

Evaluation of antimicrobial susceptibility & rapid urine screening tests in asymptomatic urinary tract infection in pregnant women in Karbala

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Abstract

Background: Urinary tract infection is a common source of bacterial infections in human and they considered mutually with anemia and hypertension as the most medical complications during pregnancy ,with observe to the point that most of urinary tract infections are asymptomatic in pregnant women and the incidence rate of asymptomatic urinary tract is about 2-13% during pregnancy, this could lead to serious complications such as prematurity ,low birth weight ,hypertension and higher fetal mortality rates if untreated ; urinalysis is one of the important and useful urological tests for diagnosis of such infections, microscopic examination of urine and the dipstick urinalyses (leukocytes esterase test, nitrite test) are common tests used for detecting bacteriuria and pyuria.

Objective: to study the prevalence of asymptomatic bacteriuria by using and evaluation various screening rapid tests of urinalysis, bacterial uropathogens and their antimicrobial susceptibility pattern in pregnant women attending educational hospital for Gynecology and Obstetrics in Kerbela.

Patients and Method: In this study (480) pregnant woman their mean age 28.3 ± 4.8 ranges (19-39),(apparently healthy without any signs or symptoms of urinary tract infection were included),attended to educational hospital for Gynecology and Obstetrics in Kerbela during the period (MAR-DEC 2010) were investigated for asymptomatic bacteriuria,all urine samples were collected then submitted for routine urinalysis and bacterial culture, Gram's stain, dipstick and urine microscopy, antimicrobial susceptibility were done using disc diffusion method .

Results: of 480 samples,(27)women (5.6%)showed urine culture results indicating significant bacteriuria, the dominant uropathogens was *E.coli* 11 (40.71% ,Ciprofloxacin, Gentamicin and Nalidixic acid to be the most effective antibiotics; all isolates showed resistance for Ampicillin, Ciprofloxacin to be the drug of choice to treat UTIs.

The Gram's stain was the most specific (98.8%) and sensitive (92.5%) among the rapid tests that had been used, the sensitivity of leukocytes esterase test was 70.3% higher than nitrite test 66.6%while specificity was 88.5% which is lower than nitrite test 97.1%, the positive predictive value and negative predictive value for nitrite test were 58%, 97.9% respectively while for leukocytes esterase test record 26.7%, 98% respectively.

The positive predictive value and negative predictive value for Gram's stain(83.3%, 99.5%) were higher than that recorded in both nitrite test and leukocytes esterase.

Conclusions:

1-a total of 27 isolates different pathogens were identified among the *E.coli* was the dominant one, the drugs Ciprofloxacin and Gentamicin Nalidixic acid, were found the most effective against the uropathogens isolates and hence it might be the drug of choice to treat urinary tract infection in pregnant women.

2-Gram's stain of uncentrifuged urine was observed to be the best among the screening tests which were evaluated and urine culture remained the gold standard for the detection of bacteriuria

3-antimicrobial susceptibility of the isolated uropathogens does not show significant differences with some other studies.

تقييم حساسية المضادات المايكروبية وفحوصات كشف البول السريعة لحالات التهاب المجاري البولية اللاسريري للنساء الحوامل في كربلاء

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الخلاصة

خلفية الدراسة: إن التهاب المجاري البولية مصدر أساسي للإصابات الجرثومية في الإنسان وبعد التهاب المجاري البولية إضافة إلى فقر الدم وارتفاع ضغط الدم من التعقيدات الطبية الأكثر شيوعاً أثناء الحمل، مع ملاحظة أن أغلب التهابات المجاري البولية في النساء الحوامل هو لاسريري ونسبة حدوثه 2-13% أثناء الحمل وإن أهمل علاج التهاب المجاري البولية في الحوامل يمكن أن يؤدي إلى تعقيدات شديدة مثل انخفاض وزن المولود عند الولادة، الولادة المبكرة، ارتفاع ضغط الدم إضافة إلى ارتفاع معدل الوفيات الجنينية، يعد تحليل البول من الفحوصات المهمة لتشخيص مثل هذه الإصابات، الفحص المجهري للبول وتحليل البول بالأشرطة القياسية (فحص خميرة الاسترات لخلايا الدم البيضاء وفحص النترت) من الفحوصات الشائعة المستخدمة للتحري عن البكتريا البولية والبول الصديدي.

هدف الدراسة: لدراسة إنتشار التهاب المجاري البولية اللاسريري باستخدام وتقييم الفحوصات البولية السريعة المختلفة، وتقييم نمط حساسية العزلات الجرثومية البولية للمضادات المايكروبية للنساء الحوامل اللاواتي راجعن مستشفى النسائية و التوليد التعليمي في كربلاء.

المرضى وطرائق العمل: أجريت دراسة (480) من النساء الحوامل متوسط اعمارهن (28.3 ± 4.8) تتراوح اعمارهن (19-39) اللاواتي راجعن مستشفى النسائية و التوليد التعليمي في كربلاء أثناء الفترة (مارس/اذار-ديسمبر/كانون الأول 2010). (النساء اللاواتي يبدون ظاهرياً سليماً مع عدم وجود أية علامات أو أعراض لالتهاب المجاري البولية شملن في الدراسة) في التحري عن إصابات التهاب المجاري البولية اللاسريري. جمعت عينات البول في أكواب نظيفة و بعد ذلك خضعت للتحليل البولي الروتيني و الزرع البولي و لطفة الغرام، تم الفحص بالأشرطة القياسية لعينات البول التي لم تتعرض للطررد المركزي في حين تم الفحص المجهري للبكتريا البولية و البول الصديدي للعينات التي تعرضت للطررد المركزي وتم إجراء فحص الحساسية للمضادات المايكروبية باستخدام طريقة إنتشار القرص.

النتائج:

من (480) عينة بولية حددت الإصابة بالتهاب المجاري البولية اللاسريري في (27) وبنسبة 5.6% من النساء اللاواتي شملن في الدراسة، البكتريا الأكثر نمواً كانت الاشريشية القولونية بواقع 11 (40.71%).
أظهرت جميع العزلات الجرثومية حساسية عالية للمضادات الجرثومية (Ciprofloxacin ,Gentamicin and Nalidixic acid) على التوالي، جميع العزلات الجرثومية كانت مقاومة لل (Ampicillin).
من بين الفحوصات البولية السريعة كانت لطفة الغرام الفحص الأكثر حساسية (92.5%) وخصوصية (98.9%)، كانت حساسية فحص خميرة السترات لخلايا الدم البيضاء كانت (70.3%) و هي أعلى من حساسية فحص النترت (66.6%) في حين خصوصية فحص خميرة السترات لخلايا الدم البيضاء كانت (88.5%) وهي أقل من خصوصية فحص النترت (97.1%).
القيمة التنبؤية الموجبة و القيمة التنبؤية السالبة لفحص النترت سجلت (58%، 97.5%) على التوالي، القيمة التنبؤية الموجبة و القيمة التنبؤية السالبة لفحص خميرة السترات لخلايا الدم البيضاء سجلت (26.7% و 98%) على التوالي.
القيمة التنبؤية الموجبة و القيمة التنبؤية السالبة لفحص لطفة الغرام كانت (99.5% و 83.3%) وهذا أعلى مما سجل في فحصي النترت و لفحص خميرة السترات لخلايا الدم البيضاء.

الاستنتاجات:

- 1- تم عزل 27 عزلة من الجراثيم المختلفة وكانت جرثومة الاشريشية القولونية هي الأكثر عدداً، وأن المضادات المايكروبية الأكثر (Ciprofloxacin ,Gentamicin and Nalidixic acid) هي المضادات المايكروبية الأكثر تأثيراً على هذه العزلات الجرثومية لهذا يمكن اعتبارها العقار الذي يمكن اختياره لعلاج التهاب المجاري البولية لدى النساء الحوامل.
- 2- لوحظ أن اختبار لطفة الغرام الفحص الأفضل (الأكثر حساسية) من بين الفحوصات المستخدمة في الدراسة و يعد الزرع الجرثومي الفحص الأول لتشخيص الإصابة بالتهاب المجاري البولية.
- 3- حساسية المضادات المايكروبية للعزلات الجرثومية لم تعطى اختلافات معنوية مع ما وجد في الدراسات المماثلة.

Introduction

Urinary tract infection is one of a serious health problem affecting millions of people yearly, infections of urinary tract are in the seconds most common type of infection in the body. (1)

Urinary tract infection has an important association in human female ,the highest incidence of urinary tract infection occur in child bearing age and this has been linked to sexual activity and aging .(2)

Asymptomatic urinary tract infection occur in 2 to 10%in women during pregnancy.(3)

Urinary tract infection can be seen in three different forms in infected pregnant women ,asymptomatic bacteriuria ,acute cystitis or acute pyelonephritis ,the incidence of asymptomatic urinary tract infection has been reported between 2-13% however physiological changes in pregnancy lead to sever course of problem and also it has been reported that if untreated asymptomatic bacteriuria increase the frequency of premature delivery and neonates with low birth weights .(4)

Basically the diagnosis of asymptomatic urinary tract infection is by urine culture but culture results are typically not available until 24-48 hrs after getting the specimens.(5)

Besides that there is microscopic examination of urine sediments and dipstick analysis (Nitrate test and Leukocytes Esterase test). (6, 7)

About 80-90% Of urinary tract infections are caused by bacteria, called E.Coli, these bacteria live normally in the intestine but sometimes get into urinary tract ,some

urinary tract infections are caused by other less common types of bacteria .(8)

The leading causes of acute and uncomplicated urinary tract infections in ambulatory patients have been reported to be due to *E.coli* ,*Staphylococcus aureus*,*Proteus* spp.,*Klebsiella* spp. and *Pseudomonus aerogenosa*. (9, 10)

in most cases of urinary tract infections ,antimicrobial therapy is initiated even before the results of urine culture are available .hence there exists a great need for antimicrobial resistance surveillance at local, national and international level there is no doubt that antimicrobial therapy is necessary when urinary tract infection develops in pregnancy

the aim of therapy is to maintain sterile urine throughout pregnancy without causing toxicity to the mother or fetus.(11,12)

this study was conducted to determine the frequency of asymptomatic bacteriuria and to evaluate the antibacterial susceptibility pattern for uropathogens isolates and also to explore the evaluation of rapid urine screening tests in detection of asymptomatic urinary tract infection in pregnant women attending educational hospital for Gynecology and Obstetrics in Kerbela.

Material and methods:

In this study mid stream urine samples were collected from (480) pregnant women their mean age 28.3 ± 4.8 range (19-39).attended to educational hospital for Gynecology and Obstetrics in Kerbela, who are apparently healthy

without any signs or symptoms of urinary tract infection were included in our study, patients were excluded if they had symptoms of urinary tract infection (dysurea, suprapubic pain ,frequency,urgency,fever) or had used antibiotics within one week.

The patients were instructed on how to collect urine samples in a sterile clean bottle, within two hours of collection urine samples had undergone for the followings:

-For urinalysis : Nitrate and Leukocytes Esterase tests were examined by insertion of multireagents strips using CYBO (DFI Co .Ltd Korea) into the uncentrifuged samples (the manufacturer's instructions were followed).

-For white blood cells counts : urine samples were centrifuged at 3000 rpm for five minutes the supernatant was discarded and the white blood cells were counted in 7-8 microscopic fields pus cells more than 5 per high power field considered significant for urinary tract infection.

-For Gram's staining : loopful urine smears of uncentrifuged well were stained by Gram's stain and examined microscopically under oil immersion ,the presence of more than one bacteria of oil immersion field in 20 fields correlated with significant bacterial culture of more than 10^5 CFU/ml of urine.

-For urine cultures: well mixed uncentrifuged mixed urine samples were cultured on (blood agar, McConkey , EMB)plates and Hinton agar (used for antibiogram test)"Oxoid" by using calibrated loop method delivering 0.01 ml of urine and incubated aerobically at $37C^\circ$ for 24-48 hrs., asymptomatic bacteriuria was defined as two

consecutive clean catch midstream urine culture showing at least 10^5 CFU/ml of the same single species from patients without symptoms of urinary tract infection(13-14).

after incubation bacteriuria was considered as significant for the samples that had given pure growth at least 10^5 CFU of uropathogen per milliliter ,while the samples that gave high colony counts with more than one pathogen or non pathogen (*Acintobacter* spp., *Candida*, *Streptococcus viridians* , coagulase negative *staphylococcus*.....etc) in asymptomatic women was considered contaminated or negative and excluded from our study.

suspected bacterial colonies were identified on the basis of Grams' reaction ,morphology, biochemical characteristic features.(Grams' negative uropathogens were identified by standard biochemical tests Enterobacteracease pathogens identified by using the ImVic tests.

These included indole production, Voges-Proskauer reactions and citrate utilization tests.

Other tests conducted were Dnase and gelatinase tests. *Proteus* spp. was identified using the characteristic urea test reaction in 4hrs and production of hydrogen sulphide from TSI agar. *Klebsiella* spp. was identified using sugar fermentation test ,gelatin liquefaction and hydrogen sulphide tests, Grams' positive bacteria were identified with corresponding laboratories tests catalase test ,coagulase (both tube and slide test),manitol salt agar test for *staphylococcus aureus*.)

Antibacterial susceptibility test was performed according to Kirby- Baures' disc diffusion method for all isolates(15), The antibiotics that used were Ciprofloxacin , Gentamicin , Nitrofurantoin , Nalidixic acid , Trimethoprim–sulfamethoxazole ,Trimithoprim, , Cefotaxime ,Carbenicillin, , Oxacillin, Ampicillin.

Results

During the study period (MAR-DEC 2010), a total of 480 midstream urine samples from pregnant women whom attending to educational hospital for Gynecology and Obstetrics in Kerbela all urine samples were examined and analyzed for asymptomatic bacteriuria.

Of 480 specimens sent for culturing ,(27)patient (5.6%)were identified to have asymptomatic bacteriuria ,the vast majority grew was *E.coli* 11 (40.71%) followed by *Proteus* spp. 6 (22.2%), *Klebsiella* spp.4 (14.8%), *Staphylococcus aureus* 2 (7.4%) ,*Enterococcus* spp. 2 (7.4%),*Pseudomonas* spp. 1 (3.7%), and *Salmonella* spp. 1(3.7%) respectively.

Urine culture was taken as gold standard and compared to various screening tests were done. Statistical formulas was applied and thus sensitivity, specificity, positive predictive value, negative predictive value were calculated.

Gram's stain of uncentrifuged urine revealed highest number of true positives (25/27) with high sensitivity (92.5%).

The lowest number of true positives was seen in nitrite test (18/27) with low sensitivity 66.6%, the leukocyte esterase test showed the highest false positives (52) while lowest numbers of false positive were seen in Gram's stain (5)

Thus decreasing and increasing of specificity of the leukocyte esterase test (88.5%) and the Gram's stain (98.8%) the above values are explained in table 3 and table 4.

A total of 10 antibiotics tested against all bacterial isolates ,the susceptibility pattern showed Ciprofloxacin to be the most effective antibiotic this was followed by Gentamicin and Nalidixic acid .the rate of resistance of isolates to antibiotics which are routinely transcript to treat urinary tract infection are explained in table 5.

Discussion

Infection of urinary tract is one of the most common infectious diseases and it would affect all age groups of people including men, women and children in worldwide. (16,17,18).

Urinary tract infections can be either symptomatic or asymptomatic patients with significance bacteriuria who have symptoms referable to the urinary tract are supposed to have symptomatic bacteriuria.(19)

The urinary tract Infection is one of the most common health problems in pregnancy because of the increase in the sex hormones beside anatomical and physiological changes during pregnancy.(20,21).

Asymptomatic bacteriuria is a condition characterized by bacteriuria without classical symptoms attributable to the urinary tract. (22)

The global prevalence of urinary tract infection during pregnancy is found to give range from 1.9%-9.1% as per

literature, in this study the prevalence of asymptomatic bacteriuria was 5.6% which was nearly similar to study in India conducted by Gayathree et al (23), studies of Iran have showed a prevalence of 6.3%(20) studies of Pakistan showed 4.8%(24) while Ali et al reported 3.3%(25)

other studies by Turpin et al and Jayalaxmi et al(2007) found the incidence of asymptomatic urinary tract infection in pregnant women was 7.3%(21), while in a study conducted in Mexico reported the frequency of asymptomatic urinary tract infection was 8.4% and Tadesse et al found the prevalence of asymptomatic bacteriuria in pregnant women was 9.8%. These differences in prevalence of asymptomatic urinary tract infection in pregnant women in these studies perhaps due to climate and different level of health in developed and developing countries.

E.coli had the highest percentage occurrence identified (40.7%) of 27 positive specimens, *Proteus* spp.isolated in (22.2%) of specimens, *Klebsiella* spp. (14.8%), *Staphylococcus aureus* and *Enterococcus* spp. (7.4%) for each respectively, *Pseudomonas* spp. and *Salmonella* spp. (3.7%), each of them respectively of 27 positive specimens.

Similar results obtained by Taneja et al (2010) found in a total 1974 clean catch midstream urine samples investigation common bacterial isolates was *E.coil* (47%),*Klebsiella* spp.(15.6),*Enterococcus* spp.(8.7%),*Proteus* spp.(5.9%)*Pseudomonas* spp.(5.9%),otherwise study by Tambekal et al (2009)found in a total 147 urine specimens found *E.coil*(59%) followed,by *seudomonas*,,spp.(15%),*Klebsiella pneumonia*(10%)*Proteus mirabilis* (9%),*Staphylococcus aureus*(6%),

also our study nearly similar to a study conducted by Paul et al (2010) they found the most prevalence of uropathogens was *E.coli*(27.1%)followed by *Staphylococcus aureus* (24.4%), *Klebsiella* spp. (11.9%), *Proteus* spp.(8.7%),*Citrobacter* spp. (6.2%), *Pseudomonas* spp.(4.4%).

The predominance of *E.coli* isolation in our study and also in others study this could be related to the urinary stasis is common during pregnancy and most *E.coli* strains prefer this environment and then they cause urinary tract infection (31)

Another reason could be as a result of poor genital hygienic practices by pregnant women who may find difficulty in cleaning their anus properly after defecating or clean their genital after passing urine.

Our study revealed that Ciprofloxacin and Gentamicin were very effective against urinary isolates .

Nalidixic acid, nitrofurantoin, Trimethoprim , trimethoprim – sulfamethoxazole were moderately effective while most isolates show high resistance against Ampicillin, Oxacillin ,Carbenicillin and Cefotaxime were highly resistance to isolates. the least resistance was detected against Ciprofloxacin and hence it might be the drug of choice to treat urinary tract infection.

Tseng et al (2008)from urinary tract infections recovered all bacteria showed the highest degree of resistance to Ampicillin and cefalothin.(32)drug resistance is one of the nature never ending process whereby organisms develop a tolerance for environmental conditions ,these may be due to preexisting factor in the organisms or it may result from acquired factors some naturally susceptible strain of bacteria may acquire resistance(33)

The susceptibility seen in this study is disposed to imply that it is very necessary to obtain sensitivity reports before start antibiotics therapy in cases of suspected of urinary tract infections.

even so ,it should be noted that ivitro antibiotics sensitivity is only guide and that the conditions may be quite different from those obtained in vivo hence the final decision to use particulate antibiotic depend on such as factors as its selective toxicity ,drug absorption, metabolism ,drug clearance rate, bioavailability and serum attainable level its therefore recommended that appropriate antimicrobial to be administered to diminish the risk of increase resistant organisms developing and prevent ineffectiveness of antibiotics on the other hand proper adherence and compliance to drug prescription and dosage on the of patients also play a role in the efficacy of the antibiotics in use.

The findings of this current study have in no doubt highlighted the need for constant monitoring of susceptibility of specific pathogens in different populations to commonly used antibiotics, prompt therapeutic intervention is therefore advocated in this current study as it is essential to prevent cases of asymptomatic urinary tract infection from becoming symptomatic with resultant damage, though improved antimicrobial drug stewardship and intervention for resistance control is little cited in Karbala ,they are inadequately implement .(34)

In our study most isolates show high susceptibility to Ciprofloxacin this is antibacterial that interferes nucleic acid synthesis by enzyme gyrase inhibiting this antibacterial has several binding sites on the enzyme and thus decrease the probability of resistance (35), our antibacterial susceptibility results are

similar with the results of Ali et al, Kiffer et al, kader et al, Maripandi et al and Adel (2010)

Nicolle (2002) has remarked that this increase in resistance may be due to improper treatment and indiscriminate use of antibiotics , antibiotics therapy should be commenced only after through culture and sensitivity tests has been carried out to avoid emerging drug resistance among the bacteria this will discourage the discriminate use of antibiotics (Semeniuk 2009) .

In our study, we found the sensitivity of nitrite test is 66.6% which is low while the specificity was high 97.7%for detection of asymptomatic urinary tract infection in pregnant women, the positive nitrite test indicate that nitrite has been produced by reduction of nitrate to nitrite by genera of Enterobacteriaceae family, also false negative are common with nitrite test. (41)

false negative results could occur in case the urinary tract infection is resulted from uropathogens that do not produce nitrate reductase., when urine has been present in bladder for in sufficiently long periods for nitrate reduction to take place or when the dietary nitrate is not present .(42)

Many studies found the sensitivity of nitrite test to be low we established nitrite sensitivity about 66.6% this percentage is nearly as others studies values (13,14,43,44,45)

The leukocyte esterase for pyurea gives a sensitivity of 70.3% while some studies have reported dipstick leukocyte esterase sensitivity to be 100%.(46).in the same time other studies show much lower values(13,14,43,44)also in these studies the leukocyte esterase and nitrite tests in the pregnant women screening tests for identification of asymptomatic urinary tract infection were not effective as rapid

screening tests, for diagnosis asymptomatic bacteriuria (13,14,43,44) Gram's stain it has been found that this method is more sensitive than other screening methods for detecting urinary tract infection.(47)

Numerous previous studies have established that the gold standard method for diagnosis of urinary tract infection as well as asymptomatic bacteriuria is the urine culture of midstream catch urine (21, 48, 49, 50)

In our evaluation of screening tests like Gram's stain , The leukocyte esterase, nitrite test we found Gram's stain of uncentrifuged urine to have a good sensitivity (92.5%)and specificity (98.8%) and negative predictive value (99.5%) than other screening tests vis-à-vis urine culture (50,51,52)

The nitrite test showed a good specificity (97.1%) and it's nearly was less sensitive than Gram's stain (92.5 %").

Our results nearly the same as what – Gayathree et al found also similar to the study conducted by birgnl et al.,among screening test evaluation we observed that Gram's stain tests of uncentrifuged urine was the best screening method for asymptomatic bacteriuria detecting as in other studies (21)also in our opinion the dipstick for leukocyte esterase and nitrite test can also serve as a rapid screening method for asymptomatic bacteriuria, as its sensitivity and specificity is nearer to that Gram's stain and urine culture.

Conclusions

1--Asymptomatic bacteriuria was prevalent in (5.6%)of 480 women who were evaluated in our study.

2- Given high specificity of nitrite test: it might be considered as an indication for Enterobacteriaceae infections; nevertheless it is recommended that physicians send urine for culture for all pregnant women

3- Gram's stain of uncentrifuged urine was observed to be the best among the screening tests which were evaluated and urine culture remained the gold standard for the detection of bacteriuria

4-none of the used rapid tests in this study was able to detect all cases of asymptomatic bacteriuria in pregnant women.

5-atotal of 27 isolates different pathogens were identified among the *E.coli* was the dominant one, the drugs Ciprofloxacin and Gentamicin Nalidixic acid, were found the most effective against the uropathogens isolates and hence it might be the drug of choice to treat urinary tract infection in pregnant women.

6-antimicrobial susceptibility of the isolated uropathogens does not show significant differences with some other studies.

Recommendations

1-It is recommended that routine microbiological analysis for antibiotics sensitivity tests for mid stream urine samples of pregnant women and other patients be carried out before administration of drugs for treatment and management of urinary tract infections since resistance to these drugs are developing in the community.

2- This study appear to suggest a need for a continuous monitoring of bacterial antibiotics susceptibility before

antibiotics prescription in order to ensure adequate treatment for urinary tract infection and reduction in the spread of bacteria resistant strain.

3- Identification and proper treatment of asymptomatic bacteriuria will lead to 10 fold decrease in the occurrence of acute

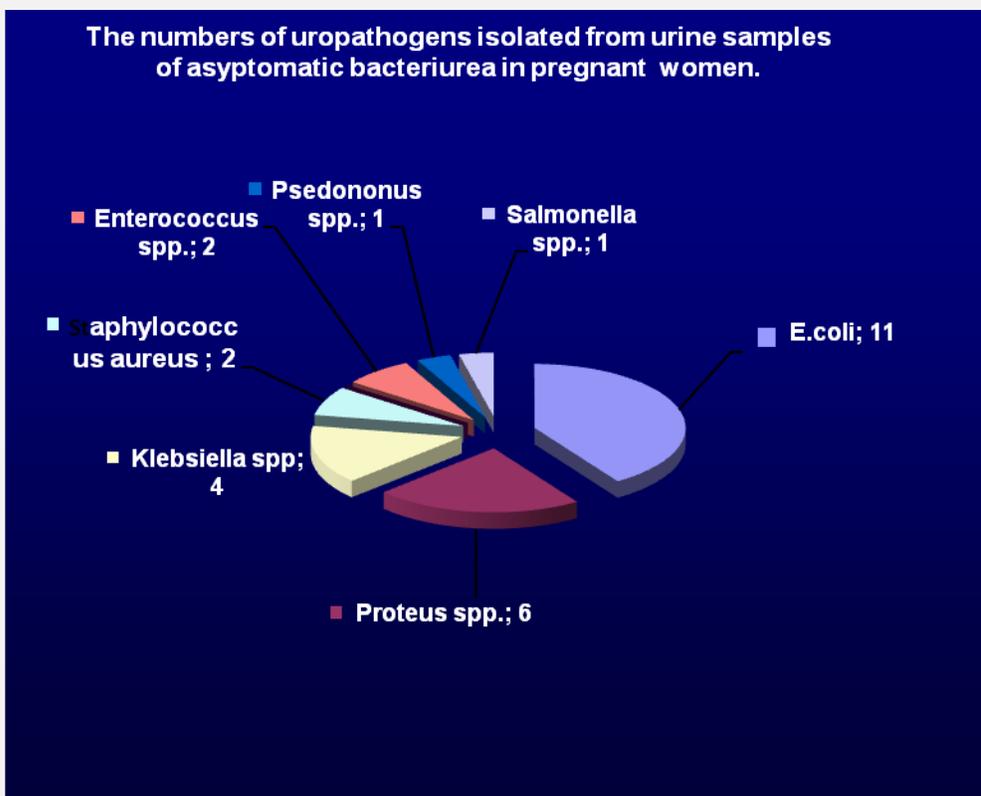
pyelonephritis later in pregnancy in women with asymptomatic bacteriuria.

4- there is a good evidence to recommend screening for asymptomatic bacteriuria in pregnancy.

5- self medication should be avoided in order to prevent spread of drug resistant strains of bacteria.

Table 1: Prevalence and percentages of bacterial uropathogens from urine cultures in asymptomatic pregnant women.

Uropathogens		Number of positive cultures	Percentage
Enterobacteriaceae	<i>Escherichia coli</i>	11	40.7%
	<i>Proteus</i> spp.	6	22.2%
	<i>Klebsiella</i> spp.	4	14.8%
	<i>Salmonella</i> spp.	1	3.7%
Non Enterobacteriaceae	<i>Pseudomonas</i> spp.	1	3.7%
	<i>Staphylococcus aureus</i>	2	7.4%
	<i>Enterococcus</i> spp.	2	7.4%
Total		27	100%



The results of urine dipstick of Nitrite and Leukocytes Esterase tests compared with their relationship to the results of urine cultures and Gram's stain examination are explained in table 2:

Urine culture	Nitrite test		Leukocyte esterase test		Gram's stain	
	positive	negative	Positive	negative	positive	negative
positive	18	9	19	8	25	2
negative	13	440	52	401	5	448
total	31	449	71	409	30	450

Table 4: Results of sensitivity, specificity, predictive values of various screening tests for asymptomatic bacteriuria in pregnant women as compared to urine culture

Screening test (n=480)	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
Nitrite	66.6	97.1	58	97.9
Leukocyte esterase	70.3	88.5	26.7	98
Gram's stain	92.5	98.8	83.3	99.5
Urine culture	100	100	100	

Table 5: antimicrobial susceptibility rates of tested bacterial uropathogens isolates against ten antimicrobial agents.

Antimicrobial agents	<i>Escherichia coli</i>	<i>Proteus spp.</i>	<i>Klebsiella spp.</i>	<i>Staphylococcus aureus</i>	<i>Enterococcus spp.</i>	<i>Pseudomonas spp.</i>	<i>Salmonella spp.</i>
	N=11	N=6	N=4	N=2	N=2	N=1	N=1
Ciprofloxacin	10(90.9%)	4(66.6%)	4(100%)	2(100%)	2(100%)	1(100%)	1(100%)
Gentamicin	7(63.6%)	5(83.3%)	3(75%)	2(100%)	2(100%)	1(100%)	1(100%)
Nitrofurantoin	4(36.4%)	5(83.3%)	2(50%)	0(0.0%)	1(50%)	1(100%)	1(100%)
Nalidixic acid	9(81.8%)	3(50%)	3(75%)	2(100%)	1(50%)	0(0.0%)	0(0.0%)
trimethoprim – sulfamethoxazole	5(45.5%)	2(33.3%)	2(50%)	0(0.0%)	1(50%)	1(100%)	0(0.0%)
Trimethoprim	4(36.4%)	3(50%)	1(25%)	1(50%)	0(0.0%)	1(100%)	1(100%)
Cefotaxime	3(27.3%)	1(16.6%)	0(0.0%)	2(100%)	1(50%)	0(0.0%)	0(0.0%)
Carbenicillin	1(9.09%)	1(16.6%)	1(25%)	2(100%)	0(0.0%)	1(100%)	0(0.0%)
Oxacillin	1(9.09%)	0(0.0%)	1(25%)	1(50%)	0(0.0%)	0(0.0%)	0(0.0%)
Ampicillin	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)

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