

## Original Research Article

# Asymptomatic UTI in pregnancy attending at tertiary care of Nepal

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**Received:** 10 January 2018

**Accepted:** 12 February 2018

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### ABSTRACT

**Background:** Urinary tract infections (UTI) during pregnancy issued by improper laboratory investigations situate women at risk of several detrimental complications. Untreated asymptomatic UTI (AUTI) may lead to pyelonephritis preterm birth, low birth weight, etc. Urine culture is used to confirm the diagnosis of UTI. Aim of this research was to carry out to find the prevalence of asymptomatic UTI and to establish antimicrobial drug susceptibility of the pathogens resulting asymptomatic UTI in pregnant women attending at tertiary care, Nepal.

**Methods:** The urine samples were collected by mid-stream clean catch method from 600 pregnant women of age 15-45 years (mean age – 28.84 years) visiting for antenatal check up in the Department of Gynaecology and Obstetrics, Chitwan Medical College (CMC), a tertiary care of Nepal. All the urine samples were subjected to bio-physical, biochemical, microscopic, and microbiological analysis. The prevalence of UTI in three trimesters and in different age groups was obtained together with antimicrobial drug susceptibility tests.

**Results:** On overall 151.83% of urine samples revealed with significant bacteriuria considered as the AUTI. On One-way ANOVA test, there was significant ( $P < 0.045$ ) prevalence of AUTI when compared among different trimesters, though higher prevalence being in the first (40%) and second (45.33%) trimesters. The prevalence of AUTI was significant ( $P < 0.004$ ) among different age groups of the pregnancy. However, the most affected age groups were between 21-29 years. *Escherichia coli* were the most implicated organism (67.8%) followed by *Klebsiella pneumonia* (21.6%). The gram-negative bacteria (*E. coli*, *K. pneumonia*, and *K. oxytoca*) were more sensitive against Amikacin, Gentamycin, Meropenem, and Nitrofurantointhan. Other drugs whereas; gram positive bacteria (*E. faecalis*) had high susceptibility with Vancomycin.

**Conclusions:** There was high incidence of AUTI among the pregnant ladies in the study region; therefore, microbial screening of urine of all pregnant women are must and should be included in the routine antenatal checkups to detect the AUTI to cut down and prevent the maternal and obstetric detrimental complications in them.

**Keywords:** Asymptomatic UTI, AST, Pregnancy, Prevalence of UTI, UTI

### INTRODUCTION

The asymptomatic UTI is a persistent, actively multiplying bacterium ( $\geq 10^5$ cfu/ml in urine) in the urinary tract lacking any symptoms of bacterial infection.<sup>1,2</sup> Both asymptomatic and symptomatic UTI is common in pregnant lady. The normal physiologic changes during pregnancy with reduction in immunity,

increased plasma and decreased urine volume and gestationally induced glycosuria, pregnant women are more prone to urinary tract infections.<sup>3,4</sup>

AUTI prevalence rate among pregnant ladies differs in different geographical settings within a country and country to country in the globe which is supposed to be due to varying parity, race, socioeconomic status and

environmental influences. Twenty five percent of pregnant women with undiagnosed and untreated AUTI get complicated into symptomatic UTI.<sup>5</sup>

During Pregnancy AUTI might progress to symptomatic UTI and can cause several complications like pyelonephritis, maternal anemia, pre-term labour, septicaemia, even death of the mother and unwanted harmful obstetric outcomes such as premature birth, low birth weight and increased fetal and neonatal mortality rates.<sup>5,6,7</sup> So in order to prevent these harmful effects of AUTI on mother and child health, antenatal care centres should suggest for routine culture of urine of pregnant ladies.<sup>8</sup> The proper screening and diagnosis of AUTI for bacteriuria can be prevented by use of appropriate antimicrobial drugs. Most health care centres in developing countries like Nepal, routine urine culture test is not carried out for every pregnant woman during her antenatal checkups presumably due to poor health education, high cost and time duration for culture result (usually 2-3days). Rather many clinicians opt for the strip urinalysis method for pregnant women that poorly quantify the extent and grade of infection in them. Moreover, in many places, the clinicians and healthcare personnel look for the presence of glucose and protein in urine to diagnose UTI. These methods do not give a clear picture of AUTI or UTI. During pregnancy, the development of the AUTI to the symptomatic UTI can be prevented based on proper diagnosis, which highlights the proverb used in medical field, "prevention is better than cure" as is being practiced since time immemorial. This mandates early and proper detection and treatment of AUTI in pregnancies. Against this background, it is aimed to identify the bacteria and look their distribution in different trimesters, which are prevalent in urine of asymptomatic pregnant women.

## METHODS

### *Study population*

This descriptive cross-sectional study was carried out on urine samples of 600 Pregnant ladies visiting in year 2015 to 2016 at Gynecology and Obstetrics Clinic of Chitwan Medical College (CMC) for antenatal check up. The pregnant women included in this study were randomly selected for convenient sampling meeting the inclusion criteria having age between 15 to 45years without any symptom of UTI like lower abdominal pain, fever, burning micturition, frequency of micturition, dysuria. Exclusion criteria included subjects having symptomatic UTI, past history of UTI in last year, under medical therapy in last 6 months and medications which may alter the immune system.

### *Demographic information*

The demographic information (age, height, weight, BMI, age of pregnancy, term of pregnancy, gravida, parity and anti - biotic used in last week) were obtained from their

file records in the Gynaecology and Obstetrics department.

### *Specimen collection*

The subjects were then educated and suggested appropriately to collect clean catch mid-stream urine sample<sup>9</sup> (on the day of submission) into a container which was sterile, capped, dry, wide-necked, leak-proof, and properly labelled with laboratory number. Before the urine collection each subject was advised for proper cleaning of external genitalia.

### *Sample transportation*

Specimens were transported to the laboratory within half an hour for investigation following the standard laboratory protocol (WHO guidelines)<sup>10</sup> in the central laboratory of Chitwan Medical College, Nepal. The samples were refrigerated at 4°C, if not sent on time.

### *Macroscopic examination*

Before processing, the bio-physical characters of the urine samples such as urine color, consistency, presence of blood, mucus, debris and any other abnormalities were observed with unaided eye.

### *Processing of specimens*

First of all, 0.02ml potassium nitrate added to 1ml of the urine sample and then incubated. The microscopic examination was carried out for the detection of leucocytes after culturing the urine specimen for quantitative bacterial count.

### *Microscopic examination for pus cells*

Unspun urine is examined using microscope and pus cells per high power field were noted and calculated. The count of 10 or more pus cells per high power field is considered as an indication of urinary tract infection, but not confirm the same.

### *Quantitative bacteriology-calibrated loop direct streak method*

The collected mid-stream urine samples were cultured onto blood agar, MacConkey agar and Sabouraud Dextrose Agar and Cysteine Lactose Electrolyte Deficient Agar (CLED). The loop full of well mixed uncentrifuged urine specimen was delivered onto the dried plate of a medium to make primary inoculums. The size of platinum loop was 4mm and it was sterilised using flame and cooled before making primary inoculums. The inoculum was spreaded very thinly in parallel lines with the loop. The loop was again sterilised between different streaks. The inoculated agar plates were incubated at 37°C for overnight and read after 24hours, while

Sabouraud Dextrose agar was incubated at 28°C room temperature.<sup>11</sup>

Colonial characteristics were read and colony count was done on every plates. Total counts were estimated from all the cultured agar plates except the sabouraud dextrose agar plate. In each cultured plate, the number of colonies was multiplied by 100, to estimate the number of organism per milliliter of urine. The cultured plate having mixed growth was regarded as contamination and such sample was again repeated for the culture. If there was the absence of any bacterial growth, those specimens were again kept for a day in incubator, and if still negative, they were reported as no growth after 48 hrs. 10<sup>3</sup>colonies on MacConkeys agar plate i.e.10<sup>5</sup> bacteria per ml of urine and 100 colonies on blood agar plate i.e. 10<sup>4</sup> per ml were considered to be significant bacteriuria.

If a pure culture of urine shows at least 10<sup>5</sup> organisms/ml of urine without any symptoms in subjects, it is said to be asymptomatic bacteriuria/UTI.<sup>2</sup> After determining the plate count, organisms were further processed by a series of biochemical tests to confirm the organism. Finally, the Disc-Diffusion method was carried out for the antimicrobial susceptibility test.

**Bacterial identification**

Gram staining was performed by making a smear from a single colony of the cultured plates. Motility test was examined from the SIM test. Similarly, a series of biochemical investigations (Citrate test, SIM, MRVP test, Ureases and TSI tests) were performed for the identification of the various gram-negative bacteria.

**Antibiotic susceptibility test**

The antibiotic susceptibility tests of the urine isolates from asymptomatic pregnant lady were done on Mueller Hinton agar (MHA) by the standard disk diffusion technique method using various antibiotic discs as recommended by CLSI (CLSI 2007).<sup>12</sup>

The isolated colony from the MHA plate were touched at its base with a sterilised inoculating wire to pick out the colony and then was inoculated into the nutrient broth tube. After inoculation, these tubes were incubated at 37°C for few hours till it reached the Mac Farland tube number 0.5 turbidity. The broth tube having overgrowth was diluted with sterile saline to match with Mac Farland tube number 0.5.

Dipping the sterile cotton swab into the broth, the inoculum was picked out and streaked onto the entire dried MHA plate. A predetermined series of antimicrobial disks were inoculated onto the MHA plate. The antimicrobial disks were slightly pressed down on the media so that the disks were in complete contact with the medium. After inoculating the antimicrobial disks, they were incubated at aerobically at 37°C overnight

(CLSI 2007). After overnight incubation, the diameter of zone of inhibition (ZOI) of each antimicrobial disk was measured with a scale from the opposite surface of the plate with their lid closed and recorded in millimeter. *E. coli* ATCC 25922 was also tested, for each experiment, as part of quality control. The results were reported in terms of sensitive’, ‘resistant’ and ‘moderately sensitive’ (intermediate) by comparing with the standard chart developed by Kirby-Bauer.

For disk susceptibility testing, Amikacin (30mcg), Meropenem (10mcg), Gentamycin (10mcg), Nitrofurantoin (100mcg), Piperacillin/tazobac (10mcg), Ceftriaxone (30mcg), Cefotaxime (30mcg), Cotrimoxazole (1.25mcg), Ciprofloxacin (5mcg), Levofloxacin (5mcg), Ampicillin/sulbactam (10/10mcg), vancomycin (30mcg) were used. The isolates showing resistance towards two or more than two drugs were considered to be MDR.

**Statistical Analysis**

Statistical analysis was performed by using SPSS (IBM SPSSv 20, Armonk, NY, USA). Descriptive measures like the percentage and proportions were computed; cross tabulations were done to establish relationships between variables and One-way ANOVA and CHI-square tests used to test association according to need. P≤0.05 was considered to be statistically significant in all analysis. Data from deep sticks and urine culture sensitivity was analyzed using quantitative methods. The study findings were presented in tabulated form.

**RESULTS**

**Anthropometric variables**

The subjects involved in this study had a mean age of 28.84 years. The mean height, weight and BMI were 1.6m, 60.72Kg and 23.55Kg/m<sup>2</sup> respectively. The mean blood pressure with systolic blood pressure (SBP) and diastolic blood pressure (DBP) were 121.29mmHg and 64.24mmHg respectively (Table 1).

**Table 1: Anthropometric and cardiac variables of pregnant women.**

Variables	Range (min-max)	Mean (average)
Age (Yrs)	16-45	28.84
Height (m)	1.42-1.77	1.6
Weight (Kg)	48-74	60.72
BMI (Kg/m <sup>2</sup> )	17.84-31.04	23.55
SBP (mmHg)	100-134	121.29
DBP (mmHg)	50-90	64.24

On physical examination of urine, it was found that urine color was light yellow in 84% of cases while 12.3% have deep yellow and remaining 2.8% have colorless (Table

2). Out of 600 samples, 93.8% had acidic PH, 5.8% had alkaline PH and only 0.3% had the neutral PH (Table 3). The biochemical reactions showed clear transparency in 66.2% of urine samples out of total 600 urine samples (Table 4). While 28.2% had slight turbidity and 5.3% had turbidity on biochemical reaction. The presence of significant number of pus cells was predominant in urine samples. It was in 53.2% of urine samples (Table 5).

**Table 2: Urine colors presentation of the 600 urine samples from pregnant ladies.**

Urine color	Percentage (number)
Light yellow	84% (504)
Deep Yellow	12.3% (74)
Colorless	2.8% (17)
Others	0.0% (0)

**Table 3: PH recording of the 600 urine samples from the pregnant ladies.**

PH	Percentage (number)
Acidic	93.8% (563)
Alkaline	5.8% (35)
Neutral	0.3% (2)

**Table 4: Transparency (biochemical reactions) revealed from the 600 urine samples of pregnant ladies.**

Transparency	Percentage (number)
Turbid	5.3% (32)
Slight turbid	28.2% (169)
Clear	66.2%

**Table 5: Microscopic examination and chemical deposits noted of the 600 urine samples from pregnant ladies.**

Deposits	Percentage (number)
Pus cells	53.3% (320)
RBC	39.5% (237)
Ca oxalate	10.7% (64)
Ammonium phosphate	6.5% (39)
Ammonium ureates	11.5% (69)
Mucus threads	33.7% (202)
Glucose	25% (150)
Albumin	12.7% (76)

Similarly, the percentage of other deposits like RBC, Ca oxalate, ammonium phosphate, ammonium ureate, mucus threads, glucose, albumin were 39.5%, 10.7%, 6.5%, 11.5%, 33.7%, 25% and 12.7% respectively (Table 5). The incidence of bacterial growth respective to age distribution of pregnant ladies is placed in Table 6. The age of the pregnant women was grouped in difference of 5 years. Though the incidence of asymptomatic UTI (>1x10<sup>5</sup>cfu/ml bacterial count) was seen in all age groups

of pregnancy, it was high in age groups 21-24years, 25-29years, 30-34years with percentage incidence of 29.6%, 27.7% and 16.1% respectively (Table 6).

**Table 6: Incidence of bacterial growth in pregnant ladies as respect to their age distribution women.**

Age Groups (yrs)	Number tested for bacterial count			Total
	a (%)	b (%)	c (%)	
16-20	18 (6.6)	25 (8.0)	2 (11.1)	45 (7.5)
21-24	65(24.0)	92(29.6)	4 (22.2)	161(26.8)
25-29	58 (21.4)	86 (27.7)	3 (16.7)	147(24.5)
30-34	42 (15.5)	50 (16.1)	9 (50.0)	101(16.8)
35-39	43 (15.9)	23 (7.4)	0 (0.0)	66 (11.0)
40-45	45 (16.6)	35 (11.3)	0 (0.0)	80(13.3)
Total	271 (100)	311 (100)	18 (100)	600 (100)

a (represents number of samples without any bacterial growth), b (represents number of samples with statistically significant bacterial growth for UTI, >1x10<sup>5</sup>cfu/ml), c (represents number of samples with bacterial growth having less than 1x 10<sup>2</sup>cfu/ml bacteria)

Out of 600 urine samples among pregnant women, 51.83% of urine samples revealed with significant bacteriuria considered as the asymptomatic UTI, while 18 out of 600 cases have bacterial growth at non-significant level (Table 6, 7 and 8). Therefore, altogether with more than 1x10<sup>5</sup>cfu/ml and less than 1x10<sup>5</sup>cfu/ml bacterial counts, 54.83% (329 out of 600 samples) had bacteriuria.

**Table 7: Incidence of significant bacteriuria and overall bacteriuria of total 600 pregnant women.**

	Significant bacteriuria (nonsymptomatic UTI) (bacterial count >10 <sup>5</sup> )	Over all bacteriuria
Pregnant women	311/600 (51.83%)	329/600 (54.83%)

**Table 8: Incidence of asymptomatic UTI in pregnancies respective of their age distribution.**

Age groups (years)	UTI Present (bacterial count >10 <sup>5</sup> )	UTI absent (bacterial count 0 or <10 <sup>5</sup> )	Total
16-20	25	20	45
21-24	92	69	161
25-29	86	61	147
30-34	50	51	101
35-39	23	43	66
40-45	35	45	80
Total	311	289	600

On Chi- square test, it is revealed that the presence of pus cells in the urine of pregnant women with asymptomatic UTI was significant (P<0.001) (Table 9).

\*(Gram-negative bacteria), \*\* (Gram-positive bacteria), numbers in parentheses represent the number of urine samples positive for each bacterium.

**Table 9: Pus cells and asymptomatic UTI relation (Chi-square test).**

	Asymptomatic UTI		X <sup>2</sup> - value	P value
	Present	Absent		
Pus cells	254/311	66/289	208.33	<0.001

Out of total 329 samples positive for bacterial growth. On bacterial identification and isolation, most of the bacteria isolated were gram -ve except for the *Enterococcus faecalis* which was gram +ve (Table 10). Gram -ve bacterial isolates were *Escherichia coli* (*E. coli*), *Klebsiella pneumonia*, *Klebsiella oxytoca*, *Acinetobacter*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Proteus vulgaris* (Table 10). Among the gram-ve bacterial isolates, *E. coli* was the most predominant isolate with highest incidence (67.8%). The percentage incidence of *Klebsiella pneumonia*, *Klebsiella oxytoca*, *Acinetobacter*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Proteus vulgaris* were 21.6%, 8.5%, 5.2%, 4.6%, 3.3%, 1.5% and 0.3% respectively (Table 10).

**Table 10: Prevalence of isolated bacteria in pregnant ladies.**

Isolated bacteria	Prevalence/Percentage
<i>Escherichia coli</i> ( <i>E. Coli</i> )*	67.8% (223)
<i>Klebsiella pneumonia</i> *	21.6% (71)
<i>Enterococcus faecalis</i> **	8.5% (28)
<i>Klebsiella oxytoca</i> *	5.2% (17)
<i>Acinetobacter</i> *	4.6% (15)
<i>Proteus mirabilis</i> *	3.3% (11)
<i>Pseudomonas aeruginosa</i> *	1.5% (5)
<i>Proteus vulgaris</i> *	0.3% (1)

Though isolates were present in all the three trimesters, it was found that the first and second trimesters had more frequency of isolates (Table 11). *E. coli* and *Klebsiella pneumonia* were distributed more in first and second trimesters than third trimester (Table 11).

**Table 11: Distribution of isolates by trimesters.**

Isolates	Trimester			Total
	1	2	3	
<i>E. Coli</i>	83	100	40	223
<i>Klebsiella pneumoniae</i>	31	35	5	71
<i>Enterococcus faecalis</i>	20	7	1	28
<i>Klebsiella oxytoca</i>	7	7	3	17
<i>Acinetobacter</i>	3	11	1	15
<i>Proteus mirabilis</i>	6	4	1	11
<i>Pseudomonas aeruginosa</i>	0	5	0	5
<i>Proteus vulgaris</i>	0	1	0	1
Total	150	170	51	371

On One-way ANOVA test, there was significant ( $P < 0.045$ ) prevalence of asymptomatic bacteriuria (UTI) when compared among different trimesters (Table 12).

**Table 12: Prevalence of asymptomatic bacteriuria (UTI) with respect to trimesters of pregnancy (One-way ANOVA test).**

	Number of samples	P value
Asymptomatic UTI present	311	0.045
Asymptomatic UTI absent	289	
Total	600	

**Table 13: Prevalence of asymptomatic bacteriuria (UTI) in pregnancies relation to their age (One-way ANOVA test).**

	Number of samples	P-value
Asymptomatic UTI present	311	0.004
Asymptomatic UTI absent	289	
Total	600	

**Table 14: Prevalence of asymptomatic bacteriuria (UTI) with respect to months of pregnancy (One-way ANOVA test).**

	Number of samples	P-value
Asymptomatic UTI present	311	0.148
Asymptomatic UTI absent	289	
Total	600	

**Table 15: Prevalence of asymptomatic bacteriuria (UTI) with respect to number of gravida of pregnant women (One-way ANOVA test).**

	Number of samples	P-value
Asymptomatic UTI present	311	0.191
Asymptomatic UTI absent	289	
Total	600	

Similarly, there was significant ( $P < 0.004$ ) prevalence of asymptomatic bacteriuria (UTI) when compared among different age groups of the pregnancy (Table 13).

But, when it was observed among different months of pregnancy (Table 14), the relation was not significant. Similarly, the prevalence was comparable when observed among different gravida of pregnancy (Table 15 and 16).

On antibiotic susceptibility test as shown in Table 17, it was found that Amikacin, Gentamycin, Meropenem and Nitrofurantoin have more sensitivity against the gram -ve bacteria (*E. coli*, *K. Pneumonia*, *Klebsiella oxytoca*, *Acinetobacter*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Proteus vulgaris*) than other drugs. Whereas, gram +ve bacteria (*E. faecalis*) have high susceptibility with Vancomycin, nitrofurantoin and Piperacillin-tazobac. Most of the isolated organisms were

resistant to Levofloxacin, Ciprofloxacin, Cefotaxim, Ampicillin/sulbactam and Terofloxacin.

**Table 16: Distribution of the isolates by gravida.**

Isolates	Gravida					Total
	1	2	3	4	5	
<i>E. Coli</i>	98	58	36	21	10	223
<i>Klebsiellapneumoniae</i>	20	24	15	8	4	71
<i>Enterococcus faecalis</i>	11	11	3	1	2	28
<i>Klebsiellaoxytoca</i>	3	14	0	0	0	17
<i>Acinetobacter</i>	11	3	1	0	0	15
<i>Proteus mirabilis</i>	0	9	1	1	0	11
<i>Pseudomonas aeruginosa</i>	2	1	0	2	0	5
<i>Proteus vulgaris</i>	0	1	0	0	0	1
Total	145	121	56	33	16	371

**Table 17: Susceptibility patterns of bacterial isolates to different antimicrobial drugs.**

Isolates	Antimicrobial drugs												Total	
	Amikacin	Meropenem	Gentamycin	Nitrofurantoin	Piperacillin/Tazobac	ceftriaxone	Levofloxacin	cefotaxim	Ciprofloxacin	Ampicillin/Sulbactam	Vancomycin	Cotrimoxazole		Terofloxacin
<i>E. Coli</i>	191	169	186	167	128	125	92	77	26	14	-	19	6	223
<i>K. pneumonia</i>	53	62	48	19	40	30	29	20	8	24	-	0	9	71
<i>E. faecalis</i>	11	11	6	23	15	9	3	6	0	4	22	1	1	28
<i>K. oxytoca</i>	14	15	15	2	1	5	3	11	1	1	-	0	0	17
<i>Acenobacter</i>	14	15	14	8	14	1	11	8	8	0	-	0	0	15
<i>Proteus mirabilis</i>	11	11	11	0	2	2	3	11	2	0	-	0	0	11
<i>P. aeruginosa</i>	5	5	5	0	4	2	0	2	1	0	-	1	2	5
<i>Proteus vulgaris</i>	0	1	1	1	1	1	0	1	1	0	-	0	0	1
Total	256	248	244	211	196	180	129	105	41	39	22	20	17	371

**DISCUSSION**

Although biochemical analysis of urine revealed mostly clear transparency (66.2%), the remarkable cases had slight turbidity (28.2%) and turbidity (5.3%), which could be due to presence of bacteria, pus cells, RBCs, proteins and other deposits (Table 5) found in this study. However, most of the pregnant women (93.8%) revealed with normal urine color and transparency, the overall incidence of bacteriuria (both having significant and non significant bacterial growth count) was high (54.83%), signifying a negative correlation between urine color and bacteriuria.

The prevalence of significant asymptomatic bacteriuria (bacterial count >1x10<sup>5</sup>cfu/ml) called the asymptomatic UTI in pregnancies in this study was 51.83%. It agrees with the previous reports concluded with high prevalence of 58%, 66%, 47.5%, 30-60% and 54% respectively, but in cintrast to this, the findings by Mobasheri E et al, Hernandez BF et al, Tadesse A, Obirikorang O et al revealed with low prevalence rates of 7.3%, 3.7%, 8.4 % and 9.5 % respectively.<sup>13-19</sup> Though, this study had lower prevalence rate than the 86.6% reported literature in Benin City, Nigeria and 78.7% reported by Amadi ES et al, the AUTI prevalence rate in this area of Nepal not said to be low.<sup>20,21</sup>

There is usually higher prevalence rate of UTI in developing countries than that of the developed countries as observed by Kolawole AS et al.<sup>22</sup> They also explained the reason for this could probably due to poor housing, ventilation, sanitation and drainage systems. Moreover, they also added that it could be pronounced due to lack of proper personal and environmental hygiene, population susceptibility and other factors like low socio-economic status and sexual intercourse among pregnant women. During gestation, there is more possibility of bacterial colonization in urethra by the bacteria originated from the gastro-intestinal and perineal flora.<sup>23</sup> The methods of contraception used before pregnancy, such as spermicides and diaphragms could predispose bacterial growth and colonization.<sup>24</sup> The other established fact that the urethra in females is shorter, wider and close to the anus contribute to the higher prevalence of the UTI in women and so in pregnancy in this study. Being in close proximity, the bacteria from the rectum can easily go up the urethra increasing the rate infections.<sup>22,25</sup> Moreover, the normal physiological (biochemical, hormonal and immunological) changes in pregnancy to reduce ureteric muscular tone in ureter and urethra, and increase in mechanical pressure from the gravid uterus, leading to urinary stasis, which act as good culture media, favouring the bacterial growth and multiplication in urine.<sup>14</sup>

Age group in pregnancies revealed a significant difference in the prevalence of asymptomatic bacteriuria ( $P < 0.05$ ). In this study, the highest percentage of infection (29.6%) found with 21-24 years age group pregnancies, followed by 25-29 years (27.7%), 30-34 years (16.1%) and 40-45 years (11.3%) age group respectively (Table 6). These findings are in coherence with the findings reported by Adeyeba OA et al, believing that the subjects with this age group (both men and women) are sexually more active which could favour the incidence of UTIs.<sup>26</sup> Further, the close anatomical relationship of the female urethra to the vagina makes it more prone to trauma during sexual intercourse resulting in increased chance of bacteria being pushed up the urethra into the bladder. The previous reports were also revealed the same age groups having the highest UTI in pregnancies.<sup>21,27</sup> In our study, asymptomatic UTI prevalence is also high in advanced maternal age ( $\geq 30$  years) group supported by the previous report.<sup>28</sup> The reason for this age group pregnant ladies could also be due to the multiparty and multigravida which is supposed to be as a risk factor for acquiring asymptomatic UTI.<sup>28,29</sup> Surprisingly, this study revealed no significant prevalence of asymptomatic UTI or bacteriuria in pregnancies with respect to parity and/or gravida.

In this study, the highest prevalence (45.33%) of asymptomatic bacteriuria was observed in the second trimester of pregnancy, followed by the first trimester (40.00%) which is in line with the reportings of Turpin CA et al, suggesting that the ladies with first and second trimesters of pregnancy reporting more frequently at the antenatal checkups.<sup>30</sup> A similar finding with high

prevalence in first trimesters was also reported by Dimetry SR et al.<sup>31</sup> It is, however, different to the observations by Okonko IO et al and Al-Haddad AM with high percentage of asymptomatic bacteriuria in the second and third trimesters.<sup>32,33</sup> It is important to highlight the significance of this finding in our study that urine culture in early pregnancy (12 to 16 weeks gestation) is the gold standard for screening of asymptomatic bacteriuria.<sup>34</sup> Undoubtedly, the urine culture in early antenatal check-up, generally the first trimester is the test of choice for screening bacteriuria/asymptomatic UTI.<sup>35</sup>

Bacterial isolates obtained by culture are dynamic and found to be varying from time to time and from one geographic to other within and across the countries. Isolated bacteria in this study are correlated with other reports.<sup>1,28,33</sup> In this study, *E. coli* (67.80 %), *K. pneumoniae* (21.60 %) and *Enterococcus faecalis* (8.50 %) were the most frequent bacteria isolated from the urine of pregnant ladies. The other bacteria isolated were *Klebsiella oxytoca*, *Acinetobacter*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Proteus vulgaris*, which were in line with previous reports highlighting the facts that UTI etiology is fast changing with the involvement of diverse species of bacteria. Our study revealed that the Gram-negative bacteria, especially *E. coli* is the most prevalent etiologic agent isolated, which is in line with various other reports in patients with UTI.<sup>2,13,25</sup>

Although the UTI aetiology are diverse showing the geographical variability of causative agents, the Gram negative bacteria, usually *Enterobacteriaceae* and specifically *E. coli* and *Enterobacter species* remains invariably predominant in most regions of the world.<sup>29,36</sup> It is clearly mentioned in various literatures that in 85% of UTI cases Gram-negative bacteria are the dominant etiologic agents and undoubtedly they are also the normal flora of the intestinal tract and rectum lying in very near to urethral orifice.<sup>14</sup>

This could be the reason for UTI, which again was favoured due to poor or unhygienic genital practices by pregnant women who may find it difficult to clean their anus properly after defecating or clean their genital after passing urine leading to infection by faecal contamination.<sup>14</sup> The increased levels of amino acids and lactose in pregnancy encouraged *E. coli* proliferation. This could be another reason for Gram negative bacteria being the dominant etiologic agent of UTI. In contrast to our study, Omonigho SE et al, found *K. pneumoniae* to be more dominant than *E. coli* in UTI, which could be due to host susceptibility differences to these pathogens brought by the biological and environmental factors encouraging biodiversity in host, pathogens, vectors and social factors such as social efforts in controlling disease.<sup>37</sup> Moderately high prevalence (21.60 %) of *K. pneumoniae* in our study indicated their gaining clinical prominence and importance as UTI pathogens. The other isolates included *Klebsiella spp.*, *Enterococcus faecalis* (8.50%),

*Acinetobacter*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Proteus vulgaris* in decreasing order of prevalence. Therefore, our findings confirmed that coliforms were most frequently isolated, which is an index organism of safety, good hygiene and sanitary quality. This supports the fact that commensals of the intestine are more involved in the UTIs because of the anatomy proximity to the genito-urinary area and poor hygiene.

Although, Gram-positive organisms are isolated in small numbers during pregnancy they are recognized as important causes of urinary tract infection. Recently, they have gained more attention by clinicians as etiologic agent of UTI. *Enterococcus faecalis*, a pseudocatalase positive and gram positive bacteria was isolated as third most common urine isolate (8.50%) of pregnant women in this study. Like other *Enterococcus*, *E. faecalis* is an endocommensal bacterium of gastrointestinal tract, but it can cause several life threatening infections other than UTI like endocarditis, bacteremia and other infections in human.<sup>31</sup> The diverse pattern of antimicrobial sensitivity and resistance among different communities and hospitals is due to indiscriminate use of antibiotics causing resistant strains.

In this study, Amikacin, Meropenem, Gentamycin and Nitrofurantoin were found to be highly effective drugs against most of isolates from urine of pregnancies. Piperacillin-tazobactam, ceftriaxone, levofloxacin and ceftazidime revealed moderately effective against those isolates. Ciprofloxacin, ampicillin-sulbactam, vancomycin, cotrimoxazole and terofloxacin were found to be resistant to the urinary isolates. However, the most effective drug against gram-positive bacteria was found to be for Vancomycin. These findings are in line with the findings by Lindsay E et al and Imade PE et al in terms of Gentamycin, Nitrofurantoin and Piperacillin-Tazobactam.<sup>34,38</sup> The increase in antibiotic resistant pattern could be due to antibiotic abuse due to lack of knowledge to health practitioner and consumer. Also, the low cost and availability of antibiotics without prescriptions in this area could be another contributing factor for antibiotic abuse, and thus the resistance.

In contrast to this study, Enayat KI et al reported high sensitivity to ciprofloxacin and very low susceptibility to tetracycline, ampicillin, gentamicin and amikacin.<sup>39</sup> Amikacin showed 85% sensitivity among different aminoglycosides. Nitrofurantoin (68%) revealed increased sensitivity in comparison to ceftazidime (62%) and cefotaxime (62%). Ampicillin remained the least sensitive (11%) drug.

However, Gentamycin was found to be most effective against both the Gram-negative and Gram-positive bacteria. The observations with gram-negative bacteria have the highest sensitivity to Gentamycin after nitrofurantoin made by Kenechukwu et al.<sup>40</sup> are in line with our findings. Gentamycin is an aminoglycoside

antibiotic that works by inhibiting protein synthesis, thereby preventing bacteria survival and multiplication. The minimum resistance was exhibited by gram-positive bacteria to penicillin, while the greater resistance was found to be for gram-negative bacteria to amikacin.

## CONCLUSION

The high prevalence rate of asymptomatic UTI in pregnant women of this geographic is of novel concern to be discussed. This is not only do it poses a threat to maternal and child health, but can impose a great socio-economic, mental and family burden. Therefore, the government and health personnel should meticulously handle to control this situation and need to take immediate action plans including counselling and public awareness of UTIs, and to expand the special care unit for prevention and treatment for pregnant women. It is necessary that the routine screening and proper laboratory diagnosis of patients with appropriate antimicrobials agents should be administered after sensitivity tests have been carried out irrespective of the types of UTI, whether asymptomatic or symptomatic.

The screening for bacteriuria in pregnancy and suitable treatment must be considered as unavoidable part of antenatal care in this region. Even the negative tests for pyuria do not confirm that the pregnant women are free of asymptomatic UTI. Thus, all pregnant ladies visited for antenatal checkups should be advised for the culture and sensitivity test of their urine specimens, irrespective of leukocyte count and result of pyuria. Though, identification of bacteria could be made at the level by serotyping, genotyping and biotyping for specific identification and administration of specific drugs, which are limitations of this study, the measure applied to this study will certainly help in detection of asymptomatic UTI which will go a long way in reducing maternal and child health complications associated with pregnancy.

## ACKNOWLEDGEMENTS

Authors would like to thank all the staffs of the Department of Microbiology and Department of Gynaecology and Obstetrics of Chitwan Medical College for their untiring effort and support. The participants could not be left without thanking them for their time and contributions. No any external fund was utilized for this study.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Uncu Y, Uncu G, Esmer A, Bilgel N. Should asymptomatic bacteriuria be screened in pregnancy? *Clin Exp Obstet Gynecol.* 2002;29:281-5.

2. Delzell JE, Lefevre ML. Urinary tract infections during pregnancy. *Am Fam Physician.* 2000;61(3):713-21.
3. Scoth JR, Whitehead ED, Naghes HM. *Dan forty obsetries and Gyneacology.* 6<sup>th</sup> edition, MC Graw Hill Boston, 1990:60-80.
4. Lucas MJ, Cunningham FG. Urinary tract infection in pregnancy. *Clinical obstet Gyeacol.* 1993;36:555-68.
5. Rubenstein JN, Schaeffer AJ. Managing complicated urinary tract infections: The urologic view. *Infect Dis Clin North Am.* 2003;17:333-51.
6. Hamdan Z, Haliem HA, Ziad M, Ali SK, Adam I. Epidemiology of urinary tract infections and antibiotic sensitivity among pregnant women at Khartoum North Hospital. *Ann Clin Microbiol Antimicrob.* 2011;10:2.
7. Tayo AO, OIAkinola, TA Ottun, JAA Onakoya, AO Ogunsanya. Apparaial of asymptomatic bacteriuria in pregnancy. *Nig J Clin Med.* 2010;3:2.
8. Romero R, Espinoza J, Chaiwornponysa T, Kalache K. Infection and prematurily and the role of preventive strategies. *Semin Neonatol.* 2002;7(4):259-74.
9. Liaw LC, Nayar DM, Pedler SJ. Home collection of urine for culture from infants by three methods: survey of BMJ. 2000;320(7245):1312-3.
10. Guidelines for the Safe Transport of Infectious Substances and Diagnostic Specimens. Available at [www.who.int/csr/emc97\\_3.pdf](http://www.who.int/csr/emc97_3.pdf).
11. Henry D. Isenberg. *Clinical Microbiology Procedures Handbook* 2<sup>nd</sup> Ed. Vol. 2. Washington D.C.: ASM press;2004.
12. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing, 17th informational supplement. Wayne, PA: CLSI. 2007;M100-S17.
13. Onifade AK, Omoya FO, Adegunloye DV. Incidence and control of urinary tract infections among pregnant women attending antennal clinics in government hospitals in Ondo State, Nigeria. *J. Food, Agric. Environ.* 2005;3(1):37-8.
14. Obiogbolu CH, Okonko IO, Anyamere CO, Adedeji AO, Akanbi AO, Ogun AA, et al. Incidence of urinary tract infections (UTIs) among pregnant women in Akwa metropolis, South eastern Nigeria. *Sci Res Essay.* 2009;4:820-4.
15. Okonko IO, Ijandipe, LA, Ilusanya, AO, Donbraye-Emmanuel OB, Ejembi J, Udeze AO, et al. Detection of urinary tract infection among pregnant women in Oluyoro Catholic Hospital Ibadan south western. *Malaysian J Microbiol.* 2010;6(1):16-24.
16. Mobasheri E, Tabbaraei A, Ghaemi E, Mojerloo M, Vakili M, Dastforooshan M. Distribution of asymptomatic bacteriuria in pregnant women referring to Dezyani Hospital in Gorgan. *J Gor Univer Med Sci.* 2002;4:42-6.
17. Hernandez BF, Lopez Carmona JM, Rodriguez Moctezuma JR, PeraltaPedrero ML, Rodriguez Gutierrez RS, Ortiz Aguirre AR. Asymptomatic bacteriuria frequency in pregnant women and uro pathogen in vitro antimicrobial sensitivity. *Ginecol Obstet Mex.* 2007;75: 325-31.
18. Tadesse A, Negash M, Ketema LS. Asymptomatic bacteriuria inpregnancy: assessment of prevalence, microbial agents and their antimicrobial sensitivity pattern in Gondar Teaching Hospital, North West Ethiopia. *Ethiop Med J.* 2007;45:143-9.
19. Obirikorang O, Quaye L, Bio FY, Amidu N, Acheampong I, Addo K. Asymptomatic bacteriuria among pregnant women attending antenatal clinic at the University Hospital, Kumasi, Ghana. *J Med Biomed Sci.* 2012;1(1):38-44.
20. Akerele P, Okonofua JA. Prevalence of asymptomatic bacteriuria among pregnant women in Benin City, Nigeria. *J Obstet Gynaecol.* 2001;21(2):141-4.
21. Amadi ES, Enemu OB, Uneke CJ, Nwosu OK, Onyeagba RA, Ugbogu OC. Asymptomatic bacteriuria among pregnant women in Abakaliki, Ebonyi State, Nigeria. *J Med Sci.* 2007;7(4):698-700.
22. Kolawole AS, Kolawole OM, Kandaki-Olukemi YT, Babatunde SK, Durowade KA, Kolawole CF. Prevalence of urinary tract infections (UTI) among patients attending Dalhatu Araf Specialist Hospital, Lafia, Nasarawa State, Nigeria. *Int J Medic Med. Sci.* 2009;1(5):163-7.
23. Naveen R, Mathai E. Some virulence characteristics of uropathogenic Escherichia coli in different patient groups. *Ind J Med Res.* 2005;122:143-7.
24. Foxman B, Brown P. Epidemiology of urinary tract infections:transmission and risk factors, incidence, and costs. *Infect Dis Clin North Am.* 2003;17:227-41.
25. Ebie MY, Kandakai-Olukemi YT, Ayanbadejo J, Tanyigna KB. Urinary Tract Infections in a Nigerian Military Hospital. *Nigerian. J Microbiol.* 2001;5(1): 31-7.
26. Adeyeba OA, Adekoya JA, Lowed AO, Adesiji YO. Urinary Tract Infections amongst Patients attending Sexually Transmitted Disease Clinic in Ibadan, Nigeria. *J Sci Eng.* 2002;9(4):4552-60.
27. Akinleye OM, Olaniyan JAT, Folorunso JB, Ipaye TO, AbdulraheemLD, Ayodele FA. Asymptomatic Bacteriuria among antenatal Women Attending private Hospital in Lagos, Nigeria. *Sch. J App Med Sci.* 2014;2(6D):3076-80.
28. Akinloye O, Ogbolu DO, Akinloye OM, Terry Alli OA. Asymptomatic bacteriuria of pregnancy in Ibadan, Nigeria: a re-assessment. *Br J Biomed Sci.* 2006;63:109-12.
29. Fatima N, Ishrat S. Frequency and risk factors of asymptomatic bacteriuria during pregnancy. *J Coll Physicians Surg Pak.* 2006;16:273-5.
30. Turpin CA, Minkah B, Danso KA, Frimpong EH. Asymptomatic bacteriuria in pregnant women attending antenatal clinic at Komfo Anokye Teaching Hospital, Kumasi, Ghana. *Ghana Med J.* 2007;41(1):26-9.

31. Dimetry SR, El-Tokhy HM, Abdo NM, Ebrahim M. A, Eissa M. Urinary Tract Infection and Adverse Outcome of Pregnancy. J Egypt Public Health Assoc. 2007;82:3-4.
32. Okonko IO, Ijandipe LA, Ilusanya AO, Donbraye-Emmanuel OB, Ejembi J, et al. Detection of urinary tract infection among pregnant women in Oluyoro Catholic Hospital Ibadan south western. Malaysian J Microbiol. 2010;6(1):16-24.
33. Al-Haddad AM. Urinary tract infection among pregnant women in Al-Mukalla district, Yemen. East Mediterranean Heal J. 2005;11(3): 505-10.
34. Nicolle LE, Bradley S, Colgan R, Rice JC, Schaeffer A, Hooton TM. Infectious Diseases Society of America guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults. Clin Infect Dis. 2005;40:643-54.
35. Connolly A, Thorp JM. Urinary Tract Infection in pregnancy. UrolClinNorth Am. 1999;26(4):779-87.
36. Teppa RJ, Roberts JM. The urine screen test to detect significant asymptomatic bacteriuria during pregnancy. J Soc Gynecol Investig. 2005;12:50-3.
37. Omonigho SE, Obasi EE, Akukalia RN. In vitro Resistance of Urinary Isolates of *Escherichia coli* and *Klebsiella species* to Nalidixic Acid. Niger J Microbiol. 20011;5(1):25-29.
38. Imade PE, Izekor PE, Eghafona NO, Enabulele OI, Ophori E. Asymptomatic bacteriuria among pregnant women. North Am J Med Sci. 2010;2(6):263-6.
39. Enayat K, Fariba F, Bahram N. Asymptomatic bacteriuria among pregnant women referred to outpatient clinics in Sanandaj, Iran. Int Braz J Urol. 2008;34(6):699-707.
40. Ogbukagu CM, Anakwenze VN, Ekwealor CC, Ezemba CC, Ekwealor IA. Incidence of Urinary Tract Infections (UTI) amongst Patients Attending Primary Health Centres in Anambra State. Advance Microbiol. 2016;6:537-47.

**Cite this article as:** Yadav LK, Yadav RL. Asymptomatic UTI in pregnancy attending at tertiary care of Nepal. Int J Res Med Sci 2018;6:1119-28.