

Urinary Tract Infection Incidence in Telafer City among Pregnant Women

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Abstract

Urinary tract infections (UTIs) are the most expected infections caused by bacteria during pregnancies. The purpose of this cross-sectional study was to assess the preponderance of UTIs, risk factors, and susceptibility to antibiotics amongst pregnant women in Telafer City. Patients and methods: The research study comprised 110 pregnant women made from hospitals and women's medical clinics in Tal Afar, as well as 55 non-pregnant women (control). The ages of pregnant women were recorded, as well as the period of pregnancy, number of births, degree of education, and place of living. Clean midstream urine specimens were taken and analyzed for UTI microscopically and cultivation on different media, and then we accomplished sensitivity treatment for the bacteria isolated utilizing a range of antimicrobial agent.

UTI has been observed in pregnant women 60% of and non-pregnant women 20%. There existed also significant occurrences of UTI infection in the first trimester (31.82%) and second trimester (50%), whereas those in the age group 36- 40 years in the third trimester of pregnancy had the smallest percentage of circumstances infestation (18.18%). The current study found that pregnant women in their second trimester had a heightened percentage of UTI infection (50%). There was a high rate of urinary tract infection that occurs among pregnant women who have one child (54.5%). The percentage showed the smallest of infestation in pregnant women who had > 4 children, with a percentage of 10.6%. The bacteria that were isolated the most commonly were *E. coli* (68.18%) compelling UTI. Almost over 70% of all isolated Gram-negative organisms showed resistance against third-generation cephalosporins, ampicillin, tetracycline, clarithromycin, and amoxicillin-clavulanic acid. This study highlight the importance of scanning all gestation women for serious UTI situations so that

those diagnosed can be treated with medications to limit the detrimental effects on the health of the two the mother and baby.

Keywords: UTI, Pregnancy, Risk Factors, Antibiotic susceptibility

Introduction

Urinary tract infections (UTIs) can occur as a result of a variety of microorganisms that have the capacity to pass through the urinary tract (Karam *et al.*, 2012; Rajaratnam *et al.*, 2014). UTIs are a customary clinical condition which occurs within 1-6% of all healthcare criteria and consists of infestation of the urinary tract, bladder, and kidney. Infections of the urinary tract during gestation are one of the most widespread medical problems in the world, particularly in developing nations (Shaheen *et al.*, 2016). Pregnant women are more likely to experience UTIs, which have a substantial impact on the rise in stillbirth births and, if not properly addressed, can have a negative impact on the newborn or the mother's health (Amiri *et al.*, 2015). Additionally, lower or upper urinary tract infections (cystitis or pyelonephritis) may arise during pregnancy. In response to the physiological alteration in the urinary tract that occur during pregnancy, raised sex hormones, a rise bladder volume, and decreased bladder strength, along with lowered urethral strength that contributes to increased urination and vesicoureteral reflux, lower urinary tract infections may lead to increased susceptibility to infection. Pyelonephritis during pregnancy, with a rate of 40% (Haghdoost *et al.*, 2020). All these changes, in addition to a close urethra-vaginal distance, lead to an expansion in the incidence of UTI through pregnancy (Mäkelä-Kaikkonen *et al.*, 2016). Since bacteria are widespread from other pathogen, such as fungi and viruses, are infrequently present during pregnancy, urinary tract infections in women frequently occur (Mancuso *et al.*, 2023). *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Enterobacter cloacae*, *Acinetobacter baumannii*, *Morganella morganii*, *Staphylococcus saprophyticus*, and *Enterococcus spp.* are frequently associated with a Gram-negative and gram-positive bacterial infections leading to UTI (Totsika *et al.*, 2012). Additionally, avoiding UTI is critical for improving mother and baby health and lowering the risk of preterm birth (Schneeberger *et al.*, 2015). The risk of UTI rises during pregnancy. Due to the hormonal changes that occur throughout pregnancy, the ureters start to enlarge about the sixth week of pregnancy. This is also known as "hydronephrosis of pregnancy," and it occurs between 22 and 26 weeks of pregnancy and lasts till birth. During pregnancy, both progesterone and estrogen levels rise, resulting in reduced ureteral and bladder tone. Increased plasma volume when pregnant causes decreased urine concentration and enhanced bladder volume. The combination of all of these factors causes urinary stasis and ureterovesical reflux (Shaheen *et al.*, 2016). The goal of this research is to find out the occurrence of UTI and

the bacteria linked to bacteriuria in pregnant women in Iraq.

Materials and Methods

Study area and design

A descriptive cross-sectional study was conducted at the Telafer Hospital and a medical clinic attended by pregnant women in TalAfar City, west of Nineveh Governorate, between October 2022 to January 2023.

Study Population

The study included a group of pregnant women, i.e. the first, second, or third trimester of pregnancy, with or without symptoms of urinary tract infection, after they visited prenatal clinics or at Tal Afar Hospital and the medical clinic inside the city, and compared them with non-pregnant women.

Ethical Approval

“All experimental protocols were approved under the faculty of nurses at Telafer University and were carried out in accordance with approved guidelines.” After ethical permission had been obtained.

Source Population and Study Participant

In this study, 165 women recruited in Telafer City; 110 pregnant women with or without signs and symptoms of UTI were assessed by consulting doctors or Gynecologists and included in the study alongside 55 non-pregnant women (controls). Pregnant women who had kidney problems or were on antibiotics within seventy-two hours of the study days were not recruited. The controls contained age-matched non-pregnant women. Scholarly written approval was obtained from each patient prior to the consultation and sample design. Socio-demographic data was obtained from each patient by means of personal interviews using standard questionnaires and kept confidential during the research. Age, occupation, educational level, parity, gravidity, pregnancy period, location, employment, and total number of pregnancies were among the socio-demographic variables collected.

Specimen Collection and Isolation

In this research, urine samples have been taken in sterile screw-capped containers using the recommended clean-catch midstream approach (Sahm *et al.*, 2001). The urine samples were analyzed microscopically after centrifugation at 3000 rpm for five minutes in order to identify pus, epithelium, red blood cells, crystals, bacteria, and yeast. After that, all of the specimens were cultivated on nutrition agar, blood agar, and MacConkey Agar with a sterile standard loop (0.001 ml) and then incubated at 37oC for a period of 24 hours. Gram stain was utilized to evaluate cell morphology in pure isolates of bacteria, standard biochemical assays were employed for bacterial recognition, and API 20 E was used for species-level detection.

Statistical Analysis

The Chi-square test was used to assess the relationship between UTI and many parameters represented by numerals, percentages, and diagrams in the collected data P-values lower than 0.05 were considered significant in statistical terms.

Results

In this research, 165 women in total, incorporating 110 gestation women and 55 non-gestation female controls, had their UTIs checked. In the current study, a UTI has been described as a positive urine culture with more than 10^5 bacteria per milliliter of urine. According to this the average incidence of UTI in pregnant women reached 60% (66/110), compared to 20% (11/55) in non-pregnant women, as illustrated in the figure.

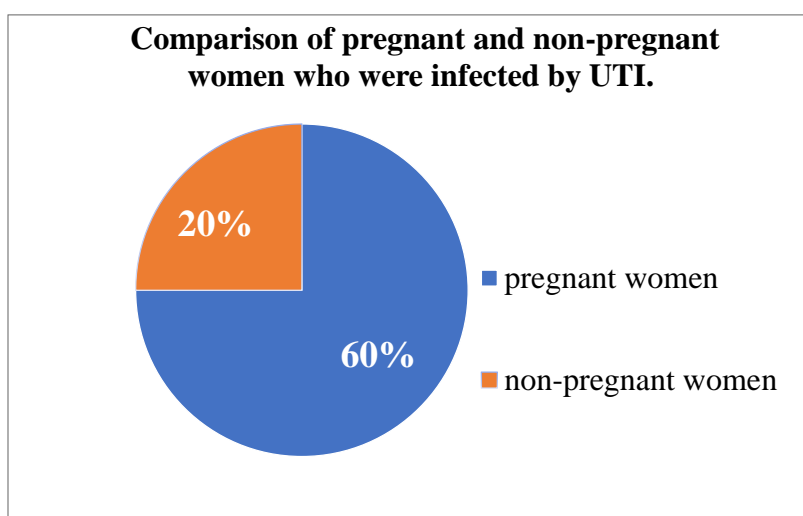


Figure 1: Ratio of UTI infection shown in pregnant and non-pregnant women.

Table 1 shows the distribution of the gestation phase during pregnancy by trimester: The percentages were as follows: the first 21 (31.8%), the second 21 (31.8%), and the last trimester from pregnant 12 (18.18%). While pregnant women who had 0-1 children had the highest infection rate (54.5%), followed by those who had 2-3 children with (31.8%), while those with more than 4 children had the lowest infection rate (10.6%). The majority of other UTI-related significant variables are determined to be 48.48% and 51.52% in women of "well" and "poor" status, respectively. The important role of education is distinguished by that 63.6% of bacteriuria patients have education, while 36.3% are illiterate. In evaluating the probability of occurrence infested, the history of urinary tract

infection was a notable dangerous aspect, with 50 women (75.6%) out of a total of 66 agents having a history of urinary illness. Natural deliveries were 68.1% of the time for pregnant women with urinary tract infections, while cesarean deliveries were 31.8% of the time as observed in the table1.

Table 1: Sociodemographic features of pregnant women in relation to UTI.

Parameter	No. examined	UTI present	% UTI present	Chi square(χ^2)	p-value
Age groups (Years)					
16-20	31	21	31.82		
21-25	40	20	30.30		
26-30	25	19	28.79	27.03**	P < 0.01
31-35	8	5	7.58		
36-40	5	1	1.51		
Gestational age(weeks)					
1-12 (first)	33	21	31.8	10.09**	P < 0.01
13-25 (second)	48	33	50		
26-36 (third)	29	12	18.18		
Parity					
0 – 1	64	36	54.5		
2 – 3	28	21	31.8	19.72**	P < 0.01
> 4	18	7	10.6		
Socioeconomic score					
Well	52	32	48.48	0.04 ^{NS}	P < 0.01
Poor	58	34	51.52		
Education					
Educated	70	42	63.6	7.84**	P < 0.01
illiterate	40	24	36.3		
Past history of UTI					
Present	80	50	75.6	27.04**	P < 0.01
Absent	30	16	24.2		
Birth types					
Natural	70	45	68.1	27.04**	P < 0.01
Cesarean	40	21	31.8		

Escherichia coli was the most predominant isolated organism (68.18%) followed by *Pseudomonas aeruginosa*, *Klebsiella spp*, *Proteus mirabilis*, and *Enterobacter*

spp. with proportions of 17.6%, 7.57%, 6.06 and 4.54% respectively that shown in the table 2.

Table 2: The proportion of identified various bacteria in the urine of pregnant women.

Pathogens	Number isolated	Percentage (%)	Ch ²
<i>Escherichia coli</i>	45	68.18	
<i>Pseudomonas aeruginosa</i>	9	13.63	
<i>Klebsiella pneumonia</i>	5	7.57	97.33**
<i>Proteus mirabilis</i>	4	6.06	
<i>Enterobacter species</i>	3	4.54	

** refer to higher significant difference between groups at (P < 0.01), according to Ch² test. Tabulated Ch² =13.27

Antibiotics susceptibility profile

The antibacterial susceptibility profile was investigated against 21 antibiotics (table 3). Table 3 and Figure 2 indicate the spread of antibiotic resistance in bacteria. All Gram-negative isolates (n=66) showed the highest resistance rate (97%-100%) to ampicillin and cephalixin. While the Meropenem was the most effective drug totally against all gram-negative Bacilli with sensitivity rate of 100%.

Table 3: Percentage of the resistance of the isolated bacteria to antimicrobial drugs.

Antibiotics	<i>E.coli</i>	<i>P.aeruginosa</i>	<i>K.pneumonas</i>	<i>Proteus</i>	<i>Enterobacter</i>	Chi ² value	Chi ² value
	No (%)						
	45(%)	9 (%)	5(%)	4 (%)	3 (%)	Total (%)	
Rifampin	42(93.3)	9(100)	5(100)	4(100)	3(100)	63(95)	0.36 ^{NS}
Ceftazidime	42(93.3)	6(66.6)	5(100)	3(75)	3(100)	59(89)	97.18* *
Cephalexin	44(97.7)	9(100)	5(100)	4(100)	3(100)	65(98)	94.00* *
Ceftriaxone	32(71.4)	8(88.8)	3(60)	4(100)	3(100)	50(76)	62.20*

	1)						*
Cefixime	38(84.4)	9(100)	4(80)	2(25)	3(100)	56(85)	82.75*
Chloramphenicol	9(20)	2(22.2)	1(20)	3(75)	0(0)	15(23)	16.67*
Tetracycline	37(82.2)	7(77.7)	4(80)	4(100)	2(66.6)	54(82)	80.63*
Nalidixic acid	21(46.6)	4(44.4)	2(40)	1(25)	3(100)	31(47)	44.97*
Ciprofloxacin	7(15.5)	2(22.2)	0(0)	2(50)	0(0)	11(17)	14.91*
Gentamycin	4(8.8)	3(33.3)	1(11.1)	0(0)	0(0)	8(12)	8.25 ^{NS}
Amikacin	8(17.7)	1(11.1)	1(20)	1(25)	2(66.6)	13(20)	14.31*
Tri/sulfa.	32(71.1)	6(66.6)	4(80)	2(50)	1(33.3)	45(68)	75.11*
Clarithromycin	38(84.4)	8(88.8)	5(100)	4(100)	3(100)	58(88)	76.31*
Nitrofurantoin	5(11.1)	1(11.1)	0(0)	2(50)	0(0)	8(12)	10.95*
Meropenem	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0.00 ^{NS}
Fosfomycin	25(55.5)	7(77.7)	4(80)	4(100)	2(66.6)	42(64)	42.52*
Ampicillin	44(97.7)	9(100)	5(100)	3(97)	3(100)	64(97)	96.94*
Amo+clavu.	40(88.8)	9(100)	5(100)	3(75)	2(66.6)	59(89)	86.67*
Aztreonam	18(40)	4(44.4)	4(80)	1(25)	1(33.3)	28(42)	35.95*
Piperacillin	28(62.2)	1(11.1)	1(20)	2(50)	1(33.3)	33(50)	86.85*

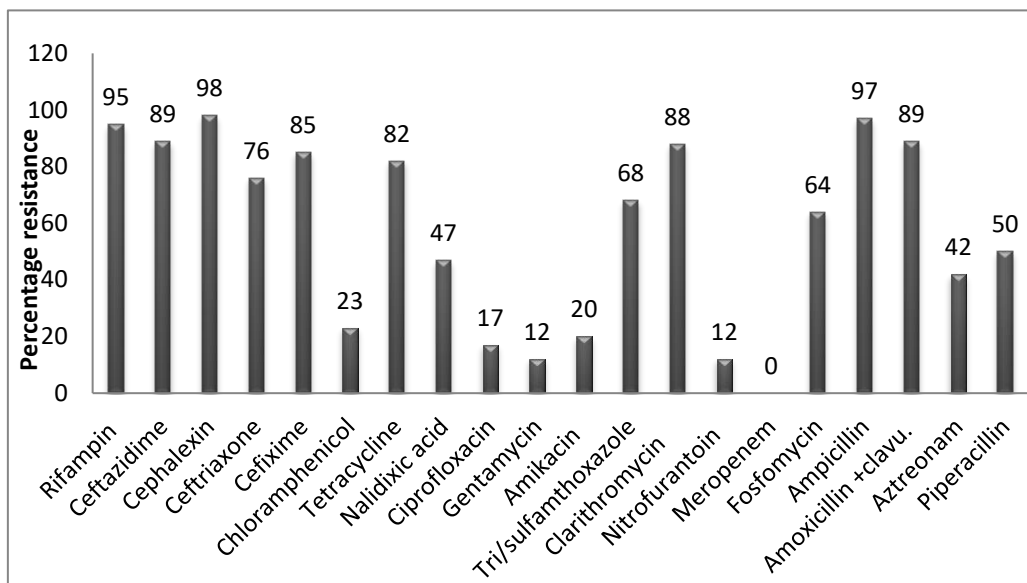


Figure 2: displaying a pattern of resistance to drugs

Isolates were observed most sensitive to meropenem and least sensitive to cephalixin and ampicillin.

On microscopic examination of the total infected participants, bacteriuria was seen among 60%, while pyuria was found among only 45.45% (Table4).

Table 4: Distribution of the items of urinalysis among the infected subjects.

Variable	No.	%	Chi ²
Bacteria	66	60	
Crystal	20	18.18	
Pus cells	50	45.45	
Protein	15	13	18.25**
Red blood cell	13	11.8	
Total collection sample	110		

** refer to higher significant difference between groups at ($P < 0.01$), according to Ch^2 test. $r^2 = 11.35$.

Discussion

The subjects of this research included a group of pregnant women and a control population of non- pregnant women for the purpose of studying urinary tract infections throughout gestation. In this investigation, the existence of a positive culture of the urine that resulted in a colony of bacteria with a number of $>10^5$

microorganisms every milliliter of urine was utilized to identify UTI. Accordingly, it was discovered that pregnant women had more urinary tract infections compared to non-pregnant women. The present results of the urinary tract infection(UTI) were compared with the study that was achieved in 2022 by Al-oebady and Munem showing high compatibility and reported that pregnant and non-pregnant women were influenced by UTI, 181 (86%),15 (27%) respectively (Al-oebady and Munem, 2022). This may be clarified through the reality that pregnant women , who exhibit greater reproductive activity, are more likely to have the bacterium causing the infection enter their urinary tract. The prevalence of asymptomatic (those found to have UTI by sample analysis but lacked any symptoms) and symptomatic bacteriuria was 15 (13.5%) and 51(46.3%) respectively. Untreated cases of asymptomatic bacteriuria during pregnancy carry a significant risk (up to 40%) of developing into acute pyelonephritis, which can result in morbidity and possibly mortality for both mom and baby(Jido, 2014). In comparison to earlier studies conducted in Ghana, which showed a prevalence of asymptomatic bacteriuria at 5.5% at Korle Bu and 7.3% in Komfo-Anokye Teaching Hospital, the current research's stated prevalence of asymptomatic bacteriuria was significantly greater at 13.5%(Labi *et al.*, 2015; Turpin *et al.*, 2007). Age 20 is an danger factor for complex UTI in gestation (Laari *et al.*, 2022). According to the present research, individuals among the ages of 16 and 20 years old showed the greatest number of cases of UTI infections, subsequent to others within the ages of 21 and 25 and those between 26 and 30. Whereas the minimal the frequency of infection was noted within individuals aged 36 to 40. A significant number of UTIs were discovered in individuals within the age range between 15 and 25 in a study carried out by Fred *et al.* (Willy Fred *et al.*, 2015). In contrast, a research by Kerure *et al.* observed that those aged 26 to 35 exhibited a greater frequency of UTIs (Kerure *et al.*, 2013). Similar to findings from a study done in Ras Al Khaimah, United Arab Emirates, the current finding shown that second period of gestation pregnant women experienced the greatest rate of urinary tract infections, with a percentage of fifty percent (50%) versus initially and third stage of gestation (Dube *et al.*, 2023). While, prior research showed incompatible with the present study pointing out that the UTI infection 30% of the infected women were in their first trimester, 44% in their second trimester, and 53% in their third trimester with no significant statistical relationship (Parveen *et al.*, 2011). women those with 2-3 kids suffered a higher rates of infection of the urinary tract, which was followed by those with 0–1 kids, whilst ladies with more than 4 kids experienced a lesser risk of infections. It's interesting that the present finding was consistent with a prior research, which found that 58.5% of women with 1 to 3 kids got a UTI (Al-oebady and Munem, 2022). Since fifty percent of the pregnant women in this research reported

previous experience of urinary tract infection, this was considered a significant risk factor when evaluating the likelihood of recurrence. In a research by Gebretensaie et al., they found that significant overgrowth of bacteria was closely associated with previous UTI history and UTI history through the three prior years in multiple logistic regression (Gebretensaie and Atnafu, 2023). In addition, the proportion of UTI in pregnant women with natural deliveries was higher than the rate of those with cesarean deliveries.

Urine culture is the most reliable method for identifying bacteriuria in gestation. In this investigation, *E. coli* was the most prevalent kind of bacteria linked to UTIs, causing more than half of the infections, then followed by *P. aeruginosa* and *Klebsiella spp.* Since *E coli* are an ordinary part of the gut flora, it may readily colonize the urinary tract and enhance the occurrence of bladder infection. According to past studies done at the population level, the uropathogenic has the strongest connection with UTI (Silva et al., 2022). Antibiotic sensitivity test show that all isolates are susceptible to Meropenem, this may be connected to our hospitals' newly enacted carbapenems treatment strategy and the fact that there are currently few consumable medications available because of the high price. All Gram-negative bacteria isolated in this study showed the highest resistance rate of 97%-100% to ampicillin and cephalexin, followed by Ceftazidime, amoxicillin + clavulanic acid, clarithromycin, cefixime, and tetracycline, The high resistance to these medications may be caused by excessive consumption for abuse of cheap drugs (Care et al., 2018).). In 66 of the urine specimens with culture-positive UTIs, bacteria were identified when the urine was analyzed using a microscope; the remaining 50 urine specimens had pyuria. Those values were supported by Al-Jawadi's study in Mousl and AL-Joda and Jasim in Samawa city in 2012 and 2021, respectively (Al-jawadi, 2012; Al-Joda and Jasim, 2021).

Conclusion

The study found that in the region of Tal Afar, pregnant women experienced UTIs threefold more regularly than non-pregnant subjects. *Escherichia coli* is the predominant pathogen causing UTI compared to another gram-negative bacterium. All bacterial isolates displayed poor susceptibilities to the commonly used anti-microbials while were significantly sensitive to Meropenem. The incidence of UTI correlated with gestation age, degree of education, and the final trimester of gestation; however, there was no correlation between livelihood and the occurrence of UTI during pregnancy. Every pregnant woman ought to undergo a routine urine examination, urine culture, to check for UTI and antibiotic therapy.

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