Frequency and Susceptibility Profile of Bacteria Causing Urinary Tract Infections among Women

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Abstract: This study aimed to study the frequency and susceptibility profile of bacteria causing urinary tract infections and associated risk factors among women at Hail province, Saudi Kingdom. A total of 320 mid-stream urine samples were collected from women between the ages of 15-45 years. *Escherichia coli* was the most frequent pathogen. It was 7 (53 %) in a healthy non-pregnant women, 9 (50 %) in pregnant non-diabetic women and 17 (37.7 %) in diabetic pregnant women. Urine microscopy revealed the presence of pus cells in 62 (81.5 %) urine samples collected. Higher incidence of UTIs was found in age groups 15-24 and 25-34 years, the percentage of the bacterial isolates were 51.1% and 37.8%, respectively. Also, we found a significant relation between high HbA_1C level and the prevalence of bacteriuria. Antibiotic susceptibility test revealed that most of the urinary pathogens were highly susceptible to Augmentin, Ciprofloxacin, Ceftazidime and Ofloxacin. Statistically, our results indicated that a higher significant relation between UTIs and age, duration of pregnancy, number of pregnancy and level of HbA_1C (P-value < 0.05).

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I. Introduction

Urinary Tract Infections (UTIs) is an infection caused by the presence and growth of microorganisms anywhere in the urinary tract. It is perhaps the single most common bacterial infection of mankind (**Morgan and McKenzie, 1993; Ebie *et al*., 2001**). Urinary tract includes the organs that collect and store urine and release it from the body which include: kidneys, ureters, bladder and urethra. UTIs are among the most common bacterial infections in humans, both in the community and hospital settings and have been reported in all age groups in both sexes (**Hooton *et al*., 1995**). It has become the most common hospital-acquired infection, accounting for as many as 35% of nosocomial infections, and it is the second most common cause of bacteraemia in hospitalized patients (**Weinstein *et al*., 1997; Stamm, 2002; Kolawole *et al*., 2009**). Women tend to have UTIs more often than men because bacteria can reach the bladder more easily in women. This is partially due to the short and wider female urethra and its proximity to anus. Bacteria from the rectum can easily travel up the urethra and cause infections (**Ebie *et al*., 2001; AAFP, 2004; Kolawole *et al*., 2009**).

Asymptomatic bacteriuria (ASB) in diabetic patients is contributed with increased risk of symptomatic UTI (**Geerlings *et al*., 2002; Ooi *et al*., 2004**). ASB is defined as the presence of at least 105 colony-forming units (CFU) /ml of 1 or 2 bacterial species in clean-voided midstream urine sample from an individual without symptoms of a UTI (**Harding *et. al*., 2003**). The prevalence of asymptomatic bacteriuria is about 3 times higher in diabetic women (ranging from 15% to 30%) than in non-diabetic women (less than 10%) (**Zhanel *et al*., 1995; Harding *et. al.*, 2003; Hoepelman *et al*., 2003**). Various risk factors for bacteriuria in women with diabetes have been suggested including sexual intercourse, age and degree of glycosuria, duration of metabolic control, complications of diabetes, macro albuminuria and high body mass index (BMI) (**Zhanel *et al*., 1995; Andriole, 2002**). The most common aetological species of bacteriuria in diabetic women include *Escherichia coli, Proteus mirabilis* and *Klebsiella pneumonia* (**Papazafiropoulou, *et al*., 2010**). Gram positive organisms such as group B *Streptococcus* and *Staphylococcus saprophyticus* are less common cause of bacteriuria (**Warren, *et al*., 1999; Ghenghesh, *et al*., 2009**).

Diabetes mellitus is a highly prevalent worldwide disorder. There is a rising prevalence particularly of type 2 diabetes mellitus. It is projected that 221 million people will have diabetes by the year 2010; Africa and Asia are designated as the regions with the greatest potential increases, where the current number is expected to double the number experienced today (**Lahelma, *et al*., 2004; Allan, 2006**). Diabetes during pregnancy can lead to serious problems for both the mother and her baby if not controlled properly. Whether an expectant mother has type $_1$, type $_2$ or gestational diabetes, careful management of the disease is necessary to prevent complications during pregnancy, labor, delivery, and following the birth. Fetal risks when maternal diabetes is present include miscarriage and stillbirth, birth defects, macrosomia, growth restriction, neonatal hypoglycemia, respiratory distress syndrome, polycythemia, and hyperbilirubinemia. Maternal complications include chronic hypertension, preeclampsia, eclampsia, gestational hypertension, hydramnios, and ketoacidosis. Glycosylated haemoglobin (HbA_1C) is formed by covalent binding of glucose to the N-terminal valine of the b-chain in the haemoglobin molecule throughout the lifetime of the erythrocyte (**Harrison and Isselbacher, 1994**). In the clinical control of diabetic patients, HbA_1C serves as an estimator of the time-averaged blood glucose concentration in the preceding 3–12 weeks. As a diagnostic tool, HbA_1C may have advantages in relation to other methods, and a glycosylated proportion of 7.0 % or higher has been proposed as indicative of the need for pharmacological intervention (**Peters *et al*., 1996**). The current study aimed to investigate the prevalence of bacteriuria among healthy non pregnant, pregnant non-diabetic and pregnant diabetic women in Hail province, Saudi Kingdom and to assess its relation with some possible risk factors such as age, duration of pregnancy, number of pregnancy and blood glucose control. The sensitivity of the organisms isolated to various antibiotics was also studied.

2. MATERIALS AND METHODS

2.1- Study population

Urine samples were collected from a total of 320 women between the ages of 15 to 45 years, during September to December, 2011. Of all 320 urine samples, one hundred collected from healthy non pregnant, one hundred collected from pregnant non-diabetic and one hundred twenty colleted from pregnant diabetic women. All these women were outpatients attending Obstetrics and Gynecology clinics in Hail province, Saudi Kingdom.

2.2- Urine collection

Clean catch urine samples were collected in sterile universal containers as described by **Karlowsky *et al.* (2006)** and **Solberg *et al*. (2006)**. Three hundred twenty "clean catch" mid-stream urine (MSU) samples were collected inside sterile disposable universal bottles from a healthy non-pregnant, pregnant non-diabetic and pregnant diabetic women. They were instructed on how to collect samples and the need for prompt delivery to the laboratory. The samples were labeled and transported to the medical microbiology, college of medicine, H'ail university in iced pack and were analyzed within one hour of collection.

2.3- Sterilization of media and materials

The media used were Nutrient Agar (NA) from Biotec Limited, Nutrient Broth (NB), MacConkey agar (MCA), Blood Agar (BA), Sabouraud Dextrose Agar (SDA), Cysteine Lactose Electrolyte Deficient (CLED) Agar and Muller Hinton Agar media. All media were supplied by Oxoid Limited. All glass wares were washed with detergent and rinsed with water, then allowed to dry. The glass wares were later wrapped in aluminum foil and sterilized in a hot air oven at 170 ^oC for 2 hr. Media were prepared according to the manufacturer's specifications and sterilized by autoclaving at 121^oC and 1.5 atm for 20 min.

2.4- Microscopy

The urine samples were mixed and aliquots centrifuged at 5000 rpm for 5 min. The deposits were examined using both x10 and x40 objectives lenses. Samples with 10 white blood cells /mm^3 were regarded as pyuric (**Smith *et al*., 2003**). A volume of the urine samples were applied to a glass microscope slide, allowed to air dry, stained with gram stain, and examined microscopically (**Kolawole *et al*., 2009**).

2.5- Culturing of bacteria from urine samples

This was carried out as described by **Cheesbrough (2002, 2004)** and **Prescott *et al*. (2008)**. Ten-fold serial dilutions were made by transferring 1 ml of the sample in 9 ml of sterile physiological saline. 1 ml was then poured into molten nutrient agar in Petri dishes and rotated gently for proper homogenization. The contents were allowed to set and the plates were then incubated at 37 ^oC for 24 hr. Bacterial colonies growing on the agar after the incubation period were enumerated to determine urine samples with significant bacteriuria. A loopful of each urine sample was also streaked on MacConkey agar, Blood agar plate and Sabouraud Dextrose agar for the isolation of the bacteria and Candida present in the urine. After incubation, plates with growth were selected, the colonies were isolated using an inoculating loop and subsequently sub-cultured on agar slants for use in further tests.

2.6- Identification of isolates

The methods used in the identification and characterization of isolated bacteria included Gram stain followed by microscopic examination, motility test and biochemical tests according to **Cheesbrough (2002, 2004)**. The isolates were identified by Bergey's Manual for Determinative Bacteriology (**Buchanan and Gibbons, 1974**). Identification was confirmed with the API 20E system (BioMereiux).

2.7- HbA_1C level

HbA_1C level was determined in capillary whole blood or venous whole blood using an immunoturbidimetric assay (DCA 2000 HbA_1C System, Bayer. Denmark). The validity of this assay has previously been tested (**Mortensen *et al*., 1994**).

2.8- Antibiotic susceptibility test

Antibiotic susceptibility of the isolated species namely *Escherichia coli, Klebsiella pneumonia*, *Neisseria gonorrhoae, Proteus mirabilis Staphylococcus aureus, Enterococcus faecalis and Pseudomonas aeruginosa*. tested for their susceptibility to some antibiotics (Amikacin, Augmentin, Cefotaxime, Piperacllin, Chloramphenicol, Ciprofloxacin, Ceftizoxime, Ceftazidime, Tetracycline, Ofloxacin, Gentamicin and Lincomycin) by modified disc diffusion technique Kirby-Bauer according to the National Committee for Clinical Laboratory Standards (NCCLS, 2003).

2.9- Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Science (SPSS), Version 15 for Windows. Chi-square test was used to compare categorical variables. A p-value less than 0.05 were considered significant.

3. RESULTS

Three hundred twenty urine samples were collected in this study, urine samples were divided into three groups, the first group was one hundred samples collected from the healthy non-pregnant women, the second group collected from pregnant non-diabetic women and the third group was one hundred twenty urine samples collected from pregnant diabetic women. Of all 320 urine samples only seventy six have urinary tract infection. Microscopic field contained more than five pus cells (WBCs) or RBCs were taken as positive. Microscopic examination of urine samples revealed that 62 (81.5%) were have pus cells, while 43 (56.5 %), 54 (71.0 %) and 5 (6.5 %) were have RBCs, epithelial cells and *Schistsoma haematobium,* respectively (Table 1).

Table 1. Microscopic examination of urine samples.

Microscopic examination	No. of positive samples (%)
Pus cell (WBCs)	62 (81.5)
RBCs	43 (56.5)
Epithelial cells	54 (71.0)
Crystals	36 (47.3)
Schistsoma haematobium	5 (6.5)
Yeast cells	5 (6.5)

Of total 320 urine samples, 76 (23.75 %) were found to contain heavy and appreciable bacterial growth (significant bacteriuria, P-value < 0.05) while 244 (76.25 %) had no appreciable bacterial growth. Figure (1) represented the frequency percentage of the isolated pathogens from all collected urine samples. *Escherichia coli* (43.4 %) represented the most frequented isolated pathogen followed by *Klebsiella pneumonia* (14.5 %), also our results indicated that *Staphylococcus aureus*, *Proteus mirabilis, Pseudomonas aeruginosa* and *Candida albicans* were recorded frequency percentage (13.2 %), (9.2 %), (7.9 %) and (6.6 %), respectively.

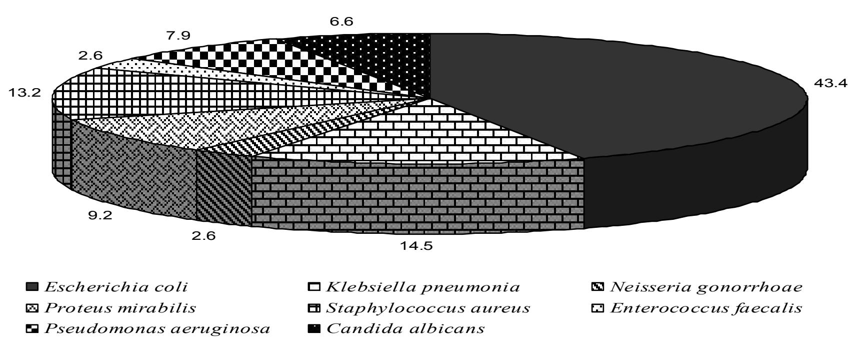

Figure 1. Frequency percentage of isolated pathogens.

3.1- Frequency of isolated pathogens and its relation to urine analysis in healthy, non-pregnant women.

One hundred urine samples were collected from healthy non-pregnant women. Urine microscopy revealed pus cells (WBCs) in 12 of the urine samples collected while red blood cells (RBCs) was only found in 7 of the samples. Culture plates with bacterial counts greater than or equal to $1x10^5$ CFU /ml were taken as positive, thus indicative of UTI. The bacterial isolates were identified based on colony morphology characteristics, Gram stain reaction and biochemical tests. Table (2) showed higher incidence of *Escherichia coli* 7 (53 %) followed by *Klebsiella pneumonia* and *Staphylococcus aureus* 2 (15.6 %), while the incidence of *Proteus mirabilis* and *Pseudomonas aeruginosa* was 1 (7.9 %). Statistically our result showed significant bacteriuria (*P*-value =0.045).

Table 2. Frequency of isolated pathogens and its relation to urine analysis in a healthy, non-pregnant women.

Isolated pathogens	Frequency		Microscopic urine analysis (No.)			
	No.	%	WBCs	RBCs	Epi. cells	Crystals
Escherichia coli	7	53.0	7	5	7	4
Klebsiella pneumonia	2	15.6	2	1	2	1
Proteus mirabilis	1	7.9	1	0	1	0
Staphylococcus aureus	2	15.6	1	1	0	1
Pseudomonas aeruginosa	1	7.9	1	0	3	0
Total	13	100 %	12	7	13	6
***p*-value**	0.045	--	0.023	0.015	0.024	0.061

3.2- Frequency of isolated pathogens and its relation to urine analysis in pregnant, non-diabetic women.

One hundred urine samples were collected from pregnant non-diabetic women. Urine microscopy revealed pus cells (WBCs) in 17 of the urine samples collected while red blood cells (RBCs) was only found in 13 of the samples. The results were represented in table 3. Our results showed higher incidence of *Escherichia coli* 9 (50 %) followed by *Klebsiella pneumonia* 3 (16.6 %), while the incidence of *Proteus mirabilis* and *Pseudomonas aeruginosa* were the same 2 (11.2 %). Statistically our result showed a highly significant bacteriuria (*P*-value = 0.007).

Table 3. Frequency of isolated pathogens and its relation to urine analysis in pregnant, non-diabetic women.

Isolated pathogens	Frequency		Microscopic urine analysis (No.)			
	No.	%	WBCs	RBCs	Epi. cells	Crystals
Escherichia coli	9	50.0	9	7	9	6
Klebsiella pneumonia	3	16.6	3	2	3	2
Proteus mirabilis	2	11.2	2	1	1	1
Staphylococcus aureus	1	5.5	0	1	0	1
Pseudomonas aeruginosa	2	11.2	2	2	2	1
Candida albicans	1	5.5	1	0	1	0
Total	18	100 %	17	13	16	11
***p*-value**	0.009	--	0.002	0.011	0.000	0.026

3.3- Frequency of isolated pathogens and its relation to urine analysis in pregnant, diabetic women.

One hundred twenty urine samples were collected from pregnant diabetic women. Urine microscopy showed the presence of pus cells (WBCs) in 34 of the collected urine samples, while red blood cells (RBCs) were only found in 23 of the samples (Table 4). In this study the prevalence of UTI in our sample of pregnant women was 37.5 % and the predominant pathogens were pathogenic *Escherichia coli* and *Staphylococcus aureus.* Our results showed a higher incidence of *E. coli* 17 (37.7 %) followed by *S. aureus* 7 (15.5 %) and *Klebsiella pneumonia* 6 (13.5 %). Also our results showed that *Proteus mirabilis* and *Candida albicans* were have the same frequency 4 (8.9 %) in pregnant diabetic women. Statistically our result showed a highly significant bacteriuria (*P*-value = 0.000). Figure 2 revealed that the frequency of isolated pathogens in a healthy non-pregnant, pregnant non-diabetic and pregnant diabetic women. Our data indicated that the frequency of isolated pathogens was higher in pregnant diabetic women than in pregnant non diabetic and healthy non pregnant women.

3.4- Association between urinary tract infections (UTIs) and risk factors

Table (5) showed the incidence of UTIs in relation to the risk factors (age, trimester, number of pregnancy and HBA_1C level) in pregnant diabetic women. A higher percentage of pregnant women (51.1 %) with UTIs were found within the age brackets of 15-24 years while age groups 35-45 years had the least percentage (11.1%). The highest number of UTIs was obtained from pregnant women within the 3$^{rd.}$ trimester (53.3 %) followed by 2$^{nd.}$ trimester (31.1 %). Also, lower number of UTIs was obtained from HBA_1C good control patients (6.7 %), while a higher number of UTIs was detected in HBA_1C poor control (57.8 %). Statistically, our results were showed a highly significant between prevalence of bacteriuria and all tested risk factors (P-value < 0.05).

3.5- Antibiotic susceptibility test

The results of the disk diffusion testing for the antibiotic susceptibility are shown in table 6. Most of the bacteria isolates were highly susceptible to Augmentin, Ciprofloxacin, Ceftazidime and Ofloxacin. *Escherichia coli, Klebsiella pneumonia, Staphylococcus aureus and Pseudomonas aeruginosa* showed a moderate susceptibility to Amikacin and Lincomycin while, *proteus mirabilis* and *Enterococcus faecalis* showed a highly resistance to Amikacin. On the other hand, *Klebsiella pneumonia, Nesseria gonorrhoae, Staphylococcus aureus* and *Enterococcus faecalis* were highly resistant to Tetracyclin.

Table 4. Frequency of isolated pathogens and its relation to urine analysis in pregnant, diabetic women.

Isolated pathogens	Frequency		Microscopic urine analysis (No.)			
	No.	%	WBCs	RBCs	Epi. cells	Crystals
Escherichia coli	17	37.7	15	9	9	6
Klebsiella pneumonia	6	13.5	6	3	5	4
Neisseria gonorrhoae	2	4.4	1	1	1	1
Proteus mirabilis	4	8.9	3	2	2	2
Staphylococcus aureus	7	15.5	5	4	4	3
Enterococcus faecalis	2	4.5	1	1	1	2
Pseudomonas aeruginosa	3	6.6	2	2	2	1
Candida albicans	4	8.9	1	1	1	0
Total	45	100 %	34	23	25	19
***p*-value**	0.000	--	0.000	0.011	0.013	0.127

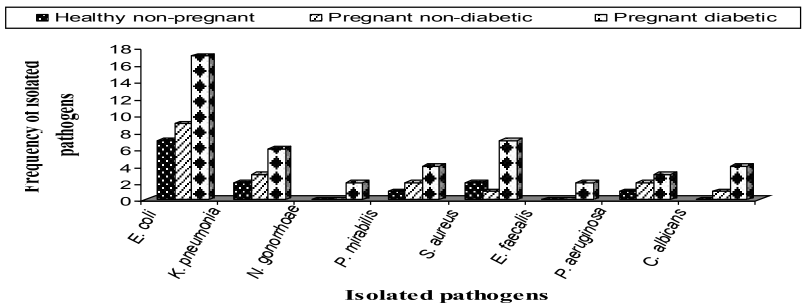

Figure 2. Frequency of isolated pathogens in healthy non-pregnant, pregnant non-diabetic and pregnant diabetic women.

Table 5. Association between urinary tract infections (UTIs) and risk factors.

Risk factors	Prevalence of significant Bacteriuria		*P*-value
	No.	%	
Age group (years)			
15-24	23	51.1	0.003
25- 34	17	37.8	
35-45	5	11.1	
Trimester			
1st	7	15.6	0.007
2nd	14	31.1	
3rd	24	53.3	
No. of pregnancies			
1-3	32	71.1	0.000
4-6	9	20.0	
7-9	4	8.9	
HBA1c level			
Good control (6.5 -7.5 %).	3	6.7	0.000
Fair control (8 -9.5 %).	16	35.5	
Poor control (> 9.5 %).	26	57.8	
Total	45	100	--

Table 6. Susceptibility profiles of isolates to 12 different antibiotics.

Bacterial isolate	AK	AUG	CF	PRL	CH	CIP	CI	CAZ	TE	OFX	GM	LM
E. coli	2+ve	3+ve	2+ve	3+ve	2+ve	3+ve	3+ve	3+ve	2+ve	3+ve	2+ve	2+ve
K. pneumonia	2+ve	3+ve	2+ve	3+ve	3+ve	3+ve	3+ve	3+ve	-ve	2+ve	2+ve	2+ve
N. gonorrhoae	3+ve	3+ve	3+ve	2+ve	3+ve	3+ve	2+ve	3+ve	-ve	2+ve	2+ve	2+ve
P. mirabilis	-ve	3+ve	3+ve	2+ve	3+ve	3+ve	3+ve	3+ve	3+ve	3+ve	3+ve	2+ve
S. aureus	2+ve	3+ve	3+ve	2+ve	-ve	3+ve	-ve	-ve	-ve	3+ve	3+ve	2+ve
E. faecalis	-ve	3+ve	2+ve	2+ve	2+ve	3+ve	2+ve	2+ve	-ve	3+ve	-ve	2+ve
P. aeruginosa	2+ve	3+ve	3+ve	2+ve	2+ve	3+ve	2+ve	3+ve	2+ve	3+ve	2+ve	2+ve

AK=Amikacin (30 µg); Aug=Augmentin (30 µg); CF=Cefotaxime (30 µg); PRL=Piperacllin (100 µg); CH=Chloramphenicol (30 µg); CIP=Ciprofloxacin (5 µg); CI=Ceftizoxime (30 µg); CAZ= Ceftazidime (30 µg); TE=Tetracycline (30 µg); OFX=Ofloxacin (5 µg); GM=Gentamicin (10 µg); LM=Lincomycin (2 µg); 3+ve= High sensitive; 2+ve=Moderate sensitive; -ve= Resistance to antibiotics.

4. DISCUSSION

Urinary tract infections (UTIs) are the commonest infections seen in hospital settings, and the second commonest infections seen in the general population (**Valiquette, 2001**). Urinary tract infections are caused by bacteria and are 10 times more common among women than men.

More than 50 % of women will have at least one UTI during their lifetime. UTIs are also a common problem in pregnancy due to the increase in six hormones and physiological changes during pregnancy (**Sabahat and Perween, 2011**). During pregnancy, the chemical composition of urine is also affected and the results in increased urinary substances e.g. glucose and amino acids which may facilitate bacterial growth in urine (**Sheikh, *et al*., 2000**). Several studies have demonstrated that the geographical variability of pathogens occurrence in cases of UTIs is limited by the predominance of Gram negative, usually Enterobacteriaceae and particularly *E. coli* and *Enterobacter* spp., in various regions of the world and the resistance patterns of these organisms can vary significantly between hospital, countries and continents (**Teppa and Roberts, 2005; Fatima and Ishrat, 2006**). In this study the etiologic agent *Escherichia coli* was the most frequent pathogen. It was 7 (53 %) in a healthy non-pregnant women, 9 (50 %) in a healthy pregnant women and 17 (37.7 %) in diabetic pregnant women, which is in agreement with similar reported studies in our region as well as in other parts of the world (**Kutlay, *et al*., 2003; Al-Haddad, 2005; Akinloye, *et al*., 2006; Khattak, *et al*., 2006; Hazhir, 2007**).

Our results indicated that a highly significant ($P < 0.05$) prevalence of UTI in pregnant diabetic women was 37.5 % while, in healthy non-pregnant and healthy pregnant women were 13 and 18 %, respectively, and the predominant pathogens was pathogenic *E. coli.* Similarly, **Sabahat and Perween** (**2011**) noted that symptomatic and asymptomatic urinary tract infections were more common in pregnant women as compared to non-pregnant women, *E. coli* was found in the highest incidence from both pregnant (58.7 vs. 35.5 %, $P < 0.046$) and non-pregnant females (53.8 vs. 52.3, $P > 0.317$).

Okonko, *et al*., (**2010**) found that most implicating organisms causing urinary tract infections among these pregnant women in this study were *Escherichia coli* and were responsible for 42.1 % of the cases of UTI. This was followed by *S. aureus* (28.9 %), *K. aerogenes* (18.4 %), *P. aeruginosa* (5.3 %) and mixed cultures of *K. aerogenes* and *S. aureus* (5.3 %). Similarly, our data showed that *Escherichia coli* was the most implicating organisms causing urinary tract infections among pregnant women and was responsible 37.7 % of UTIs cases in diabetic pregnant women. This was followed by *S. aureus* (15.5 %), *K. pneumonia* (13.5 %) and *P. aeruginosa* (6.6 %). 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 (**Okonofua *et al*., 1989; Ebie *et al*., 2001; Njoku *et al*., 2001**). **Onifade *et al.*** (**2005**) and **Aiyegoro *et al.*** (**2007**) also reported that *E. coli* was the most commonly isolated pathogen in significant bacteriuria. In a similar study by **Nwanze *et al.*** (**2007**) the commonest isolates were also *Escherichia coli* (51.2 %), *S. aureus* (27.3 %), and *Klebsiella pneumoniae* (12.8 %) respectively. This same pattern was also reported by **Kolawole *et al*.** (**2009**).

The majority of the most recent studies including developing countries found the prevalence ranged between 4-10 %. This range during pregnancy was reported to be as high as 78.7 % in a population from Nigeria that included *Staphylococcus aureus* as an uropathogen (**Amadi *et al*., 2007; Moghadas and Irajian, 2009**). Gram-positive organisms have recently received more attention as causing bacteriuria and urinary tract infection. Although, they are seen in small numbers during pregnancy they are recognized as important causes of urinary tract infection. **Kalantar *et al*., (2008),** showed that findings of coagulase negative *Staphylococcus aureus* in UTIs cases. Similarly, our results indicated that the prevalence of *Staphylococcus aureus* 2 (15.6 %) in a healthy non-pregnant women, 1 (5.5 %) in a healthy pregnant women and 7 (15.5 %) in diabetic pregnant women.

Escherichia coli has identified as the most common pathogen isolated among the pregnant women in this study, which was consistent with the majority of the reported studies in literature (**Versi, 1997; Al-Haddad, 2005; Hazhir, 2007; Aseel *et al*., 2009; Sharifa, 2010; Al-Jiffri *et al*., 2011; Shazia Parveen *et al*., 2011; El-Sokkary, 2011**). However, *E. coli* formed 37.7 % of the isolated organisms in pregnant diabetic women. On other hand, lower than our data have been reported in other studies, such as Turkey 2005 (77 %) (**Tugrul, 2005**), UAE 2005 (66.7 %) (**Abdullah and Al-Moslih, 2005**), Iran 2009 (70 %) (**Moghadas and Irajian, 2009**), and in Pakistan 2006 (78.6 %) (**Fatima and Ishrat, 2006**). Moreover, higher than in Nigeria 2006 (11.1%) (**Akinloye, 2006**), Qatar 2009 (31%) (**Aseel *et al*., 2009**), KSA 2010 (53 %) (**Sharifa, 2010**), India 2011 (57.14 %) (**Shazia Parveen *et al.*, 2011**), Egypt 2011 (56 %) (**El-Sokkary, 2011**) and KSA 2011 (43.9 %) (**Al-Jiffri *et al*., 2011**).

The findings of this study showed that 53.3 % of the women who had UTIs were in first to third pregnancy, 20 % were in their fourth to sixth pregnancy and 8.9 % were in their seventh to ninth pregnancy. This showed that parity is one of the possible factors affecting the incidence and prevalence rate of UTIs among women. Also women in their second and third trimester were found to have the higher incidence of UTIs; 31.1 % and 53.3 % respectively. While, women in their early month of the pregnancy (First trimester) had low of UTIs (15.6 %). Similarly, **Okonko *et al.,*** (**2010**), showed that 58.3 % of the women who had UTIs were in their 3rd. pregnancy and above or have had more than 3 children; 43.7 % were in their 2nd. pregnancy and 42.5% 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. This study also showed that women in their 6th month (50.0%) and 7th month (71.4%) of their pregnancy had the higher incidence of UTIs, while women in their early month of the pregnancy had no specific bacteria growth and shows no sign of UTIs. **Vazquez and Villar** (**2000**), also reported that 10-30% of women with bacteriuria in the first trimester develop upper UTIs in the second or third trimester. Thus, pregnant women should be screened for bacteriuria by urine culture at 12 to 16 weeks of gestation. The presence of 1 x10^5 CFU /ml of urine should be considered as highly significant (**Okonko *et al*., 2010**).

High incidence of UTIs was found in age groups 36-40 years, though, a high percentage of the bacterial isolates were obtained mainly from pregnant women in age group 26-30 years. This confirms the usual report that the risk of UTIs increases with age. 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. K. pneumoniae* and *P. aeruginosa* was the least common isolates in this study (**Okonko *et al*., 2010**). This was in agree with our results, we showed that higher incidence of UTIs was found in age groups 15-24 and 25-34 years, the percentage of the bacterial isolates were 51.1 % and 37.8 %, respectively. This confirms that the risk of UTIs increased with age. The pattern of isolates reported in this study is consistent with the usually reported pattern. Also, our results showed a significant relation between high HbA_1C level and the prevalence of bacteriuria. In poor control of HbA1c, the prevalence of bacteriuria was (57.8 %), while in a good control HbA_1C, the prevalence of bacteriuria was (6.7 %). Statistically, our results were showed a highly significant between prevalence of bacteriuria and all tested risk factors (P-value < 0.05). Similarly, **Boroumand *et al*.,** (**2006**), found a significant relation between bacteriuria and glycosuria.

El-Sokkary, (**2011**) showed that the presence of *Candida albicans* in UTIs cases was 10 %. Similarly, our results showed that the prevalence of *Candida albicans* in UTIs cases among diabetic pregnant women was 8.9 %. Our study indicated that Augmentin, Ciprofloxacin, Ceftazidime and Ofloxacin were highly effective to the urinary tract pathogens. On the other hand, *Klebsiella pneumonia, Nesseria gonorrhoae, Staphylococcus aureus* and *Enterococcus faecalis* were highly resistant to Tetracyclin. It was concluded that UTIs are more common in pregnant diabetic women as compared to healthy non-pregnant and non-diabetic pregnant women. *E. coli* was found to be the most common urinary tract pathogen in all subjects. Also, our results indicated that a higher significant relation between UTIs and age, duration of pregnancy, number of pregnancy and level of HbA_1C (P-value < 0.05).

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