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Original article

Epidemiological profile of urinary tract infection among pregnant women in Karbla, Iraq

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ABSTRACT

Objectives: The current study aims to determine the cause of urinary tract infection (UTI) during pregnancy and relation of age and pregnancy period with this infection, compare pregnant and non-pregnant in bacterial UTI infection by used different methods of diagnosis. **Methods:** Urine samples were collected from pregnant women suspected to UTI infection, in the Obstetrics and Gynecology Hospital and determine causal agent of UTI infection by microscopy, cultural character and biochemical tests. **Results:** The result showed UTI caused by bacterial infection of *Escherichia coli (E. coli), Staphylococcus aureus, Klebsiella Pseudomonas, Proteus* species, *Enterobacter* and *Streptococcus* in arrangement. There is relation between UTI and age of pregnant patient women most infection in medial age and there is relation also with repeated abortion in women put not significant and there is relation also with pregnancy period most infection happened in third pregnancy trimester and this relation was significant through *p*-value. **Conclusion:** The current report will help determine the cause of UTI infection in pregnant women and which period of pregnancy happened and which age infected more.

Introduction

Pregnant women's urinary tract infections (UTIs) remain a clinical dilemma and a significant issue for medical professionals. The effects of bacteriuria on the mother and the fetus are more severe, even though the prevalence is only slightly greater in this population than in non-pregnant women [1]. The risk of developing pyelonephritis is significantly higher (up to 40%), and there may also be a larger chance of pre-eclampsia, preterm birth, and poor neonatal birth weight [2].

This is connected to significant changes in the urinary tract's structure and function, which are normal during pregnancy. About 80% of pregnant

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women experience mild hydronephrosis along with dilatation of the urinary tract. This condition is partially brought on by relaxation of the urethral sphincter and a decrease in smooth muscle tone that results in a slower ureteral peristalsis. High amounts of progesterone in the blood may be the cause of this [3].

Concomitantly, the larger uterus compresses the bladder, raising the intravesical pressure and perhaps causing vesico-ureteral reflux and bladder retention following a miction, which are prevalent in pregnant women. An ascending infection can thrive when there is urinary stasis and a compromised physiological anti-reflux mechanism [4]. Pregnancy-specific biochemical alterations in urine, such as elevated levels of glucose, amino acids, and hormone breakdown products that raise urine pH [5], are additional predisposing factors.

Similarly, as in non-pregnant women, in pregnant women UTIs are classified either as asymptomatic bacteriuria (ASB), when the infection is limited to bacterial growth in urine, or symptomatic infections (acute cystitis, acute pyelonephritis), when bacteria invade urinary tract tissues, inducing an inflammatory response. urinary tract infections (UTIs) in pregnancy are by definition considered complicated infections and require a special diagnostic approach and management [6].

Frequent health issues that arise during pregnancy. According to estimates, the prevalence of ASB varies from 2% to 10-13%, which is comparable to that of pregnant women [7, 8]. Data on acute cystitis in non-pregnancy are scarce; current research report a 1-4% incidence of the condition [9, 10]. Most reports indicate that between 0.5% and 2% of pregnancies have acute pyelonephritis [11, 12]. The study aims to determine the bacterial cause of UTI during pregnancy and relation of age and pregnancy period with this infection, compare pregnant and non-pregnant in bacterial UTI infection by using different methods of diagnosis.

Materials and methods

Blood agar and MacConkey agar were purchased from Himedia Company, Iraq.

Sample collection

From October 2021 to August 2022, 610 urine samples were taken from patients at the Obstetrics and Gynecology Hospital who were suspected of having a UTI infection, all under the observation of a doctor. Blood agar and MacConkey were used in the hospital to culture the samples.

Media preparation

Blood agar and MacConkey agar prepared as Himedia company procedure.

Detection of bacterial sample

Microscopic characters examine bacterial characters by Gram's stain, colony character, study the character of colony to detection bacterial genus and biochemical test as in *E-coli (*oxidase negative and positive catalase). *Staphylococcus* (catalase positive and oxidase negative). *Klebsiella* (oxidase negative and positive catalase). *Streptococcus* (catalase negative and oxidase negative).

Results

Between October 2021 and August 2022, 620 non-pregnant women and 610 pregnant women at the Obstetrics and Gynecology Hospital in Kerbala city had urine samples taken in case they had a UTI and result was shown in **table (1),** the percentage of UTI infection in non-pregnant women in Kerbala city was (65. 24%), the most common bacteria caused UTI is *Staphylococcus* (27.8%) then *E. coli* in (17.2%), *Klebsiella* (13.1%), *streptococcus* (8.03%) and final *Enterobacter* (4.26%) in arrangement**.**

The result was shown in **table (2)** the percentage of UTI infection in pregnant women with different bacterial causes increase compare non pregnant women in Kerbala city was (68. 63%), the most common bacteria caused UTI is *E. coli* in (25.4%) then *Staphylococcus* (17.3%), *Klebsiella* (9.8%), *Pseudomonas* (6.3%), *Proteus spp* (4.9%), *Enterobacter* (3.2%) and final *Streptococcus* (1.6%) in arrangement.

The result was shown in **table (3)** the percentage of UTI infection in pregnant women with different bacterial causes increase compare non pregnant women in Kerbala city was (68. 85%), the most common bacteria caused UTI after used vitek instrument for more accuracy is *E .coli* in (25.4%) then *Klebsiella pneumonia* (9.8%), *Staphylococcus aureus* ((8.5%), *Staphylococcus epidermidis* (4.9%), *Staphylococcus hemolyticus* (2.9%), *Staphylococcus saprophyticus* (1.6%), *Pseudomonas aeruginosa* (6.09%), *Proteus mirabilis* (4.5%), *Enterobacter aerogenes* (3.6%) and final *Streptococcus* species (1.3%) in arrangement.

The Result in **table (4)** Showed the relation between age of pregnant women and UTI infection, the highest UTI infection percentage in age 26-35 years old (53.09%), then age (15-25) years old (33.33%) and 36-45 years old (13.57%) in arrangement and there are no significant differences appear through *p*-value (0.185).

The result showed in **table (5)** the relation of UTI infection with repeated abortion in pregnant period, the percentage of abortion in pregnant women with UTI infection is (31.87%), most abortion in second trimester (15.62%), then third trimester (10%) and first trimester (6.25%) and there are no significant differences in *p*-value (0.301).

The result in **table (6)** showed the relation of UTI infection with pregnant period, the percentage UTI infection is highest in the third trimester (42.85%), then second trimester (35.71%) and final first trimester (23.8%) and there are high significant differences in *p*-value (0.0005).

Table 1. Bacterial causes UTI infection in women diagnosis by cultural character and biochemical test.

Microbes name	**Positive**		**Negative**		**Total**
	Number	Percentage	Number	Percentage	
None	0	0.00%	212	100.0%	34.7%
Staphylococcus	170	42.7%	N/A	N/A	27.8%
E. coli	105	26.3%	N/A	N/A	17.2%
Klebsiella	80	20.1%	N/A	N/A	13.1%
Streptococcus	49	12.3%	N/A	N/A	8.03%
Enterobacter	26	6.5%	N/A	N/A	4.26%
Total	398		212		65. 24%

Table 2. Bacterial causes UTI infection in pregnant women by used cultural and biochemical diagnostic methods.

Microbes name	**Positive**		**Negative**		**Total**
	Number	Percentage	Number	Percentage	
None	0	0.00%	190	100.0%	31.14%
E. coli	155	36.9%	N/A	N/A	25.4%
Klebsiella	60	14.2%	N/A	N/A	9.8%
Staphylococcus	106	25.2%	N/A	N/A	17.3%
Pseudomonas	39	9.2%	N/A	N/A	6.3%
***Proteus* species**	30	7.1%	N/A	N/A	4.9%
Streptococcus	10	2.3%	N/A	N/A	1.6%
Enterobacter	20	4.7%	N/A	N/A	3.2%
Total	420		190		68. 85%

Table 3. Bacterial causes UTI infection in pregnant women by used Vitek diagnostic methods.

Microbes name	**Positive**		**Negative**		**Total**
	Number	Percentage	Number	Percentage	
None	0	0.00%	190	100.0%	31.14%
E. coli	155	36.9%	N/A	N/A	25.4%
Klebsiella pneumonia	60	14.2%	N/A	N/A	9.8%
Staphylococcus aureus	52	12.3%	N/A	N/A	8.5%
Staphylococcus epidermidis	30	7.1%	N/A	N/A	4.9%
Staphylococcus hemolyticus	18	4.2%	N/A	N/A	2.9%
Staphylococcus saprophyticus	10	2.3%	N/A	N/A	1.6%
Pseudomonas aeruginosa	37	8.8%	N/A	N/A	6.06%
Proteus mirabilis	28	4.7%	N/A	N/A	4.5%
***Streptococcus* species**	8	1.9%	N/A	N/A	1.3%
Enterobacter aerogenes	22	5.2%	N/A	N/A	3.6%
Total	420		190		68. 85%

Table 4. Relation of UTI infection with age of pregnant.

Age group	Positive		Negative		Total	*P*. value
	Number	Percentage	Number	Percentage		
15-25	140	33.33%	50	26.3%	30.8%	0.155
26-35	223	53.09%	110	57.9%	55.8%	
36-45	57	13.57%	30	15.8%	13.5%	
Total	420		190			

Table 5. Relation of UTI infection with repeated abortion.

Pregnant period	Positive		Negative		Total	*P*. value
	Number	Percentage	Number	Percentage		
1st trimester	20	6.25%	60	18.75%	24.8%	0.301
2nd trimester	50	15.62%	90	28.12%	44.2%	
3rd trimester	32	10%	68	21.25%	31.25%	
Total	102		218		31.87%	

Table 6. Relation of UTI with pregnant period.

Pregnant period	Positive		Negative		Total	*P*. value
	Number	Percentage	Number	Percentage		
1st trimester	100	23.8%	80	42.1%	16.39%	0.0005*
2nd trimester	150	35.71%	30	15.8%	24.59%	
3rd trimester	180	42.85%	80	42.1%	29.50%	
Total	420		190		68. 85%	

Figure 5. *Streptococcus* on blood agar.

Figure 6. *Staphylococcus* on blood agar.

Figure 7. *Klebsiella* on MacConkey agar.

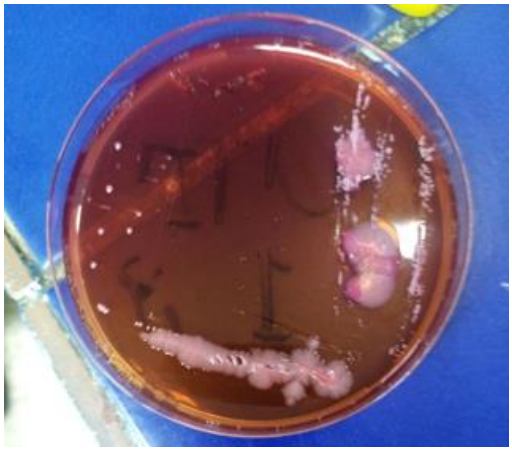

Figure 8. *Escherichia coli* on MacConkey agar.

Discussion

Women experience UTIs at a high rate: over 50% experience them at some point in their lives, and 25% develop into RUTIs. Although RUTI causes have been studied and linked to pelvic floor function and estrogen status, the relationship between obstetric history and RUTI occurrence remains unclear. It is often known that pregnancy and childbirth have an impact on the degradation of perineal muscles, which can result in pelvic prolapse and urine incontinence [13, 14].

Urinary tract infections (UTIs) are the second most prevalent infection in the general population and the most common illness observed in hospital settings [15]. 47.4% of the pregnant women in this study reported having a UTI. With a few small exceptions, these results were almost identical to those of researchers in other nations. These discrepancies could be caused by variations in the surrounding environment, community social customs, and standards of personal hygiene and education [16]. Similar studies conducted in our region found that the prevalence was 10.6% in Turkey, 28.5% in Pakistan [18], and 38.0% [17] in Iraq [19]. The current study demonstrated that women with high parity between the ages of 20 and 35 had the highest percentage of UTIs. This supports the findings of a study by **Krcmery et al.** [20] about the risk factors for UTI in women.

Escherichia coli was the most often identified uropathogen (73.5%) from the urine of study participants who were infected. This is consistent with the results of **Jonathan et al.** [21], who discovered that 80.0% of the bacterial growth in sick women is attributed to *Escherichia coli*. In the current study, 17.6% of the sick women had staphylococcal infection. *Staphylococcus aureus* is the second most common cause of UTI, particularly in young women, according to Louise et al. The remaining cases of simple UTIs are caused by *Proteus mirabilis* and *Pseudomonas aeruginosa* [22, 23] given that *Escherichia coli* is the bacterium that causes the greatest problems.

Urinary tract infections (UTIs) are the second most common infection in the general population and the most prevalent infection in hospital settings. According to comparable studies conducted in our region, the prevalence was 10.6% in Turkey, 28.5% in Pakistan, and 38.0% (17) in Iraq. According to the current study, women with high parity between the ages of 20 and 35 had the highest percentage of UTIs. Sexual activity, experiencing a UTI for the first time at a young age, and having a mother's history of UTIs are risk factors for UTIs in women. [24,25].

In line with the findings of **Sheik et al.,** UTI is commonly observed in the current study as gestational age increases. *Escherichia coli* was the most often isolated uropathogen from the urine of the study's affected participants. Eighty percent of the bacterial growth in sick women is caused by *E. coli.* [26].

Among the affected women in the current investigation, Staphylococcal infection was observed. *Staphylococcus aureus* is the second most frequent cause of urinary tract infections, particularly in young women. The remaining uncomplicated UTIs are caused by *Proteus mirabilis* and *Pseudomonas aeruginosa*. Cephalosporine, amoxicillin, or nitrofurantoin are sensible options because *E. coli* is the most harmful pathogen. Since trimethoprim is an antagonist of folic acid, it is often avoided during organogenesis [27].

Conclusions

Urinary tract infections (UTIs), which are divided into three categories—ASB, cystitis, and APN—are the most prevalent bacterial infection during pregnancy. Untreated ASB may advance to APN, which is linked to increased maternal and newborn morbidity, according to some data. It's also important to take into account the hazards connected to regular antibiotic therapy for ASB. Given the available data, it makes sense to recommend a single ASB urine test throughout the first half of pregnancy in order to lower the risk of APN and associated complications while reducing exposure to and use of antibiotics. A screen-and-treat strategy is especially pertinent in nations where women have limited access to treatment because it lowers the risk of maternal and newborn problems as well as the necessity for medical visits.

Low-quality data supports the current guidelines for managing UTIs during pregnancy, underscoring the need for additional research to evaluate the advantages of diagnosing and treating ASB as well as its effects on the health of expectant mothers and newborns. More research is also needed on preventative interventions, both pharmaceutical and non-pharmacological, and more affordable diagnostic techniques.

Competing interests

None.

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