary and secondary antenatal care (ANC). The women were interviewed and the study rationale was explained to them. Those who consented to participate were asked to respond to a questionnaire and to give urine samples for laboratorial investigation. Recent use of systemic antibiotic in the last week and the presence of vaginal bleeding were set as exclusion criteria.

Ethical issues

The scientific committee of Family and Community Medicine in Baghdad Medical College had approved the study protocol and an official permission was gained from the hospital authority. Verbal consents were given by the participants before participation. Furthermore, the participants were contacted to be informed about the results of their laboratory tests. If their tests' results were abnormal, appropriate management was initiated by obstetricians.

Data collection tool

The data needed for the study were collected via a questionnaire that was developed after reviewing previous studies and literature. It consisted from several parts:

- The first part contained questions about the sociodemographic characteristics of the respondents
- The second part had questions about the obstetrical history
- The third part inquired about the medical history of the past and the current pregnancy
- The forth part was reserved to ask about the sexual history

- The fifth part was to inquire about the current symptoms of UTI whether they were present at the time enrollment
- The sixth part was assigned for the laboratory investigations.

The first five parts of the questionnaire were filled by the researcher via direct interviewing with the study subjects, while the sixth part was filled by the researcher from the results obtained from the laboratory.

Laboratory investigation

Urine samples were collected from each participant. The participants were given a sterile plastic cup with a tight fitting lid and the following instructions about the proper collection of midstream urine sample were given to them:

- First, the genitalia should be washed with water
- Second, after squatting, they should separate the two folds of the labia with their fingers
- Third, when urinating, the first drops of urine should be discarded; then, the sterile cup should be placed few centimeters below the genitalia to avoid contamination with the skin
- After finishing, the sterile cup should be covered with its lid to avoid leakage and/or contamination of urine.

The urine specimens were delivered to the laboratory within 30 min of collection, where they were given serial number and were prepared for processing. Two types of tests were run on each specimen, microscopic analysis, and culture.

According to the American Academy of Obstetrics and Gynecology, the following definitions were applied: ^[12]

- Positive (+ ve) urine culture: As the presence of 100,000 or more of colony-forming unit per milliliter
- Asymptomatic bacteriuria: The presence of a positive urine culture without the presence of any symptoms suggestive of UTI such as dysuria, frequency, pain, urgency, and hematuria
- Symptomatic confirmed UTI: The presence of both the urinary symptoms and the positive urine culture
- Symptomatic suspected UTI: The presence of urinary symptoms and abnormal urine microscopy examination

In the current study, for research purposes, the presence of a positive urine culture with or without urinary symptoms was set as diagnostic criteria for UTI.

Statistical analysis

The data were entered into the Excel datasheet and were analyzed with SPSS version 27 (SPSS Inc., Chicago, IL, USA). Tables and graphs were applied to the descriptive data. Categorical data were tested using Chi-square or Fisher's exact test. Quantitative data were analyzed using a *t*-test. The level of significance was assumed using $P < 0.05$.

RESULTS

Sociodemographic characteristics of the participants

A total of 243 women were included in the study, majority of them were between the 18–25 and 26–35 years' age

groups (40.7% each). Being a homemaker was the most frequent occupation (70%) and having a college degree and higher was the prevalent educational level (47.3%). Most of the women lived in urban areas (93.4%) and had adequate income (65.8%). Table 1 shows the sociodemographic characteristics of the participants.

The prevalence and the spectrum of urinary tract infection

The prevalence of UTI was calculated depending on the presence of a positive urine culture, which was found in nearly one-third of the participants (31%); of these, 7% had asymptomatic bacteriuria (ASB) and 24% had symptomatic bacteriuria in the form of cystitis (21%) and pyelonephritis (3%) as shown in Figures 1 and 2.

Table 1: Sociodemographic characteristics of the participants (n=243)

Variable	Frequency (%)
Age	
<18	16 (6.6)
18–25	99 (40.7)
26–35	99 (40.7)
>35	29 (11.9)
Occupation	
Homemaker	170 (70.0)
Employed	57 (23.5)
Student	16 (6.6)
Educational level	
Primary	39 (16.1)
Secondary	89 (36.6)
College and higher	115 (47.3)
Residence	
Urban	227 (93.4)
Rural	16 (6.6)
Income	
Adequate	160 (65.8)
Inadequate	83 (34.2)
Total	243 (100.0)

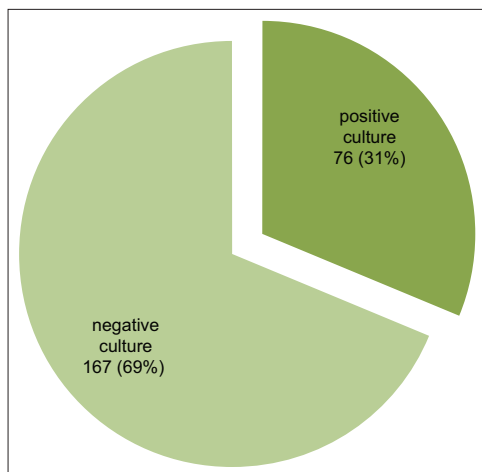


Figure 1: Prevalence of urinary tract infection depending on positive and negative urine cultures

The association of urinary tract infection with the characteristics of the participants

There was no significant statistical association between UTI diagnosis and the sociodemographic variables such as the age, occupation, educational level, residence, and income, where all the *P* values were higher than 0.05 as shown in Table 2.

The obstetrical history of the participants

Women in their third trimester of pregnancy constituted half of the participants (51%), whereas women in the first trimester constituted only 15%. The presence of UTI was not affected by the trimesters of pregnancy, where *P* value was found to be >0.05 . Furthermore, neither the numbers of parities nor the number of abortions were associated with UTI. Regarding the ANC, it was found that 90.5% of the participants had ANC; however, the presence of ANC had no association with UTI. The obstetrical history of the participants and its association with UTI is presented in Table 3.

The medical history of the participants and its association with urinary tract infection

Hypertension (HNT), DM (diabetes mellitus) (chronic and gestational), and anemia were present in 11.5%, 9.1%, and 34.6% of the women in the present study, respectively. DM was significantly associated with the diagnosis of UTI where 18.4% of the women with positive urine culture had DM vs. 4.8% of the women with negative urine culture, $P < 0.001$. Neither HNT nor anemia were associated with UTI.

The presence of a previous history of catheterization and history of UTI in the previous year were found in 10.5% and 42.1% of the participants with positive urine cultures, respectively, which were significantly higher than that found in the participants with negative urine cultures (3% and 21.6%, respectively), where *P* values were <0.05 . Table 4 summarizes these findings.

Sexual history of the participants and its association with urinary tract infection

Significant statistical association was found between the frequency of sexual intercourse per week and the diagnosis of UTI ($P < 0.001$), where women having ≤ 1 sexual intercourse per week were observed to have higher rate of negative urine cultures (62.9%) than those having ≥ 2 sexual intercourse per week.

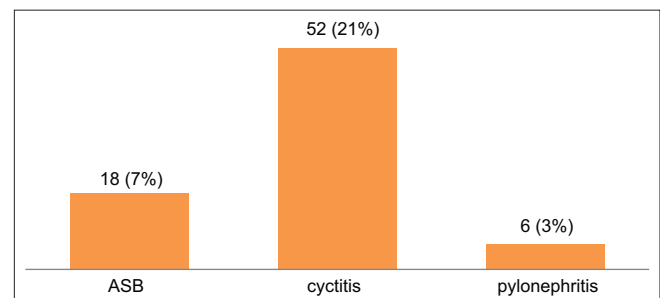


Figure 2: The clinical spectrum of urinary tract infection (n = 76)

Table 2: Characteristics of the participants and urinary tract infection

Variable	Culture		Total (n=243), n (%)	P
	Negative (n=167), n (%)	Positive (n=76), n (%)		
Age				
<18	10 (6.0)	6 (7.9)	16 (6.6)	0.08
18–25	77 (46.1)	22 (28.9)	99 (40.7)	
26–35	61 (36.5)	38 (50.0)	99 (40.7)	
>35	19 (11.4)	10 (13.2)	29 (11.9)	
Occupation				
Homemaker	122 (73.1)	48 (63.2)	170 (70.0)	0.29
Employed	35 (21.0)	22 (28.9)	57 (23.5)	
Student	10 (6.0)	6 (7.9)	16 (6.6)	
Educational level				
Primary	24 (14.4)	15 (19.7)	39 (16.1)	0.40
Secondary	58 (34.7)	31 (40.8)	89 (36.6)	
College	85 (50.9)	30 (39.5)	115 (47.3)	
Residence				
Urban	157 (94.0)	70 (92.1)	227 (93.4)	0.38
Rural	10 (6.0)	6 (7.9)	16 (6.6)	
Income				
Adequate	105 (62.9)	55 (72.4)	160 (65.8)	0.18
Inadequate	62 (37.1)	21 (27.6)	83 (34.2)	

Table 3: The obstetrical history of the participants

Variable	Culture		Total (n=243), n (%)	P
	Negative (n=167), n (%)	Positive (n=76), n (%)		
GA				
First	31 (18.6)	7 (9.2)	38 (15.6)	0.16
Second	55 (32.90)	26 (34.2)	81 (33.3)	
Third	81 (48.5)	43 (56.6)	124 (51.0)	
Parity				
0	37 (22.2)	18 (23.7)	55 (22.6)	0.93
1–3	90 (53.9)	39 (51.3)	129 (53.1)	
>3	40 (24.0)	19 (25.0)	59 (24.3)	
Abortion				
0	80 (47.9)	43 (56.6)	123 (50.6)	0.30
1	64 (38.3)	27 (35.5)	91 (37.4)	
≥2	23 (13.8)	6 (7.9)	29 (11.9)	
ANC				
Yes	149 (89.2)	71 (93.4)	220 (90.5)	0.35
No	18 (10.8)	5 (6.6)	23 (9.50)	

ANC: Antenatal care, GA: gestational age

Postsex micturition was practiced by the majority of the participants (82.7%). Although it was practiced by higher proportion of women with negative urine cultures than those with positive urine cultures (85.6% vs. 76.3%), the association was of not statistically significant where *P* value was 0.09, as shown in Table 5.

Urine analysis results

The presence of pyuria was found in 92.1% of the women with

positive urine cultures and in 35.9% in women with negative urine cultures. Similarly, hematuria was found in 63.2% of the participants with positive urine cultures vs. 28.7% of the participants with negative urine cultures. Both pyuria and hematuria were significantly associated with the diagnosis of UTI (*P* value < 0.001). By conducting 2 × 2 table, the sensitivity and the specificity of pyuria would be 92.1% and 64.1%, respectively, while the sensitivity and the specificity of hematuria would be 63.2% and 71.3%, respectively, as shown in Table 6.

The bacterial isolates

E. coli was isolated in half of the cultures of the participants (51.3%) followed by *Staphylococcus aureus* (21.1%) of the cultures. *Klebsiella proteus*, *Enterobacter* spp., and *Pseudomonas aeruginosa* were isolated in fewer proportions, as illustrated in Table 7.

DISCUSSION

The prevalence of UTI in pregnant women of the current study was found to be 31%, ASB constituted 7%, and symptomatic bacteriuria constituted 24%. These results were almost parallel to the results of a previous study in another Iraqi city (Al-Najaf), where the prevalence of UTI in pregnant women was found to be 37%, and ASB and symptomatic bacteriuria constituted 14% and 23% of their study sample.^[13] However, higher prevalence of UTI was reported in other studies conducted in other Iraqi cities, 47% in Mosul,^[4] and 43% in Kirkuk.^[14] In the countries of the MENA region (Middle East and North Africa), the prevalence of UTI was reported as follows: 13% in Iran,^[15] 53.5% in Saudi Arabia,^[16] 32% in Egypt,^[17] and 49.3% in Libya.^[18]

The prevalence of ASB in this study was 7%, which is consistent with that reported in the literature, where the prevalence of ASB was reported to be between 2% and 10%.^[3,19] Due to the risk that ASB could impose on the mother and the fetus, screening should be done for the detection and subsequent treatment of ASB.

In the current study, there were no significant statistical associations between UTI diagnosis and the age, occupation, educational level, and residence of the participants. Similar findings were reported by other studies.^[20–22] As for the income, it was found that the prevalence of UTI was not different between the women with adequate and inadequate income; this finding was also reported by a previous Iraqi study^[13] and a previous study in Libya;^[18] however, this result did not agree with the results of other studies, where low income was more prevalent in women with UTI.^[16,20–24] Low income will lead to malnutrition and low immunity which may increase the risk of UTI.

One of the findings of the current study is that the frequency of UTI was not affected by the trimesters of pregnancy; this finding was also observed by other studies.^[18,20–22] The study by Ali and Abdallah noted that UTI was more frequent in pregnant women in their third trimester,^[25] while the study by Laily *et al.* noted that UTI was more prevalent in the second trimester of pregnancy.^[26]

Table 4: The medical history of the participants and urinary tract infection

Variable	Culture		Total (n=243), n (%)	P
	Negative (n=167), n (%)	Positive (n=76), n (%)		
HNT				
Yes	18 (10.8)	10 (13.2)	28 (11.5)	0.66
No	149 (89.2)	66 (86.8)	215 (88.5)	
DM				
Yes	8 (4.8)	14 (18.4)	22 (9.1)	<0.001
No	159 (95.2)	62 (81.6)	221 (90.9)	
Anemia				
Yes	62 (37.1)	22 (28.9)	84 (34.6)	0.24
No	105 (62.9)	54 (71.1)	159 (65.4)	
History of catheterization				
Yes	5 (3.0)	8 (10.5)	13 (5.3)	0.02
No	162 (97.0)	68 (89.5)	230 (94.7)	
History of UTI				
Yes	36 (21.6)	32 (42.1)	68 (28.0)	0.001
No	131 (78.4)	44 (57.9)	175 (72.0)	

UTI: Urinary tract infection, HNT: Hypertension, DM: Diabetes mellitus

Table 5: The sexual history of the participants and urinary tract infection

Variable	Culture		Total (n=243), n (%)	P
	Negative (n=167), n (%)	Positive (n=76), n (%)		
Frequency of sexual intercourse per week				
≤1	105 (62.9)	27 (35.5)	132 (54.3)	<0.001
Twice	45 (26.9)	42 (55.3)	87 (35.8)	
>2	17 (10.2)	7 (9.2)	24 (9.9)	
Postsex micturition				
Yes	143 (85.6)	58 (76.3)	201 (82.7)	0.09
No	24 (14.4)	18 (23.7)	42 (17.3)	

Table 6: Urine analysis findings and urinary tract infection

Variable	Culture		Total (n=243), n (%)	P
	Negative (n=167), n (%)	Positive (n=76), n (%)		
Pyuria				
Yes	60 (35.9)	70 (92.1)	130 (53.5)	<0.001
No	107 (64.1)	6 (7.9)	113 (46.5)	
Hematuria				
Yes	48 (28.7)	48 (63.2)	96 (39.5)	<0.001
No	119 (71.3)	28 (36.8)	147 (60.5)	

Regarding the number of parities and its association with UTI, different studies reported different findings, where in

the current study and in the studies by Abdulla and Oleiwi,^[13] El-Kashif,^[16] Gesses *et al.*,^[20] Johnson *et al.*,^[22] and Laily *et al.*,^[26] the number of parities was not associated with UTI; in the studies by Getaneh *et al.* and Francine *et al.*, the multiparous women were significantly more likely to get UTI with odds ratio (OR) of 1.5 and 2.1 respectively;^[21,27] while the primiparous women in the studies by Lee *et al.* and Vicar *et al.* were significantly more likely to get UTI with OR of 1.4 and 1.9, respectively.^[24,28] These differences in reports could be due to the presence of confounding variables such as the type of delivery whether it was normal vaginal delivery, assisted vaginal delivery, or cesarean delivery; thus, the type of delivery other than the number of deliveries could have the association with UTI.

In contrast to the number of parities, in which there are contradictory results to its association with UTI, there is an agreement that the abortion history was not related to the UTI frequency.^[15,16,18,27]

Regarding the ANC, it was found that 90.5% of the participants of this study had ANC, and the number of ANC visits ranged between 1 and 6; however, no association between ANC and UTI was found. In a case-control study by Francine *et al.*, where they studied the effect of the number of ANC visits on the acquisition of UTI, it was found that the odds of having UTI in pregnancy increased 5.6 times in women with ≤4 ANC visits.^[27] Having regular ANC may reduce the risk of getting UTI by addressing its risk factors and managing any health issues that could be associated with UTI.

DM was significantly associated with the diagnosis of UTI where 18.4% of the women with UTI had DM vs. 4.8% of the women without UTI. Significant associations were also observed by previous studies.^[16,23,27] DM is a systemic disease that could affect the immune system and increase the rates of infections.

In the current study, pregnant women with previous history of catheterization were found to have higher rates of UTI than those who did not; similar finding was reported by the authors Abdulla and Oleiwi.^[13] Furthermore, in a meta-analysis by Getaneh *et al.*, the history of catheterization was observed to be significantly associated with the odds of getting UTI (OR = 2.7); they reported that catheterization is an invasive procedure that may cause abrasions to the mucosa of the urethra which may facilitate the entry of microorganisms to the urinary tract.^[21]

Having history of a previous UTI is one of the recognized risk factors of UTI and was reported by several studies;^[13,16-21,27] similarly, the current study noted that UTI was more common in women who had a previous history of UTI than those who had not. The emergence of resistant bacteria that cannot be fully eradicated may explain why women with a previous history of UTI are more susceptible to another UTI.

Significant statistical association was found between the frequency of sexual intercourse per week and the diagnosis

Table 7: The bacterial isolates

Bacterial growth	Frequency (%)
<i>Escherichia coli</i>	39 (51.3)
<i>Staphylococcus aureus</i>	16 (21.1)
<i>Klebsiella</i>	8 (10.5)
<i>Proteus</i>	7 (9.2)
<i>Enterobacter</i> spp.	4 (5.3)
<i>Pseudomonas aeruginosa</i>	2 (2.6)
Total	76 (100.0)

of UTI in our study, where women having ≤ 1 sexual intercourse per week were observed to have lower rate of UTI than those having ≥ 2 sexual intercourse per week. Francine *et al.* stated that having sexual intercourse ≥ 3 per week was significantly associated with UTI (adjusted OR = 3.4);^[27] on the other hand, Laily *et al.* reported that having sex at least once within the last 2 weeks was associated with UTI with an OR equals to 3.1.^[26] Sexual intercourse might induce minor urethral trauma that permits bacterial entry and invasion.

Pyuria and hematuria were found to be significantly associated with the diagnosis of UTI in the present study with sensitivity of 92% and 63% and specificity of 64% and 71% respectively. The sensitivity and the specificity of pyuria as reported by the American College of Obstetricians and Gynecologists were 90%–96% and 47%–50%, respectively, while the sensitivity and the specificity of hematuria were 18%–4% and 88%–89%, respectively.^[19]

E. coli was the most prevalent bacterial isolate observed in the present study, followed by *S. aureus*, which is in agreement with the observations of other studies.^[4,23,24,26,29]

CONCLUSIONS

- The prevalence of UTI in pregnant women was found to 31%, ASB constituted 7% and symptomatic bacteriuria constituted 24%
- History of DM, previous history of catheterization, history of UTI in the previous year, and the frequency of sexual intercourse per week were found to be significantly associated with UTI
- Pyuria and hematuria were found to be significantly associated with the diagnosis of UTI with sensitivity of 92% and 63% and specificity of 64% and 71% respectively
- *E. coli* was the most common bacterial isolate (51.3%) followed *S. aureus* (21.1%)
- Screening for UTI by urine culture should be done routinely for all pregnant women, since a significant proportion of them would present with no symptoms (ASB).

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Conflicts of interest

There are no conflicts of interest.

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