Prevalence of Bacterial Urinary Tract Infection in Pregnant and non Pregnant Women in Alegailat and Sabratha Hospitals, Libya

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Abstract:

Urinary tract infections are common during pregnancy, and the most common causative organism is *Escherichia coli*. Asymptomatic bacteriuria can lead to the development of cystitis or pyelonephritis. All pregnant women should be screened for bacteriuria and subsequently treated with antibiotics such as nitrofurantoin, Trimethprim-sulfamethaxazole or cephalexin. Pyelonephritis can be a life-threatening illness, with increased risk of perinatal and neonatal morbidity. Recurrent infections are common during pregnancy and require prophylactic treatment. Pregnant women with urinary group B streptococcal infection should be treated and should

receive intrapartum prophylactic therapy. Objectives: Identifying the most frequent bacterial pathogenic agents of urinary tract infection (UTI) in pregnant and non pregnant women isolated from Sabratha and Alegailat hospitals and to determine the antibiotics sensitivity patterns for both groups.

Among four hundred and thirty eight (438) pregnant and non pregnant women screened, 186 (42.46%) were positive urine culture, including 96 (51.61%) pregnant women and 90 (48.38%) non pregnant women, According to gestation age, the number and percentage of cases with positive urine culture were 19 (19.7%) in the first trimester, 27 (28.1 %) in the second trimester, 50 (43.7%) in the third trimester. The susceptibility patterns seen in our study seem to suggest that it is absolutely necessary to obtain sensitivity reports before initiation of antibiotic therapy in cases of suspected UTI.

Introduction:

Urinary tract infections are the most common bacterial infection in women, can cause damage to the bladder and kidney(49). UTI affects all age groups, but women particularly pregnant women are more susceptible than men, due to pregnancy, short urethra, easy contamination of urinary tract with fecal flora and various other reasons (1,2). 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 . Increased bladder volume and decreased bladder tone, along with decreased ureteral tone, contribute to increased urinary stasis and ureterovesical reflux (3) Additionally, the physiologic increase in plasma volume during pregnancy decreases urine

concentration. Up to 70 percent of pregnant women develop glycosuria, which encourages bacterial growth in the urine. Increases in urinary progestin and estrogens may lead to a decreased ability of the lower urinary tract to resist invading bacteria. This decreased ability may be caused by decreased ureteral tone or possibly by allowing some strains of bacteria to selectively grow.(3, 4) These factors may all contribute to the development of UTIs during pregnancy. The organisms that cause UTIs during pregnancy are the same as those found in non pregnant patients. *Escherichia coli* accounts for 80 to 90 percent of infections. Other gram-negative rods such as *Proteus mirabilis* and *Klebsiella pneumoniae* are also common. Gram-positive organisms such as group B streptococcus and *Staphylococcus saprophyticus* are less common causes of UTI. Less common organisms that may cause UTI include enterococci, *Gardnerella vaginalis* and *Ureaplasma ureolyticum* (5,6)

Pregnant women should be treated with proper antibiotics. The choice of antibiotic should address the most common infecting organisms (i.e., gram-negative gastrointestinal organisms). The antibiotic should also be safe for the mother and fetus. Historically, ampicillin has been the drug of choice, but in recent years *E. coli* has become increasingly resistant to ampicillin (7). Ampicillin resistance is found in 20 to 30 percent of *E. coli* cultured from urine in the out-patient setting (8). Nitrofurantoin is a good choice because of its high urinary concentration. Alternatively, cephalosporins are well tolerated and adequately treat the important organisms. The current study was undertaken to find the spectrum of micro-organisms responsible for causing UTI in pregnant and non pregnant patients and to find out the most appropriate antibiotic

Materials and Methods:

Sample collection:

In this study, a total of 438 samples were collected from pregnant and non pregnant patients in Alegailat and Sabratha hospitals, Libya, by clean catch midstream urine in a sterile tube, with an age range from 16 to 50 years and immediately transported to the laboratory and the inclusion criteria were pregnant and non pregnant women (from 16 to 50) years of age. Fresh midstream urine was collected aseptically in sterile containers and submitted to the clinical microbiology laboratory In Sabratha hospital, the strains were identified using standard biochemical methods.

The standardized Kirby-Bauer disc diffusion test of the Clinical and Laboratory Standards Institute (formerly NCCLS) was used for Antibiotic susceptibility testing and accordingly interpretations were carried out, and were performed on Muller-Hinton agar with Oxoid disks (Oxoid, Hampshire, UK). Antibiotic disks concentration (drug concentrations in µg) were Amikacin 30 (Ak), trimethoprim-sulfamethoxazole 25 (Tm-Su), Ciprofloxacin 5 (Cip), Gentamicin 10 (Gm), Nitrofurantoin 300 (Nf), Cefotaxime 30 (Cf) . All the isolates were stored on nutrient agar slopes at room temperature or in Luria-Bertani (LB) broth with 50% glycerol at -80ºC for long-term storage.

RESULTS:

During the 5-months study period i.e., Nov'2014-Mar 2015, out of the 384 samples screened, a total of 186 (42.46%) were positive samples of urine from both pregnant, and non pregnant females, and the remaining 252 (57.53%) were negative. Out of the 186 positive samples screened, a

total of 96 (51,6%) samples of urine from pregnant females, in different stages of pregnancy were found to be positive on culture.. Most of the positive pregnant patients with symptomatic as well as asymptomatic UTI were in the third trimester of pregnancy (52%), followed by second trimester (28,1%), and only (19,8%) in the first trimester of pregnancy as shown in (Table 1).

Table 1: Urine culture in relation to gestational age.

Gestational age	No of positive infection	No of Pregnant women	Positive infection%
First trimesters	37	19	19.8%
Second trimesters	71	27	28.1%
Third trimesters	78	50	43.7%
Total	186	96	52%

Prevalence of urinary tract infection among the studied patients is illustrated in table 4and figure 4. Out of 186 urine culture were performing during the study period, 96 (51.61%) showed pregnant women and 90 (48.38%) showed non pregnant women. The result also revealed that, (25-31) the highest patient 35 (36.4%) compared with (46-52) low patient 8 (8.3%) was pregnant women and (25-31) the highest patients (32.22%) compared with (46-52) low patients (6.6%) was non pregnant women as shown in (Table 2).

Table 2: Urine culture in relation to age group of pregnant and non pregnant women.

Age range	Pregnant women		Non pregnant women	
	No.	%	No.	%
18 – 24	27	28.1	22	24.4
25 – 31	35	36.4	29	32.2
32– 38	25	26	15	16.6
39 – 45	8	8.3	18	20
46 – 52	1	1	6	6.6
Total	96	100%	90	100%

Concerning the distribution in Sabratha hospital, the results illustrated that the highest number of pregnant women in Sabratha hospital group, were recorded in age range from (25 – 31) 24 cases .

For non pregnant women in Sabratha hospital group, the highest number were concentrated in age range (25 – 31) 27cases as shown (Table 3).

Table3: Distribution of cases involved in the study according to Alegailat and Sabratha hospitals

Age range	Alegailat hospital				Sabratha hospital			
	Pregnant women		Nonpregnant women		Pregnant women		Nonpregnant women	
	No.	%	No.	%	No.	%	No.	%
18 – 24	22	35.2	12	33.3	12	25	8	80
25 – 31	30	48.3	18	50	24	50	27	67.5
32 – 38	6	9.6	3	8.3	6	12.5	3	7.5
39 – 45	2	3.22	1	2.7	4	8.3	1	2.5
46 – 52	2	3.22	2	5.5	2	4.1	1	2.5
Total	62		36		48		40	

The *Enterobacteriaceae* accounted for nearly two-thirds of the isolates and *E. coli* alone accounted for 35% of the urinary isolates followed by *Klebsiella pneumonia* 16%, *Proteus mirabilis* (7,5%), and *Enterobacter cloacae* (3,2%) . Among the Gram-positive cocci, *Group-B streptococci* (24,7%) were more frequently isolated than *S. aureus* (13,4%) as shown in(Table 4).

Table 4: Distribution of bacterial uropathogens isolated from pregnant and non pregnant women

Type of organism	Number	Percentage
Escherichia coli	65	34.94%
Group-B streptococci	46	24.73%
Klebsiella pneumoniae	30	16.12%
Staphylococcus aureus	25	13.44%
Proteus mirabilis	14	7.52%
Enterobacter cloacae	6	3.22%
Total	186	100%

Antibiotic sensitivity testing:

Antibiotic susceptibility testing was done according to Kirby-Bauer's disc diffusion method for all the isolates. We found that 90% of *Escherichia coli* isolates were sensitive to Ciprofloxacin (90%), (41%) for Trimethoprim, (58%) for Nitrofurantoin, (50%) for Ampicillin, (42%) for Trimethoprim- sulfamethoxazole, (71%) for Gentamicin . In addition , (20%) of *Group-B streptococci* were sensitive to Ciprofloxacin, (100%) for Gentamicin, (50%) for Ampicillin, (0%) for Ciprofloxacin, Amikacin, and Trimethoprim- sulfamethoxazole, and (100%) for Cefotaxime as shown in (Table 5).

Table 5: Drug sensitivity patterns in bacteria species isolated from pregnant and non pregnant women

Antibiotics	*E. coli*	*Group-B streptococci*	*K. pneumoniae*	*S. aureus*	*P. mirabilis*	*E. cloacae*
Nitrofurantoin	58%	20%	100%	50%	100%	100%
Gentamicin	71%	100%	50%	100%	100%	0%
Ampicillin	50%	50%	20%	75%	75%	80%
Ciprofloxacin	90%	0%	100%	13%	80%	83%
Amikacin	95%	0%	100%	0%	50%	63%
Cefotaxime	96%	100%	50%	100%	80%	70%
Trimethoprim-sulfamethoxazole	42%	0%	57%	0%	46%	56%

Discussion:

After screening four hundred and thirty eight (438) women in the Alegailat and Sabratha hospitals, the overall prevalence of UTI (pregnant and non pregnant women) was 96 (51.61%)pregnant women and 90(48.38%) non pregnant women.This high rate compared to that in developed countries, in United State, the incidence of UTI during pregnancy was 2.5%-8.7%, which was the same as that of non pregnant women of the same age group, was found concordant with other studies in developing countries. It was 30% in a study in Yemen (9), 28.5% in a Pakistani study (10), and between 22-28.8% in some studies in Egypt (11) 14.2% in Saudi Arabia women (1) 10.6% Turkey women (12).

Pregnancy is a unique state with anatomic and physiologic urinary tract changes. pregnant women with urinary tract infections have an

increased susceptibility to pyelonephritis. Although urine cultures are expensive, require laboratory expertise and take 24–48 h for results to become available, quantitative culture remains the gold standard for diagnosis of urinary tract infection in pregnancy as the performance of rapid urine screening tests in pregnancy is poor (13,14). A prospective study of 3254 pregnant women from Sweden examined the risk of acquisition of urinary tract infection during pregnancy (15). The risk of acquiring infection during pregnancy increased from 0·8% in the 12th gestational week to 1·93% at the end of pregnancy which. In our study we found that the risk of acquisition was the highest in the third trimester. The Gram-negative bacteria predominated, with *E. coli* being the most common pathogen (34,9%) isolated in the study. Other studies had also reported a similar frequency of UTI caused by *E. coli*.(16,17) Among the Gram-positive cocci *Group-B streptococci* was isolated most frequently (24,7%), followed by *S. aureus* (13,4%), a view also corroborated by Rizvi *et al*.(18). There has been no systematic review of which antibiotic is best for the treatment of urinary tract infection in both pregnant women. The antibiotic chosen should not only have a good maternal and fetal safety profile, but also excellent efficacy and low resistance rates in a given population.(19,20). Although many review articles suggest antibiotic regimens for both pregnant and non pregnant women, increasing antibiotic resistance complicates empirical regimens. On antimicrobial susceptibility testing, it was noted that both the Gram-negative as well as Gram-positive isolates showed a significantly low resistance to the some group of antimicrobials which are considered the traditional drugs safe in pregnancy. Fluoroquinolones have been shown to impair cartilage development in animal studies. Although this adverse effect has not been described in humans, quinolones should rather be avoided in pregnancy. As in this study showed a high level of resistance against gram positive and high level of sensitivity against gram negative bacteria.

Conclusion:

The susceptibility patterns seen in our study seem to suggest that it is absolutely necessary to obtain sensitivity reports before initiation of antibiotic therapy in cases of suspected UTI.

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