

## The Prevalence of Urinary Tract Infection (UTI) Among Pregnant Women In Hodeidah City

AL-KadassyAM<sup>1</sup>, Baraheem OH<sup>2</sup>, Ogaili MA<sup>3</sup>

<sup>1</sup>Department of Medical Microbiology, Faculty of Medicine and Health Sciences, Hodeidah University, Yemen

<sup>2</sup>Department of Medical Microbiology, Faculty of Medicine and Health Sciences, Hodeidah University, Yemen

<sup>3</sup>Department of Medical laboratories, Faculty of Medicine and Health Sciences, Hodeidah University, Yemen

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**Abstract:** This study aimed to define the bacteriological etiology and incidence of urinary tract infections (UTIs) among 55 pregnant women attending the antenatal care clinics in primary health center in Hodeida city, Yemen. Clean voided mid-stream urine samples were collected and cultured. Isolated bacteria were characterized by standard laboratory tests, and antibiotic sensitivity was performed by disk diffusion method. Clinically significant bacterial growth was detected in 30 (54.5%) of the samples examined. *Escherichia coli* was the most frequent etiological agent of UTI (50 %) followed by *Staphylococcus aureus* (13.3%), *Streptococcus B-hemolytic* (13.3%), *Klebsiella* spp. (10%), *Staphylococcus saprophyticus* (10%), and *Pseudomonas aeruginosa* (3.4%). The antimicrobial sensitivity analysis for *E. coli*, as the most commonly UTI isolated agents, to antibiotics are as follows: chloramphenicol (93.3%), gentamicin (73.3%), ampicillin (73%), nalidixic acid (26%), and tetracycline (2%). Our results reveal a high incidence of UTIs with highly variable pattern of antibiotic resistance. More surveillance is needed to enhance in the administration of antibiotics therapies and management of UTIs. Also, increased public educations about personal hygiene are strongly recommended to decrease the incidence of UTIs in pregnant women.

**Keywords:** bacteriuria, *Escherichia coli*, Hodeida, pregnant women, Urinary Tract Infection,

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### I. Introduction

Urinary tract infections (UTI) during pregnancy is one of the most common public health problems worldwide, and that upto 10% of women will experience a symptomatic UTI at some time during their lifetime<sup>(1,2)</sup>. Pregnant women are at increased risk for UTIs, beginning in week 6 and peaking during weeks 22 to 24, approximately 90 percent of pregnant women develop ureteral dilatation, which will remain until delivery<sup>(3)</sup>. Asymptomatic bacteriuria have been reported to occur in 1.9 to 9.5 % of pregnant women<sup>(4)</sup>. Either symptomatic or asymptomatic infection can result in serious consequences if not early detected and treated<sup>(5,6)</sup>. Although variety of microorganisms, including fungi and viruses can cause UTIs but bacteria are the most common culprits and are responsible of nearly 95 % of cases<sup>(7)</sup>. Of these bacteria *E. coli* is among the most common causative agents of the disease and is solely responsible for more than 80% of these infections. Several physiological, anatomical and personal factors contribute to UTIs during pregnancy<sup>(5,6)</sup>. For example, urethral dilatation, increased bladder volume and decreased bladder tone result in an increased urinary stasis and ureterovesical reflux which in turn increase the risk of UTIs<sup>(8)</sup>. One of the reasons that enhances bacterial growth in up to 70% of pregnant women is the development of glycosuria which is caused by the physiologic increase in plasma volume consequent decreases in urine concentration<sup>(6,7)</sup>. Other factor that may increases the risk of UTI is poor or inadequate personal hygiene and the proximity of vagina and anus and inability of women to empty their bladder completely. High incidence of UTI has previously been reported in lower socioeconomic population<sup>(9)</sup>. It has also been reported that sexual activity and use of certain contraceptive methods can increase the risk of infection<sup>(10)</sup>. Early, accurate diagnosis and treatment of UTI are thus essential to ensure optimal management and to prevent further complications.

The therapeutic strategy of patients with UTI is normally started empirically and often based on information determined from the antimicrobial resistance pattern of the urinary pathogens. However, the reemergence of antibiotic resistance warrants continuous monitoring of sensitivity pattern of bacterial isolates.

This study was designed to determine the incidence of UTI among pregnant woman in AL-Hodeidah city and identify possible risk factors and the etiological agents of UTIs and their susceptibility patterns to commonly used antibiotics.

## II. Materials And Methods

### 2.1 Samples

This study included urine samples from 55 pregnant women attending the antenatal care clinics in the primary health center in Hodeida city, west of Yemen, from August to October, 2011 (AL-Hawq PHC n = 35 samples, AL-Haly PHC n = 20 samples). Participants' age ranged from 18 to 40 years (mean age -- years). None of participants received antibiotics within the previous two months. A questionnaire was used to assess the participants' demographic, clinical data and conditions established as important factors to increase the risk of having UTIs. The questionnaire was designed especially for the purpose of this study. It was based on a literature review of previous studies concerning patients' knowledge about UTI and UTI risk factors. Clean catch midstream urine (MSU) samples were collected inside sterile disposable universal containers from all participants. Subjects were instructed on how to collect samples and the need for prompt delivery to the laboratory. The samples were labeled and transported to the laboratory under adequate conditions and were analyzed within 30 minutes to 1 hour of collection.

### 2.2 Laboratory Investigation

#### 2.2.1 Microscopy

The urine samples were thoroughly mixed and aliquots centrifuged at 5000 rpm for 5 min. The sediments were investigated using both 10X and 40X objectives. Urine with 9 white blood cells or less was considered normal while those with  $\geq 10$  were regarded as pyuria. A drop of urine samples were placed on a glass microscope slide, allowed to air dry, stained with gram stain, and examined microscopically.

#### 2.2.2 Isolation and identification of organisms

Aliquots of urine samples for culture were tested shortly after collection. All samples were plated in parallel on blood agar (BA), MacConkey agar (MCA), Nutrient Agar (NA), while Nutrient Broth (NB), or Cysteine Lactose Electrolyte Deficient (CLED) may be used when necessary. Culture media were incubated at 37<sup>o</sup>C for 24-48 hours. After incubation, plates with single organism growth were selected, urinary tract infections was diagnosed if a single organism was cultured at a concentration of  $\geq 10^5$  CFU/ml or when a single organism was cultured at a concentration of 10<sup>4</sup> CFU/ml and  $\geq 10$  leukocytes per high-power field were observed on microscopic examination of the urine. Identification of bacterial strains was conducted using standard biochemical techniques<sup>(5,6)</sup>.

#### 2.2.3 Antimicrobial susceptibility tests

Based on standard operational procedures, antimicrobial susceptibility tests were performed on Mueller-Hinton agar (Oxoid, Hampshire, England) using the method described by Kirby Bauer disk diffusion method<sup>(11)</sup>. The antibiotics tested were: ampicillin (10 $\mu$ g), tetracycline (30 $\mu$ g), gentamicin (10 $\mu$ g), chloramphenicol (30 $\mu$ g), nalidixic acid (30 $\mu$ g) (Oxoid, England). We used the criteria for the National Committee for Clinical laboratory Standards (NCCLS) to interpret resistance data<sup>(12)</sup>.

## 1. STATISTICAL ANALYSIS

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 16.0 (SPSS, Inc., Chicago, Ill). The continuous variables were given as means  $\pm$  standard deviation. The Pearson Chi-squared test was employed to test for association between discrete variables. *P*-value of  $< 0.05$  was considered to indicate statistically significant differences.

## III. Results

Among 55 pregnant women between the ages of 18 - 40 years who were screened, significant bacteriuria was found in only 30 (54.5%) cases . Highest incidence 22 (73.33%) was reported in the age group of 20- <30 years and in moderate incidence of infection 7( 23.3%)were in age 30 -40 and lower infection 1 ( 3.3%) were in age < 20 years (Table 1).

Gram negative bacteria occurred more frequently than Gram positive bacteria, constituting 19 (63.4%) of the total isolates. The commonest bacterium which was detected in culture was *Escherichia coli* 15 (50 %). This was followed by *Staphylococcus aureus* 4(13.3%), *Streptococcus B-hemolytic* 4 ( 13.3 % ), *Klebsiellaspp.* 3 ( 10 % ) , , *Staphylococcus saprophyticus* 3 (10%) and *Pseudomonasaeruginosa* 1 ( 3.4 %) (Table 2)

There was higher rate of infection in the second trimester 16 (53.00%), compared to first trimester 9 (30.00%), and third trimester -5 (17.00%) (Table 3). Urinary tract infections were more prevalent among ans/Housewives, this constituted (83%) of thepregnant women with UTI, followed by civil servants and students (6.67%) and finally teachers (6.67%), (Table 3).

Among all pregnant women in the study 20 (66.6 %) reported with symptom suggestive of an UTI growth in the urine culture while 10 (33.3%) of the pregnant women which had no symptoms of UTI gave positive urine cultures (Table 3) .

*Escherichia coli*, the most common isolate, was found to be sensitive to chloramphenicol (93.3% sensitivity) and to ampicillin and gentamycin (73.0% sensitivity). Twenty six percent sensitivity was documented for nalidixic acid. Sensitivity to tetracycline was 2.0%. *Staphylococcus aureus*, the second most frequent organism which was isolated, was found to be sensitive to gentamycin (100% sensitivity) and to ampicillin and chloramphenicol (75.0% sensitivity), whereas nalidixic acid and tetracycline were resistant (Table 4).

**Table 1:** Frequency of bacterial isolation from 30 possible urine cultures samples in in pregnant women

Bacteria isolates	Species	No.	%
Gram Positive cocci	<i>Staphylococcus aureus</i>	4	13.3%
	<i>Staphylococcus saprophyticus</i>	3	10%
	<i>Streptococcus B—Hemolytic</i>	4	13.3%
Gram Negative bacilli	<i>Escherichia coli</i>	15	50%
	<i>Klebsiellasp</i>	3	10%
	<i>Pseudomonas aeruginosa</i>	1	3.4%

**Table 2:** Incidence of UTI in relation to age distributions of pregnant women.

Age group ( years)	No. tested	( % )	No. positive	( % )	No. Negative	( % )
< 20	4	7%	1	3.33%	3	12%
20 -	38	69%	22	73.33%	16	64%
30 – 40	13	24%	7	23.33%	6	24%
TOTAL	55	100%	30	54.5%	25	45.5%

**Table 3:** Prevalence of UTI and demographic characteristic of study population

Characteristics	No. Tested (%)	No. Negative (%)	No. Positive (%)	Chi-square (x2)	P-value
Occupational Groups	3 (5.45%)	1 (4%)	2 (6.67%)	2.85,	0.41 5
Students	5 (9.09%)	4 (16%)	1 (3%)		
Teachers	3 (5.45%)	1 (4%)	2 (6.67%)		
Civil Servants ans/Housewives	44 (80.00%)	19 (76%)	25 (83%)		
Parity				0.041	0.979
Nullipara	17 30.9%	8 (47.1%)	9 (52.9 %)		
Para 2	13 23.6%	6 (46.2%)	7 ( 53.8 %)		
≥ 3	25 45.4%	11 (44%)	14 ( 56 % )		
Trimester				1.72	0.423
First trimester	20 (36%)	11 (44%)	9 (30%)		
Second trimester	25 (45%)	9 (36%)	16 (53%)		
Third trimester	10 (18%)	5 (20%)	5 (17%)		
Symptoms of UTI				0.262	0.609
Symptomatic	30 (55 %)	15 (60.3%)	20 (66.6 %)		
Asymptomatic	25 (45 %)	10 (40.6%)	10 (33.3 %)		

**Table 4:** Frequency distribution of microorganism and their susceptibility to antibiotics.

Bacteria isolated	Total no isolated	Susceptibility to antimicrobial drug %									
		Ampicillin		Tetracycline		Gentamicin		Chloramphenicol		Nalidixic acid	
<i>Escherichia coli</i>	15 (50%)	11	(73.%)	3	(2%)	11	(73.3%)	14	(93.3%)	4	(26.%)
<i>Klebsiellasp.</i>	3 (10%)	2	(67 %)	0		2	(67 %)	3	( 100 %)	3	100%
<i>Pseudomonas aeruginosa</i>	1 (3.4%)	0		1	100%	1	(100%)	0		0	
<i>Staphylococcus aureus</i>	4 (13.3%)	3	(75 %)	0		4	(100 %)	3	(75 %)	0	
<i>Staphylococcus saprophyticus</i>	3 (10%)	2	(67 %)	0		3	(100 %)	2	(67 %)	0	
<i>Streptococcus B-hemolytic</i>	4(13.3%)	4	100%	2	50%	4	(100 %)	3	(75 %)	0	
Total	30(100%)	22	73.3%	6	20%	25	(83.3%)	25	(83.3%)	7	23.3%

#### **IV. Discussion**

The incidence of UTIs in this study population was 54.5%. This is nearly similar to that reported in Nigeria<sup>(13,14)</sup>. While in other studies the incidence was lower than our study<sup>(15,16,17)</sup>. UTIs are especially problematic for women and up to a third of all women will experience a UTI at some point in their life<sup>(18)</sup>. In similar studies in our Region, the prevalence was 38% in Iraq<sup>(19)</sup>, 28.5% in Pakistan<sup>(20)</sup>, 14.2% in Saudi Arabia<sup>(21)</sup> and 10.6% in Turkey<sup>(22)</sup> and this high prevalence and incidence of UTI reported in this study may be attributed to the environmental conditions where the subjects reside.

The low incidence rate of urinary tract infection reported among Teachers (3%) in this study may be attributed to the extensive health care talk given regularly in public awareness programmers among the housewives. The incidence rate of bacteriuria among pregnant women in second trimester is 53%, The findings of this study showed that 56% of the women who had UTIs were in their 3rd pregnancy and 52% were in their 1st pregnancy. This showed that parity is one of the possible factors affecting the incidence and prevalence rate of UTIs among women.

In this study, women in their 2nd and first trimester were found to have the higher incidence of UTI 53% and 30% respectively. Though fewer women were in their third trimester, they showed no specific bacteria growth and show no sign of UTIs. Also reported that 30% of women with bacteriuria in the first trimester develop upper UTI in the second. Thus, pregnant women should be screened for bacteriuria by urine culture at many weeks of gestation. The presence of  $1 \times 10^5$  CFU of bacteria per mL of urine should be considered as highly significant<sup>(23)</sup>.

Only thirty samples were observed to have pus cells. *E. coli* is the most common pathogen among patients with uncomplicated UTIs<sup>(24)</sup>. Other members of the family Enterobacteriaceae (such as some strains of *Klebsiella* spp.) and other organisms (such as *Staphylococcus aureus*), can have similar requirements<sup>(25)</sup>.

The most implicating organisms causing urinary tract infections among these pregnant women in this study were *Escherichia coli* and were responsible for 50% of the cases of UTI. This was followed by *S. aureus* (13.3%), *Klebsiella* spp. (10%),). This finding is similar to other reports which suggest that Gram negative bacteria, particularly *E. coli* is the commonest pathogen isolated in patients with UTI also reported that *E. coli* was the most commonly isolated pathogen in significant bacteriuria<sup>(26,27,28)</sup>.

In this study, a total of 30 isolates were obtained from the 30 pregnant women with positive cultures; only one bacterial species was isolated from each subject, High incidence of UTI was found in age groups 20 <30 years, though, a high percentage of the bacterial isolates were obtained mainly from pregnant women in age group 20 <30 years. This confirms the usual report that the risk of UTIs increases with age<sup>(27)</sup>. The pattern of isolates reported in this study is consistent with the usually reported pattern, with *E. coli* being the most common organism isolated in cases of urinary tract infection followed by *S. aureus* and *Klebsiella* spp. *P. aeruginosa* was the least common isolates in this study.

The high incidence of urinary tract infections reported among pregnant women might be as a result of a variety of factors; women under 50 years of age with acute symptoms such as dysuria, urgency or frequency suggesting of lower UTI or loin pain suggesting of upper UTI are extremely likely to have bacteriuria. Asymptomatic bacteriuria becomes increasingly common with age. Alternations in vaginal microflora also play a critical role in encouraging vaginal colonization with coliforms and this can lead to urinary tract infection<sup>(29)</sup>.

The findings of this study revealed that the important infecting organisms were found to be the commensals of perianal and vaginal regions. This calls for increase in personal hygiene<sup>(29)</sup>. This study has highlighted the need to raise awareness of UTIs and to expand services for prevention and treatment for pregnant women. To do this effectively, however, it may be necessary to improve the quality of health care provided at the community level. Since UTI may be symptomatic and asymptomatic in most cases, it is therefore suggested that routine screening of patients with unexplained sources of fever be done for UTI and the appropriate antimicrobials administered after sensitivity tests have been carried out in order to prevent the cases becoming symptomatic later with resultant renal damage<sup>(14)</sup>.

#### **V. Conclusion**

Culture technique is a rapid and sensitive test highly recommended in the diagnosis of urinary tract infection and so that all pregnant women should be screened for UTI with a urine culture, treated with antibiotics if the culture is positive and then retested for cure. It is necessary to obtain sensitivity reports before initiation of antibiotic therapy in cases of suspected UTI. Further studies should be performed on a larger sample of pregnant women for evaluation of the role microbial in UTI among pregnant women in Hodeidah city.

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