

Original Article

# Isolation of *Candida spp.* and *E. coli* as the most frequently isolated causative agents of women urinary tract infection in Makkah Al-Mukaramah

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## عزل فصييلة الكانديدا و الايشريشيا كولي كأكثر الفصائل المسببة لعدوى الجهاز البولي التي تصيب النساء في مكة المكرمة

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قسم الكائنات الدقيقة بكلية الطب وقسم طب المختبرات بكلية العلوم الصحية\* - جامعة أم القرى - مكة المكرمة - المملكة العربية السعودية. ص. ب. : 7607

### الملخص العربي

تعتبر عدوى الجهاز البولي واحدة من أكثر الأمراض شيوعا التي تصيب جسم الإنسان بشكل عام وتعتبر من أخطر المشاكل التي تصيب النساء الحوامل بشكل خاص. وتعزى زيادة حدوث هذا النوع من العدوى بالتغيرات الفسيولوجية المتعلقة بفترة الحمل عند النساء. هدف الدراسة الحالية كان لتشخيص ومعرفة مدى انتشار هذه العدوى والميكروبات المسببة لها في النساء الحوامل والغير حوامل اللواتي يراجعن عيادة النساء والولادة في مستشفى حراء العام. اشتملت الدراسة على مجموع 300 حالة من النساء في عمر (18-60 عاما) قسمت كما يلي (200 امرأة حامل و 100 امرأة غير حامل) وذلك بواسطة استخدام استبان ممنهج احتوى أسئلة عن المعلومات الشخصية، التاريخ المرضي، العوامل المؤثرة في الدراسة. استخدمت في الدراسة عينات بول لعمل التحاليل المجهرية والزرعة البكتيرية. تعرف عدوى الجهاز البولي بوجود بكتريا في البول بمعدل أكثر أو يساوي 100,000 وحدة تكوين مستعمرة بكتيرية/مل من البول مع أو بدون خلايا قيحية. عينات الدم الكامل استخدمت لتحديد صورة الدم الكامل للحالات المدروسة لمعرفة العدوى الشاملة للجسم البشري.

أظهرت الدراسة نسبة 6,5% و 10% مصابة بعدوى الجهاز البولي في النساء الحوامل وغير الحوامل بالتتالي. 2,5% من النساء الحوامل صنفوا على أنهم مصابين بعدوى الجهاز البولي مع وجود أعراض مرضية، بينما 4% منهم مصابين

من غير وجود أعراض مرضية. في حالات النساء الغير الحوامل سجلت 4% و 6% مصابين بالعدوى مع وجود أعراض مرضية وعدم وجود أعراض مرضية بالتتالي. فصيلة الكانديدا والايشريشيا كولي كانت أكثر الفصائل الميكروبية المعزولة في الدراسة بنسب 39,1% و 17,4% بالتتالي. اختبار الحساسية للمضادات الحيوية اظهر ان الاجمنتين والاميكاسين وبيراسيلين هم الأقل مقاومة (7,1%) بينما النيتروفورنتين والاميسيلين هما الأكثر مقاومة (42,9%).

#### الخلاصة:

بصورة غير متوقعة وجد أن مدى انتشار عدوى الجهاز البولي اكبر بين النساء الغير الحوامل من النساء الحوامل. أظهرت الدراسة كذلك إن الكانديدا كانت هي أكثر الفصائل ظهورا في حالات عدوى الجهاز البولي (39,1%) تليها الايشريشياكولي بنسبة 17,4%، وجد كذلك ان الاجمنتين والاميكاسين والبيبرسيلين كانوا الأكثر تأثيرا في علاج البكتيريا المسببة لعدوى الجهاز البولي.

### ABSTRACT

Urinary Tract Infection (UTI) is one of the most common infections in the body. In pregnant women, UTI represents a serious health problem. The increasing frequency of UTI among pregnant women is attributed to the physiological changes that associate pregnancy. The aim of the current study was to investigate the prevalence and causative agents of UTIs among pregnant and non pregnant women attending OPD clinics at Hera'a Hospital. A total of 300 women with age range of 18–60 years (200 pregnant and 100 non pregnant women) were subjected to the study. Personal data, medical history, and risk factors-related data were collected by using of structured questionnaire. Sterile urine samples for urine analysis, and urine culture were used. UTI was defined as the presence of significant bacteriuria  $\geq 100,000$  CFU/mL of urine with or without pus cells. Whole blood samples for CBC were also collected from studied cases for evaluation of systemic infections. The study revealed that 6.5% and 10% of investigated pregnant and non-pregnant women, respectively, were positive for UTI. In the pregnant group, 2.5% were symptomatic UTI, while 4% were asymptomatic UTI. In the non-pregnant group 4% and 6% were symptomatic and asymptomatic UTI, respectively. *Candida sp.* and *E. coli* were the most frequently isolated pathogens from all investigated UTI cases at a rate of 39.1% and 17.4%, respectively. The antimicrobial sensitivity test revealed Augmentin, Amikacin and piperacillin as the least resistant antibiotics (7.1%) while Nitrofurantoin and Ampicillin were the most resistance (42.9%) for the isolated causative bacterial agents.

#### Conclusions:

As expected, the prevalence of UTI was higher among non-pregnant women than pregnant women. *Candida spp.* was the most frequently (39.1%) isolated pathogen from all UTI cases, followed by *E. coli* at a rate of 17.4%. Augmentin, Amikacin and piperacillin were the most sensitive antibiotics for the treatment of bacterial cause of UTI.

## INTRODUCTION

Urinary Tract Infection (UTI) is a medical condition that affects urinary tracts in both sexes. While UTI can affect both sexes, studies showed that the disease affect more women than men. The short female urethra (3-4 cm) as compared to the long male one (20 cm) has makes females more susceptible than men to UTI that result from rectal bacterial contamination (Winterling, 1997). In Kolawole's study, for example, equal random groups of male and female subjects were examined for UTI, 60% of the female subjects were infected whereas only 33% of the male subjects were infected (Kolawole *et al.*, 2009). Similar studies that underscore the same findings led researchers to believe that UTI is a predominant disease of women (Forbes *et al.*, 2007). However, even among women, UTI is susceptible to different factors, such as age, pregnancy, and other health conditions. The natural relocation of bladder as well as the hormonal changes that occur during pregnancy was described among the factors that increase the risk of UTI among pregnant women (Abdullah and Al-Moslih, 2005).

Urinary Tract Infections are usually associated with bacterial infection. However, some other infectious agents had been reported as possible cause of the infection. These include viral agents as *human papilloma virus* (HPV), *human immunodeficiency virus* (HIV) and *herpes simplex virus type 2* (HSV-2), which may infect the urethra (Shankel, 2007). Fungal agents may also be associated with UTI include *Candida*, which infects people who have an impaired immune system or those with a bladder catheter in place. Other types of fungi include *Blastomyces* and *Coccidioides*. Fungi and bacteria may infect the kidneys at the same time (Shankel, 2007). Parasitic agents associated with infection of urinary tract include *Trichomonas spp.*, *Schistosoma spp.* and *Filaria* (Shankel, 2007). More than 85% of UTIs caused by bacteria comes from the normal flora of the intestine or the vagina in women (Hooton and Stamm, 2001).

Urinary Tract Infection can be classified according to the clinical picture into symptomatic UTI, showing accompanied symptoms, or asymptomatic one. In both cases, urinalysis and urine culture are the definitive tests for the diagnosis, which is based on the detected number of bacteria and white blood cells (pus cells) in urine sample (American Academy, 1999). UTI is special problem in the women, both for pregnant and non pregnant. In many studies of UTIs in pregnant women, the incidence of UTI can be as high as 30% (Al-Haddad, 2005); while in Saudi Arabia the prevalence was 14.2% (Al-Sibai *et al.*, 1989). Rate of 10.58% have been reported from Iran (Zeighami *et al.*, 2008), and 58.3% in Ireland (Barr. *et al.*, 1984). The prevalence of UTI in pregnant with gestational diabetes mellitus (DM) was 7.9%. This was not significant different from that found in non- diabetes mellitus women (6.3%) (Rizk, 2002).

The prevalence of asymptomatic bacteriuria in pregnant women was 9.9% in Qatar and the dominant bacteria isolates were *E.coli* (31%) and *streptococcus agalaticae* (30%) (Mona *et al.*, 2009). In UAE the prevalence was 4.2% and the most common causative organism was also *E.coli* (66.67%) (Abdullah, 2005). Rate of 7.3% have been reported from Ghana (Turpin *et al.*, 2007), 16% in Ireland (Barr *et al.*, 1984) and 3-5% in Iran (Zeighami *et al.*, 2008). Recurrent UTI are problem in 20-25% of pregnant women in Iran (Zeighami *et al.*, 2008) and 31% of pregnant women in UAE (Rizk, 2002).

In studies of UTIs in non-pregnant women the incidence of UTI can be as high as 66.67% in Nigeria (Kolawole *et al.*, 2009), while 10.8% have been reported in USA (Foxman *et al.*, 2000). The prevalence of asymptomatic bacteriuria in non-pregnant women was 28.8% in Pakistan (Sheikh *et al.*, 2000). The prevalence of asymptomatic bacteriuria in non-pregnant women was 5 % (Hooton and Stamm, 2001). The prevalence of asymptomatic bacteriuria is higher in women with DM than in women without DM. The prevalence of ASB in women with DM was 26% while the prevalence was 6% in women without DM (Geerlings *et al.*, 1999) and in similar study in turkey the prevalence of asymptomatic bacteriuria in women with type II DM was 18.6% (Turpin *et al.*, 2008).

The diagnosis of UTI may be made on the basis of clinical signs and symptoms in combination with urinalysis results. The most common screening tests for UTI are urine dipstick & microscopic urinalysis. Urinalysis reveals both bacteriuria and pyuria. The number of bacteria and white blood cells are the basis for diagnosing UTI. The use of centrifuged urine in the microscopic analysis has sensitivity of 94% and specificity of 84-92 % (Shaw *et al.*, 1998).

Urine culture remains an important test in the diagnosis of UTI, because it helps to documentation of the infection, determination the identity of infecting bacteria and for antimicrobial susceptibility testing. It is not necessary for outpatients with uncomplicated UTI.

The aim of the current study was to investigate the prevalence of UTIs among pregnant and non pregnant women attending OPD clinics at Hera'a Hospital and to determine the common microbial agents associated with it.

## MATERIAL AND METHODS

### Study population and specimens

A total of 300 women with age range of 18 – 60 years, who agreed to enter the study, were subjected to the investigation. The study sample included 200 pregnant women and 100 non pregnant ones. The pregnant women were selected consecutively from those attending the Gynecology and Obstetrics (GOB) clinic at Hera'a Hospital, Makkah Al-Mukaramah, Saudi Arabia for prenatal care from December 2008 to July 2009. On the other hand, non-pregnant women were selected from those attending GOB and other clinics of the same hospital for different reasons other than prenatal care over the same period. Sterile urine samples for urinalysis, and urine culture were collected from all studied cases. Urinalyses and urine cultures were used for the detection of UTI. A UTI was defined as the presence of significant bacteriuria  $\geq 100,000$  colony-forming units (CFU) per mL of urine.

### Urine Collections and Examination

All women were instructed how to give a clean-catch midstream urine specimen. Briefly, they were asked to clean the area around urethral opening with clean water, dry it and then collect a midstream urine sample by discarding the first part of urine and collecting 10-20 ml of the midstream in sterilized containers.

All urine containers were properly labeled and sent to the laboratory with a request for complete urinalysis and urine culture. Each sample of urine was divided into 2 parts for urinalysis and urine culture.

#### **Urinalysis:**

Wet preparation from the first part of each urine sample was prepared and examined microscopically at X40 for detection of white blood cells as an indicator of pyuria. Samples with  $\geq 10$  WBC/mm<sup>3</sup> were regarded as pyuria. The rest of the first part of urine sample was examined by dipstick tests using Comber 10 reagent test strips (Analyticon, Germany) that have panels to detect protein, blood and nitrite and leukocyte esterase in urine (Smith et al., 2003).

#### **Urine Culture:**

The second part of urine sample was cultured on plates of blood agar and CLED (cystine-lactose-electrolyte-deficient) agar with standard calibrated loop delivering 0.01 mL of urine. After streaking, the plates were incubated aerobically at 35°C for 18-24 hours. The plates were then examined macroscopically and microscopically for bacterial growth. The bacterial colonies were counted and multiplied by 100 to give an estimate of the number of bacteria present per milliliter of urine. Urinary tract infection was positive diagnosed by growth of  $\geq 100,000$  colony forming unit (CFU) of urinary tract pathogen per ml in culture of midstream urine sample, regardless of the presence or absence of leukocytes (Stamm and Hooton 2003). Urine cultures with 10<sup>3</sup>–10<sup>4</sup> CFU/mL were regarded as suspected infections, cultures with less than 10<sup>3</sup> CFU/mL were considered contaminated, while cultures with no growth of bacteria were said to be negative. Identification of bacterial pathogens was confirmed by observation of gram staining, colony characteristics, and a battery of biochemical tests (Cheesbrough, 2000). Any specimen containing more than one species of bacteria was considered contamination.

#### **Antibiogram of Isolated Bacterial Agents:**

Antibiotic sensitivity tests were carried out for all urine samples with significant bacteriuria using the Kirby-Bauer NCCLS modified disc diffusion technique with the following antibiotics: ampicillin, amoxicillin-clavulanic acid, nitrofurantoin, ciprofloxacin, nalidixic acid, trimethoprim, cephalexin, gentamicin. After incubation at 35°C for 16-18 hour, sizes of inhibitory zones were measured and interpreted using NCCLS standards.

## **RESULTS**

#### **Prevalence of UTI among pregnant and non-pregnant women**

Out of 200 pregnant women, 13 (6.5%) were positive for UTI, while out of 100 non-pregnant women, 10 (10%) were found positive for UTI. In the pregnant group, 5 (2.5%) UTI-positive cases were associated with symptoms and classified as symptomatic UTI, while 8 (4%) cases were not associated with symptoms and considered as asymptomatic UTI. On the other hand, in the non-pregnant group 4 (4%) UTI-positive cases were associated with symptoms and represented the symptomatic UTI, and 6 (6%) cases were symptomless and were described asymptomatic UTI (Table 1).

**Table 1. Prevalence of UTI among pregnant and non-pregnant women.**

Examined women	Positive UTI Cases		Symptomatic UTI		Asymptomatic UTI	
	n	%	n	%	n	%
Pregnant Women (200)	13	6.5	5	2.5	8	4
Non-pregnant Women (100)	10	10	4	4	6	6

**Urinalysis Findings in UTI Cases**

With regard to the microscopic findings of examined urine samples from UTI cases, pus cells, RBCs and microbial cells were recorded at different frequencies. In pregnant women, the study revealed that out of the examined cases, 60% and 37.5% showed pus cells, 20% and 0% showed RBCs, and 40% and 87.5% showed microbial cells among symptomatic and asymptomatic groups, respectively. In non-pregnant women, the results revealed that 25% and 16.7% of UTI cases were showing pus cells, 25% and 0% were showing RBCs, and 75% and 50% were showing microbial cells among symptomatic and asymptomatic groups, respectively (Table 2).

**Table 2. Microscopic urinalysis findings of UTI cases among pregnant and non-pregnant women.**

Microscopic Urinalysis	Pregnant Women				Non-pregnant Women				Total (23)	
	Symptomatic UTI (5)		Asymptomatic UTI (8)		Symptomatic UTI (4)		Asymptomatic UTI (6)			
	n	%	n	%	n	%	n	%	n	%
Pus Cells	3	60	3	37.5	1	25	1	16.7	8	34.8
RBC	1	20	-	-	1	25	-	-	2	8.7
Microbial Cells	2	40	7	87.5	3	75	3	50	15	65.2

### Frequency of Microbial Agents Associated with UTI Cases

In the pregnant group, out of the 5 symptomatic UTI cases. *Candida spp.* was the most frequently isolated pathogen followed by *Enterococcus cloacae* representing 80% and 20 %, respectively. In the asymptomatic group, out of the 8 recorded cases, *E. coli*, *Streptococcus agalactia*, *Klebsiella pneumonia* and *Candida spp.* were isolated at equal frequency (25% each) (Table 3).

**Table 3. Frequency of isolated UTI-associated microbial agents among both pregnant and non-pregnant women**

Microbial Agents	UTI cases among Pregnant Women				UTI cases among Non-pregnant Women				Total (23)	
	Symptomatic (5)		Asymptomatic (8)		Symptomatic (4)		Asymptomatic (6)			
	n	%	n	%	n	%	n	%	n	%
<i>Candida spp.</i>	4	80	2	25	1	25	2	33.3	9	39.1
<i>Escherichia coli</i>	-	-	2	25	-	-	2	33.3	4	17.4
<i>Streptococcus agalactia</i>	-	-	2	25	-	-	1	16.7	3	13.0
<i>Streptococcus bovis</i>	-	-	-	-	1	25	1	16.7	2	8.7
<i>Klebsiella pneumonia</i>	-	-	2	25	-	-	-	-	2	8.7
<i>Enterobacter cloacae</i>	1	20	-	-	-	-	-	-	1	4.3
<i>Pseudomonas aeruginosa</i>	-	-	-	-	1	25	-	-	1	4.3
<i>Protius mirabilis</i>	-	-	-	-	1	25	-	-	1	4.3

Regarding the non-pregnant group, *streptococcus bovis*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and *Candida spp.* were isolated at equal frequency (25% each) from the symptomatic UTI cases. On the other hand, *E.coli* and *Candida spp.* were the most frequently isolated pathogens (33.3% each) from the asymptomatic UTI cases followed by *Streptococcus*

*agalactia* and *Streptococcus bovis* (16.7 % each) as shown in (Table 3). Overall, *Candida* spp. was the most frequently isolated microbial pathogen (39.1%) from all recorded UTI cases. However, *E.coli* was the most frequently isolated bacterial pathogen (17.4%) from all UTI cases followed by *Streptococcus agalactia* (13 %). On the other hand, *Enterobacter cloacae*, *Pseudomonas aeruginosa* and *Protius mirabilis* were the least frequently isolated bacterial pathogen (4.3% each) from all UTI cases (Table 3).

#### **Antibiogram of Isolated UTI-causative Bacterial Agents.**

In the current study, antibiotic sensitivity tests were carried out for the recovered bacterial isolated from UTI cases. The outcome of the sensitivity tests were shown in (Table 4). The results revealed that out of the recovered 14 bacterial isolates, 42.9% were resistant to Nitrofurantoin and Ampicillin, 35.7% were resistant to Gentamycin and Cotrimoxazol, 28.6% were resistant to Cephalothin, 14.3% were resistant to Norfloxacin and Cefatoxime and finally 7.1% were resistant to Augmentin, Amikacin and piperacillin.

## **DISCUSSION**

The aim of the present study was to investigate the prevalence of UTI and its causative agent among both pregnant and non-pregnant women attending Hera'a hospital at Makkah Al-Mokarramah including both symptomatic and asymptomatic cases. Interestingly, the overall prevalence of UTI was higher among non-pregnant women (10%) as compared to pregnant ones (6.5%) with asymptomatic UTI frequency of 4% and 6% among pregnant and non-pregnant women, respectively. This finding was on the contrary with the notion of the increasing frequency of UTI among pregnant women due to the physiological changes (both hormonal and mechanical) that occur during pregnancy as well as the difficulty with hygiene due to a distended pregnant belly (Mikhail and Anyaegbunam, 1995; Andrews *et al.*, 1990). Although these studies verify the relation between pregnancy and UTI, it can hardly be accurate to claim that pregnant women are more susceptible to UTI than non-pregnant ones. The current finding could be attributed to the increased awareness among pregnant women of the UTI and its possible complication during the routine doctor visit for pregnancy follow up with the subsequent implementation of more restrict hygienic measurements as compared to the routine hygiene practiced by non-pregnant women.

Although the current rate of UTI frequency is in accordance with recently reported prevalence in Middle East countries as UAE (4.8%) and Iran (6.1%) (Abdullah, 2005 and Hazhir, 2007). This rate was lower than what was reported earlier (14.2%) in Saudi Arabia (Al-Sibaie *et al.*, 1989). The alteration of UTI frequencies in Saudi Arabia could be attributed to the currently improved health care and hygienic measurements taken by women and the increased awareness and level of education as compared to earlier periods. Moreover, the prevalence of asymptomatic bacteriuria varies from one community to another. For example, in Asian studies, while the asymptomatic bacteriuria was 4.3% among Filipino pregnant women (Seccon *et al.*, 2003), it reaches up to 12% in rural areas in Bangladesh (Ullah *et al.*, 2007). Similarly, in Africans studies the prevalence of asymptomatic bacteriuria in Ethiopia and Ghana was 9.3% and 7.3%, respectively (Uncu *et al.*, 2002 and Turpin *et al.*, 2007). Also, in western studies the same differences were recorded, for example while the prevalence of asymptomatic bacteriuria in the US was 2-7% (Delzell and Lefevre, 2000), it reached up to 16% among Spanish pregnant women (Akinloye *et al.*, 2006). This variation can be attributed to several factors such as the geographical variation, ethnicity of the subjects,



setting of the study (primary care, community based, or hospitals) and the variation in the screening tests (urine dipstick, microscopy and culture).

Regarding the frequency of UTI-associated pathogens, the present study revealed *E. coli* as being the most common bacterial pathogen isolated from all currently studied UTI cases, which are in consistent with the majority of the reported studies. However, *E. coli* formed only 17.4% of isolated organism which is lower than what have been reported in different countries like Ethiopia (79%) (Turpin *et al.*, 2007), Turkey (77%) (Tugrul *et al.*, 2005), Philippines (50%) (Seccon *et al.*, 2003) and Ghana (37%) (Ullah *et al.*, 2007). The predominance of *E. coli* is usually attributed to the urinary stasis, which is common in pregnancy (Delzell and Lefevre, 2000). Moreover, the anatomical and the functional changes that occur during pregnancy results in a high risk of acquiring UTI from *E. coli* (Abdullah and Al-Moslih, 2005).

Although nonbacterial infections are less common causative agents of UTI and tend to occur more often in immunosuppressed individuals or those with diabetes mellitus, the current study revealed that 39.1% of currently detected UTI cases were infected with *Candida* species. This could be attributed to the excessive use of antibiotic therapy, as certain types of bacteria that live naturally in the vagina usually keep *Candida spp.* from growing out of control. If the balance of these microorganisms becomes upset, *Candida spp.* may be allowed to grow uncontrollably and lead to lower UTI. The use of certain medications, changes in hormone levels, or certain diseases are examples of factors that can allow a vaginal yeast infection to develop. (Hsueh *et al.*, 2002) have reported *Candida spp.* as the most frequent isolates (23.6%) from UTIs at a university hospital in Taiwan during the period 1993 - 1998 followed by *E.coli* (18.6%) and *P. aeruginosa* (11.0%).

The most useful antibiotics, as revealed in the current study, were augmentin, amikacin and piperacillin followed by norfloxacin and cefatoxime as they showed the least resistance frequency (7.1% and 14.3%, respectively) among isolated causative bacterial agents and were able to inhibit most commonly isolated UTI pathogens. Meanwhile, nitrofurantoin and ampicillin followed by gentamycin and cotrimoxazol, which are commonly used antibiotics, were poorly effective against majority of the organisms isolated in this study with a resistance rate of 42.9% and 35.7%, respectively. This differ from the studies and findings in Caucasian women where ampicillin and septrin remain the most useful antimicrobial agents (Ronald, 1987) and the findings by Ebie *et al.* (2001) among patients in Military Hospital, Jos, Nigeria where the isolates were highly susceptible to nitrofurantoin and that of Olaitan (2006) which has septrin (co-trimoxazole) as very effective.

The high efficacy of augmentin, piperacillin, norfloxacin and cefatoxime as reported in the current study could be attributed to the fact that these drugs are relatively expensive when compared to most antibiotics frequently used. This probably had restricted their procurement and indiscriminate use, therefore making the organisms susceptible to it. This is similar to other reports where quinolones are the most effective (susceptible) (Krumpermann, 1983; Burbige *et al.*, 1984; Ebie *et al.*, 2001; Ehinmidu, 2003; Mbata, 2007). On the other hand, the high resistance to other drugs may be due to the practices of self medication and indiscriminate use of these antibiotics with the subsequent resistance acquirement.

## CONCLUSION

The results of our study show that Urinary tract infection in pregnancy is a very frequent medical problem, which if untreated on time or inefficiently treated it may lead to severe maternal and fetal complications. The study also revealed that symptoms are poor markers of UTI during pregnancy and therefore antenatal care should include direct questioning and urine examination. Therefore, all pregnant women should be screened at least once by urine culture for asymptomatic bacteriuria throughout their antenatal controls.

During early pregnancy if possible and when the result is positive, they should be treated by oral antibiotics for a period of 3-7 days. Those women should also be followed-up for recurrent infection after the treatment by means of periodic culture processing. Also, the results from this study revealed that the important infecting organisms were found to be the commensals of perianal and vaginal regions. This calls for an increase attention towards personal hygiene. The findings have no doubt highlighted the need for constant monitoring of susceptibility of specific pathogens in different populations to commonly used anti-microbial agents. These data may be used to determine trends in antimicrobial susceptibilities, to formulate local antibiotic policies, to compare local with national data and overall to assist clinicians in the rational choice of antibiotic therapy to prevent misuse or overuse of antibiotics.

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