

Urinary Tract Infection among Pregnant Women and its Associated Risk Factors: A Cross-Sectional Study

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Urinary tract infection is widespread among pregnant women and is accompanying adverse maternal, fetal, and neonatal outcomes. Even so, no data exist regarding this problem in Wadi Addawser to guide specific management and thus to avert the adverse consequences. The study aimed to assess the urinary tract infection among pregnant women and its associated risk factors and to investigate the most common antibacterial agent used by infected pregnant women. A total of 303 pregnant women who attend the obstetrics and gynecology clinic with the inclusion criteria were included. The sample was collected using a structured interview. The study results showed, 53.5 % of the studied women had positive pathogens in the urine culture. *E. coli* (37%) followed by *Klebsiella pneumonia* (27%) had the highest percentage of the isolated pathogens. Amoxicillin and cefoxitin (40.1% & 21.6%, respectively) are the most antibiotics used by infected women, while the lowest used antibiotics are fusidic acid (5.6%). The clinical symptoms such as frequency of micturition, dysuria, lower abdominal pain, urine color change, painful burning sensation, incomplete bladder evacuation were most common among infected women. Since the symptoms are a good predictor for urinary tract infection during pregnancy, so early screening for pathogens and proper treatment for infected cases should be applied.

Keywords: An antibacterial agent; Pregnant women; Urinary tract infection.

Pregnancy is associated with structural, physiological and functional changes in the urinary tract which most often resulting in ascending of pathogens into the urinary bladder, causing urinary tract infections (UTIs).¹ In the general population, the extent of UTIs among pregnant women is higher than other healthy women.² Both symptomatic and asymptomatic UTIs are prevalent among pregnant women and are linked with adverse effects to the mother, the fetus, and newborn.^{1,3}

The changes in the urinary tract during

pregnancy and immune system increase the prevalence of bacteriuria, causing serious risks for both mother and fetus. Parity, Increasing age, sickle cell anemia, diabetes, urinary tract disorders and history of UTI, may increase the risk of urinary tract infection in pregnant women.^{4,5}

In pregnancy, urinary tract infection without antibiotic treatment may be result in serious complications such as low birth weight, preterm labor, hypertension, pre-eclampsia, anemia, pyelonephritis, amnionitis, stillbirths, neonatal

deaths, bacteremia and toxic septicaemia.^{6,7} Treatment of urinary tract infection may reduce the risk of pregnancy complications. So, screening for early diagnosis and treatment of urinary tract infection in pregnant women is essential to avoid its complications.⁸

Among pregnant women in Saudi Arabia, the prevalence of UTI was reported to be 20% (12% with symptomatic urinary tract infection and 8% were asymptomatic.⁹ In general, the cases of UTIs are caused by bacteria pathogens, especially gastrointestinal pathogens, that infects the urethral meatus through contaminating the area surrounding the rectum and spreading to the bladder.¹⁰

Approximately the common pathogenic causes of urinary tract infection are "*Escherichia coli*, *Staphylococcus* spp., *Streptococcus* spp., *Proteus* spp., *Klebsiella* spp. *Corynebacterium*, *Neisseria*, and *Pseudomonas* spp.". The severity of a urinary tract infection is influenced by the malevolence of the bacteria and the susceptibility of the host.¹¹ Penicillin, Amoxicillin, cefotaxime, norfloxacin, and cefoxitin are the most competent antibiotics for the treatment of the majority of the urinary tract pathogens.⁹

The significance of the present study is that urinary tract infection can be a danger for pregnant women between whom it has been revealed that up to 50% of those with asymptomatic Bacteriuria (ABU) go on to get pyelonephritis. Therefore, women during pregnancy should be assessed for predisposing factor and the causative organism of UTI during their antenatal follow-up. The urine examination for the presence of pathogens and the suitable antibiotic regimen should be specified for maternal and fetal health safety. The sensitivity for the antibiotics and their adverse reaction related to pregnancy should be considered¹²

The aim of the study

This study aimed to assess the urinary tract infection among pregnant women and its associated risk factors, and to investigate the most common antibiogram used by infected pregnant women.

MATERIAL AND METHODS

Study design

A cross-sectional design.

Study population and samples

The total subjects of the study sample

consisted of 303 pregnant women who attend the antenatal clinic at Wadi Addwaser General Hospital, KSA with the inclusion criteria. The inclusion criteria were pregnant women at the second trimester of pregnancy with suspected clinical symptoms of urinary tract infection. The suspected clinical symptoms of urinary tract infection such as; the frequency of urination, fever, dysuria, painful burning sensation, strangury, incomplete bladder voiding, lower abdominal pain, flank pain, changed urine color and shaking chills. Exclusion criteria; sickle cell disease (renal damage), anatomic or functional congenital urinary abnormalities, the pregnant women under antibiotic regimen within 72 hours to the study data collection were excluded because the antibiotic must have inhibited or destroyed the pathogens.

Sampling

The data were collected through face to face interview from first October 2018 to end of March 2019 by using structured questionnaire that include; the socio-demographic characteristics as (age, level of education, occupation, and family income).

Obstetrical history (number of pregnancies, number of deliveries, abortion, number of children and previous treatment for UTI during current pregnancy. Health habits (regular voiding, drinking enough water, intake of vitamin C, frequent tea intake , soft drinks and coffee ingestion; . Medical history as previous genital tract infection, hypertension, anemia , kidney calculi, and Diabetes Mellitus and clinical symptoms faced by pregnant women. The vaginal swab was taken from the study sample and analyzed to exclude vaginal infection according to the hospital rules.

Urine sample technique

Enough clean-catch midstream urine specimen was collected by the pregnant women after given adequate and careful instructions for urine sample collection technique.

The urine sample was inoculated on blood agar- plates- (MacConkey agar). The urine sample plates were put in the incubator under perfectly aerobic conditions at 37°C for 24 hrs. After 24 hours of incubation, The urine culture plates were examined macroscopically to identify the color, appearance, morphology, and the colonies size. The isolated bacteria were diagnosed by using Gram stain and biochemical test, and microscopic

examination. Antimicrobial susceptibility of isolated bacteria was examined to determine the proper antibiotic use. The presence of leukocyte (LE) and nitrate in urine were screened by using the biochemical reagent strip test (dipstick test). The microscope was used to test red blood cells (RBCs) and pus cell (pyuria) in urine¹³

Statistical analysis

The original data were coded and inserted into SPSS system files (SPSS package version

19, Chicago, USA). The data were analyzed and interpreted. Smirnov test was used to test the distribution of data. Univariate analyses including (Mann Whitney test and t-test) were used to test the significance of the quantitative variables results. Monte Carlo test, Chi-Square test, and Fisher’s Exact test were used to testing the significance of the qualitative variables results.

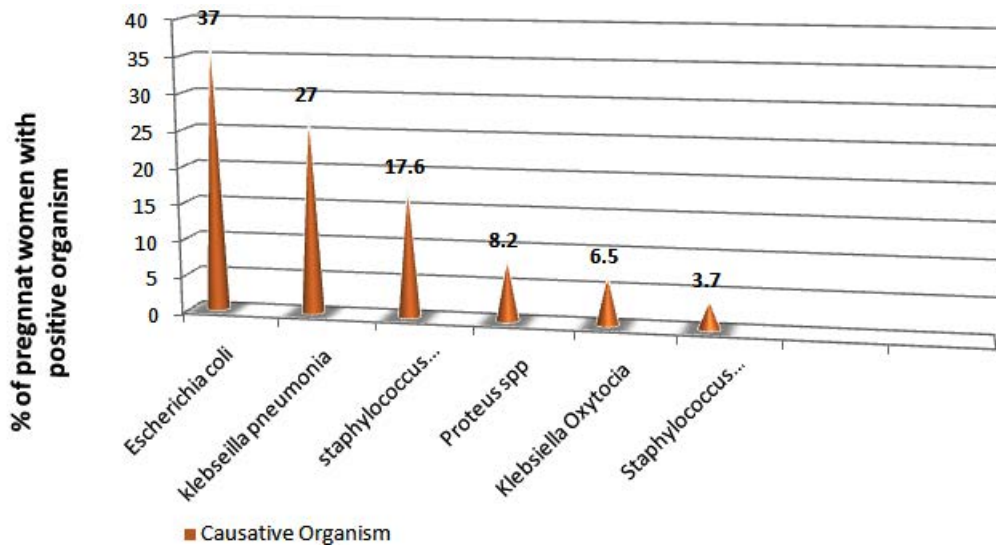


Fig. 1. The bacteria isolated from the urine culture

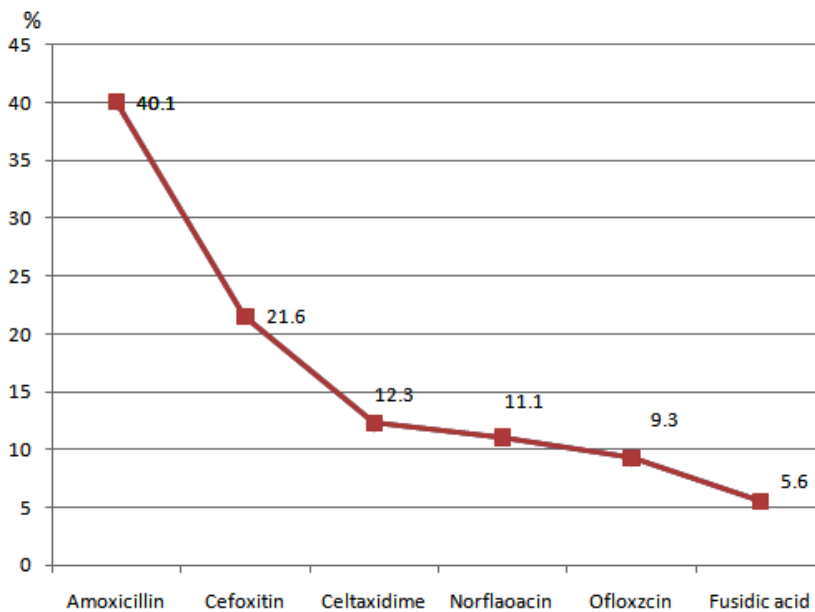


Fig. 2. Antibiotics used by infected pregnant women(n= 162)

RESULTS

Out of 303 pregnant women, 162 women (53.5%) were positive for urinary tract pathogens. *E. coli* were the most frequent organism (37%) isolated from a positive pregnant women urine culture, followed by *Klebsiella pneumonia* (27%) while the lowest was *staphylococcus saprophytic* (3.7%). The study presented that amoxicillin and cefoxitin (40.1% & 21.6%, respectively) are the most used antibiotics by infected women for the treatment of UTI, while the lowest used is the fusidic acid (5.6%) figure 1,2). Table (1): shows that there are statistically significant differences among negative and positive culture women concerning the age, occupation, family income, and previous treatment for UTI during current pregnancy at $P=0.05$. And there were no differences with the number of pregnancies, number of deliveries, abortion and the number of living children.

Table (2) Reveals that there is a statistically significant difference between the presence of pathogens in urine culture in relation to regular bladder voiding, diabetes mellitus, previous urinary tract infection and regarding clinical manifestation among the pregnant women

DISCUSSION

The result of the present study revealed the overall prevalence of urinary tract infection among pregnant women was (53.5%), which is obviously higher than what was documented earlier in Saudi Arabia (20%).⁹

In spite of the advances in medical and health care nowadays. This contrast in prevalence may be due to change in the studied sample and place of data collection. This result is nearly similar with the result of Worie & Eze., 2010¹⁴ but it was lower than the result from Niger (75%)¹⁵

Regarding bacteria isolated from the urine culture among pregnant women, the present results showed that the highest isolated organisms were *E. coli* (37%) and *Klebsiella pneumonia* (27%) while the lowest was *staphylococcus saprophytic* (3.7%). The previously mentioned result can be explained by the fact that the acidity of urine during pregnancy reaches the percentage that helps *E. coli* to grow.¹⁶ This finding is most consistent with many of the previous studies which determined that *E. coli*

are the most common urinary tract associated bacteria.^{9,15,17-21} In another study, *Staphylococcus aureus* is the most prevalent pathogens among asymptomatic pregnant women.²²

In the current study, amoxicillin and cefoxitin (40.1% & 21.6%, respectively) are the most used antibiotics by infected women for the treatment of UTI, while the lowest used is the fusidic acid (5.6%). In this respect, Faidah *et al.*,⁹ reported that amoxicillin, cefoxitin, celtaxidime, norfloxacin, penicillin, and fusidic acid are the highest beneficial antibiotics for treatment of UTI during pregnancy. The effect of these antibiotics lies in these highly expensive drugs and had controlled their attaining and indiscriminate use, therefore facilitating the pathogens susceptible to them.

In this study, there is a statistically significant differences among negative and positive culture women concerning the age, occupation, family income and previous treatment for UTI during current pregnancy at $P=0.05$. In this context, Eriksson²³ and Rahiman *et al.*,⁶ reported that Urinary tract infection (UTI) is a common in women of all ages but the incidence and prevalence increase with age. Kolawole *et al.*,¹⁴ stated that socioeconomic rank is a predictor for the presence of bathogens in urine and this result from shortage in housing and drainage system, improper environmental and personal hygiene. From the researcher's point of view, this could be attribute to the association of low socioeconomic status with Improper nutrition and low immunity especially during pregnancy. This study result is in line with the outcome of Tamalli *et al.*,¹⁷ study which revealed that prevalence of bacteriuria in healthy women is found to be 9% and 21% in case of poor pregnant women. It is noticeable that the infection of the urinary system is widespread among working women, and this can be explained that working women do not drink enough water during working hours. Moreover, 66.7% of positive culture women have previous UTI during current pregnancy with $P=0.05$. Kearney,²⁵ mentioned that during pregnancy, there is a modification in the immune system of the pregnant woman to help implant the egg and the development of the fetus. So, the response of the immune system is modified from a cell-intermediated to a humoral reaction which results in fewer responses to bacterial cell surface

proteins and probably facilitate pathogenicity. These modifications allow bacteria to penetrate, multiply and settles in the urinary system

The current study results showed that the difference between the presence of bacteria in urine culture in relation to regular bladder

Table 1. The Socio-demographic characteristics and the obstetric history of the studied pregnant women (n=303)

Socio-demographic characteristics	Women with a negative culture (n=141)		Women with a positive culture (n=162)		Significance
	No.	%	No.	%	
Age (years)					
Less than 25	30	21.3	33	20.4	
25-<35	81	57.4	63	38.9	
35-45	30	21.3	66	40.7	
Min-Max	18.0-42.0		20.0-45.0		t=2.082
Mean±SD	29.3±5.9		32.0±6.7		P=0.040*
Level of education					
Illiterate	9	6.4	15	9.3	
Read and write	18	12.8	30	18.5	X2=5.145
Secondary school	54	38.3	39	24.1	MCP=0.280
University	48	34.0	45	27.8	
Postgraduate studies	12	8.5	33	20.3	
Occupation					
Work	42	29.8	93	57.4	X2=7.760
Housewife	99	70.2	69	42.6	P=0.005* com
Family income					
Insufficient	21	14.9	30	55.6	X2=18.314
Moderate	111	78.7	63	38.8	MCP<0.0001*
Enough		9	5.6		
NO of pregnancies					
1-2	51	36.2	51	31.5	
3-4	48	34.0	48	44.4	
5 or more	42	29.8	39	24.1	
Min-Max	1-9		1-12		Z=0.618
Median (Q1-Q3)	3 (2-5)		4 (2-4)		P=0.537
Number of deliveries					
None	39	27.7	24	14.8	
1-2	66	46.8	75	46.3	
3-4	24	17.0	39	24.1	
5 or more	12	8.5	24	14.8	
Min-Max	0-8		0-8		Z=1.431
Median (Q1-Q3)	2 (0-3)		2 (1-3)		P=0.152
Abortions					
None	87	61.7	123	75.9	
1-2	48	34.0	30	18.5	
3-4	6	4.3	9	5.6	
Min-Max	0-3		0-4		Z=1.462
Median (Q1-Q3)	0 (0-1)		0 (0-0.5)		P=0.144
Previous treatment for UTI during current pregnancy					
Yes	39	27.7	108	66.7	X2=15.310
No	102	72.3	54	33.3	P<0.0001*

Q1-Q3: Interquartile range, Z: Mann Whitney test, X2: Chi-Square test, *significant at P=0.05, t: Student t-test, MCP: Monte Carlo corrected, P-value, *significant at P=0.05

Table 2. The predisposing factors and clinical manifestations of the studied pregnant women (n =303)

Predisposing factors	Women with NEGATIVE culture (n=141)		Women with POSITIVE culture (n=162)		Significance
	No.	%	No.	%	
Health-related Habits during pregnancy					
Vitamin C intake	84	59.6	75	46.3	X ² =1.777 P=0.183
Regular bladder voiding	123	87.2	99	61.1	X ² =8.755 P=0.003*
Frequent soft drinks consumption	69	48.9	99	61.1	X ² =1.508 P=0.219
Frequent tea consumption	57	40.4	93	57.4	X ² =2.899 P=0.089
Frequent coffee consumption	57	40.4	93	57.4	X ² =2.899 P=0.089
Drinking enough water	111	78.7	102	63.0	X ² =2.989 P=0.084
Medical history					
Genital tract infection	45	31.9	54	33.3	X ² =0.023 P=0.880
Hypertension	36	25.5	57	35.2	X ² =1.101 P=0.294
Kidney stones	15	10.6	24	14.8	X ² =0.391 P=0.532
Diabetes Mellitus	12	8.5	57	35.2	X ² =10.147 P=0.001*
Previous urinary tract infection	33	23.4	108	66.7	X ² =18.904 P<0.0001*
Anemia	66	46.8	57	35.2	X ² =1.408 P=0.235
Clinical manifestation					
Painful burning sensation	54	38.3	117	72.2	X ² =11.763 P=0.001*
Incomplete bladder voiding	39	27.7	105	64.8	X ² =13.910 P<0.0001*
Frequency of urination	66	46.8	147	90.7	X ² =23.227 P<0.0001*
Fever	27	19.1	66	40.7	X ² =5.507 P=0.019*
Strangury	30	21.3	90	55.6	X ² =12.345 P<0.0001*
Dysuria	33	23.4	129	79.6	X ² =31.292 P<0.0001*
Shaking chills	21	14.9	57	35.2	X ² =5.413 P=0.02*
Flank pain	48	34.0	96	59.3	X ² =6.407 P=0.011*
Change urine color	36	25.5	120	74.1	X ² =23.706 P<0.0001*
Lower abdominal pain	69	48.9	120	74.1	X ² =6.766 P=0.009*
Laboratory results					
Hematuria	3	2.1	48	29.6	X ² =13.577 P<0.0001*
Pyuria	18	12.8	123	75.9	X ² =40.291 P<0.0001*

X²: Chi-Square test

*significant at P≤0.05

voiding, diabetes mellitus, previous urinary tract infection was statistically significant. Rahiman *et al.*,¹⁶ stated that emptying of the bladder is the dominant defense against urinary tract infection so, complete emptying the bladder during urinating and not ignoring the desire to urinate can help women to be away from urinary tract infections in most cases. Also, urinary tract infection was significantly associated with pregnant women who have diabetes mellitus and previous UTI. This is maybe attributable to elevate the glucosuria and decrease the immune system host factors prejudice to infection during pregnancy. Increase blood glucose during pregnancy causes a neutrophil disturbance by excessing calcium inside the levels of the cell and restrict with actin, also diapedesis

and phagocytosis. The vaginal candidiasis and vascular disease also have a role in recurrent of infections. Also, this is due to the stoppage of the urine during pregnancy caused by physiological and anatomical changes in the urinary system, such as uterus compression on the ureters and the effect of the relaxation of progesterone on the urinary tract muscle.²⁶ Moreover, Emiru *et al.*,²⁷ proved that recurrent urinary tract infection and diabetes mellitus are risk factors for UTI, so the frequency and the severity of UTI rise in pregnancy.

The current study results revealed that, a statistically significant difference between presences of bacteria in urine culture in relation to clinical symptoms related to urination. The clinical symptoms such as frequency of micturition,

dysuria, lower abdominal pain, urine color change, painful burning sensation, incomplete bladder evacuation. This result consistent with the results of Almushait *et al.*,²⁸ study which found nearly the same results. There is a statistically significant difference between the presence of pathogens in urine in relation to laboratory findings such as pyuria and hematuria, $P=0.05$ in the present findings. This result is in line with Michelim *et al.*,²⁹ who stated that Pyuria is found in a majority of women with pyelonephritis.

CONCLUSION

Out of 303 pregnant women, 162 women were positive for urinary tract pathogens. *E. coli* were the most frequent organism isolated from a positive pregnant women urine culture, followed by *Klebsiella pneumonia* while the lowest was *staphylococcus saprophytic*. Amoxicillin and cefoxitin are the most used antibiotics by infected women for the treatment of UTI, while the lowest used is fusidic acid. There was a statistically significant difference between the presence of pathogens in urine culture in relation to regular bladder voiding, diabetes mellitus, previous urinary tract infection, and regarding clinical manifestation among pregnant women. Since the symptoms are a good predictor for urinary tract infection during pregnancy, so early screening for pathogens and proper treatment for infected cases should be applied.

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