

# Maternal and Perinatal Outcome of Urinary Tract Infection in Pregnancy at Dhulikhel Hospital, Kathmandu University Hospital

Kayastha B,<sup>1</sup>Tamrakar SR<sup>2</sup>

<sup>1</sup>Department of Obstetrics and Gynecology,  
College of Medical Sciences,  
Bharatpur, Chitwan, Nepal.

<sup>2</sup>Department of Obstetrics and Gynecology,  
Dhulikhel Hospital, Kathmandu University Hospital,  
Dhulikhel, Kavre, Nepal.

## Corresponding Author

Bhagirathi Kayastha,  
Department of Obstetrics and Gynecology,  
College of Medical Sciences,  
Bharatpur, Chitwan, Nepal.  
E-mail: kayakayastha@gmail.com

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## ABSTRACT

### Background

Urinary tract infection (UTI) is common in pregnancy and poses a great challenge because it has several adverse outcomes in both the mother and her unborn foetus.

### Objective

This study aims to determine the incidence of culture positive urinary tract infection, culture and sensitivity of the common causative organisms and find out the maternal and perinatal outcomes in culture positive urinary tract infection.

### Method

This prospective study was carried out in the Department of Obstetrics and Gynaecology at Dhulikhel Hospital over a period of one year. Urine routine and microscopy was done as a preliminary screening test for urinary tract infection and those with abnormal results were subjected to urine culture and sensitivity and ultrasonological evaluation.

### Result

A total of 162 pregnant women were included in the study. Incidence of culture positive urinary tract infection was 25.9%, highest in age group 15-20 years (47.8%), more in primigravida (30.1%) and common at second trimester (40.4%). *Escherichia coli* (90.4%) was the commonest organism isolated and ceftriaxone was the most sensitive antibiotic. Patients with culture positive urinary tract infection had higher incidence of anaemia, preterm labour, need of surgical intervention. Such patients also had increased chances of preterm delivery, low birth weight babies and newborn intensive care unit (NICU) admission.

### Conclusion

We conclude that urinary tract infection in pregnancy leads to adverse maternal and fetal outcomes. And we recommend urine culture and sensitivity at each trimester so that urinary tract infection can be diagnosed and treated on time.

## KEY WORDS

*Adverse maternal and perinatal outcomes, Culture positive urinary tract infection, Urine culture and sensitivity*

## INTRODUCTION

Urinary tract infection (UTI) is the most frequently seen 'medical' complications in pregnancy with global prevalence ranging from 3 to 35% across five continents.<sup>1</sup> The hospital based prevalence showed 9.8% in India, 12.7% in Saudi Arabia, 56.5% in Ghana and 37.84% in Nepal.<sup>2-4</sup>

UTI is a term applied to a variety of clinical conditions, ranging from asymptomatic presence of bacteria in the urine to severe infection of the kidney with resultant sepsis.<sup>5</sup> In most studies, UTI is defined as "microscopic findings of more than ten pus cells per high power field (40x) in urine."<sup>6,7</sup> Positive urine culture is defined as significant growth of microbial organism(s). Negative urine cultures include those with no growth, with an insignificant quantity of growth or those with mixed growth due to probable contaminants.<sup>8</sup>

Symptomatic UTI is defined as a positive urine culture with fever (> 38°C) who has at least one urinary symptom (dysuria, urgency, frequency, or suprapubic pain or tenderness). And a patient is said to have asymptomatic bacteriuria if there are no signs or symptoms referable to the urinary tract.<sup>8</sup>

The combination of mechanical, hormonal and physiological changes during pregnancy in the urinary tract has a profound impact on the acquisition and natural history of bacteriuria during pregnancy.<sup>9</sup> The physiological increase in plasma volume during pregnancy decreases urine concentration and up to 70% pregnant women develop glycosuria which encourages bacterial growth in the urine.<sup>10,11</sup>

There is strong evidence that UTI causes adverse maternal and fetal outcomes like intrauterine growth restriction (IUGR), preterm delivery, cesarean section and pre-eclampsia.<sup>12</sup> Untreated UTI may lead to pyelonephritis, chronic renal insufficiency and still birth.<sup>13</sup> Additionally, the antibiotic chosen should have a good maternal and fetal safety profile.<sup>14</sup>

Our study has aimed to understand the incidence of UTI, the most common organisms, the sensitive antibiotics, ultrasound findings; and the maternal and fetal outcomes associated with UTI.

## METHODS

This was a prospective longitudinal study conducted in the Department of Obstetrics and Gynecology at Dhulikhel Hospital, Kathmandu University Hospital (DH, KUH) from June 2018 to May 2019. Ethical approval was obtained from the Institutional Review Committee (IRC) of KUSMS. Convenient sampling method was used for data collection.

The sample size was calculated using the following formula (Cochran formula)

$$\begin{aligned} \text{Sample size (N)} &= (Z)^2 \times P(1-P) / M^2 \\ &= (1.96)^2 \times 0.12(1-0.12) / (0.05)^2 \\ &= 162 \end{aligned}$$

Where, Z= degree of confidence level at 95%= 1.96

P = Prevalence of the disease (12%), based on data obtained from one year of UTI at Dhulikhel Hospital, Kathmandu University Hospital

M = Margin of error i.e. 5%

Semi structured questionnaire was designed in order to collect the necessary information.

All women of age 16 to 35 years with singleton live intrauterine gestation from six weeks to post term attending our Antenatal outpatient department with UTI but no history of hypertension, diabetes, renal disorder were considered for the study and they were subjected to urine culture and sensitivity.

One hundred and sixty-two such women who met the inclusion criteria were included. After proper counseling, informed consent was taken from each patient. The history, physical examination, and relevant laboratory investigations were done. The blood investigations included complete blood count, serum urea and creatinine. Routine and microscopic examination of urine was done during first antenatal checkup and was repeated in second and third trimesters.

The patient having positive urine culture report was treated with appropriate antibiotics. All the patients who had culture positive and culture negative UTI were followed up throughout the pregnancy till delivery.

Maternal outcomes were measured in terms of anemia, preterm delivery, pyelonephritis, need for surgical intervention and intensive care unit (ICU) admission. Perinatal outcomes were measured in terms of preterm birth, IUGR, low birth weight (LBW) and neonatal intensive care unit (NICU) admission.

The information was collected in predesigned proforma and then entered in Microsoft Excel 2013. The data were analyzed using Statistical Package for Social Science (SPSS), version 16. The Chi-square test, Fisher exact test and Likelihood ratio have been used to find out the significance of the study parameters. The p-value <0.05 was considered significant.

**RESULTS**

Out of 162 pregnant women, incidence of culture positive UTI was found to be 42 (25.9%).

**Table 1. Incidence of asymptomatic bacteriuria and symptomatic UTI during pregnancy**

UTI	Number
Asymptomatic	25
Symptomatic	17
Total number of pregnant with UTI	42

Among 42 patients with culture positive UTI, 60% had asymptomatic bacteriuria.

**Table 2. Association of culture positive UTI with age and parity**

Age range (years)	Number of patients	Age				p-value
		Culture positive		Culture negative		
		N	%	N	%	
15-20	23	11	47.82	12	52.17	
21-29	128	28	21.87	100	78.12	0.045
≥ 30	11	3	27.27	8	72.72	

Parity	Number of patients	Parity				p-value
		Culture positive		Culture negative		
		%	N	%	N	
G1	106	32	30.18	74	69.81	
G2	38	7	18.42	31	81.57	0.22
G3	18	3	16.66	15	83.33	

Culture positive UTI was higher among the patients aged 15-20 years (47.82%) than that in other age groups which was statistically significant (p=0.045).

**Table 3. Presence of culture positive UTI according to trimester**

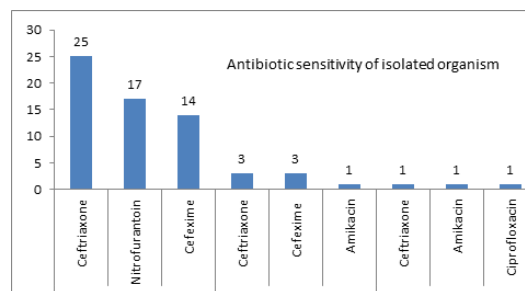
	Trimester					
	First		Second		Third	
	N	%	N	%	N	%
Total culture positive	11	26.1	17	40.4	14	33.3
Total cases	34	21	52	32.0	76	47

More than two third of the culture positive UTI cases (40.4%) were detected during second trimester.

**Table 4. Microorganisms isolated in culture positive UTI**

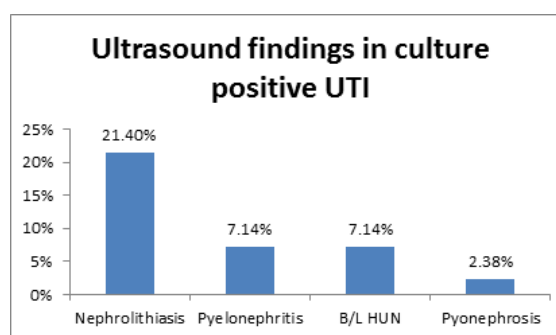
Organisms	Number	Percentage
Escherichia coli	38	90.47
Klebsiella Oxytoca	3	7.14
Enterobacter	1	2.38
Total	42	100

Escherichia coli was isolated in almost all cases (90.47%) of culture positive patients.



**Figure 1. Antibiotic sensitive to cultured organisms**

Ceftriaxone was the most sensitive antibiotics for E.coli, Klebsiella and Enterobacter spp.



**Figure 2. Shows Ultrasound findings in culture positive UTI (B/L HUN: Bilateral Hydroureteronephrosis).**

Nephrolithiasis (21.4%) was the commonest finding in culture positive UTI.

**Table 5. Association of maternal outcomes with culture positive UTI**

Maternal outcomes	Number of patients	UTI				P-value	
		Culture positive		Culture negative			
		N	%	N	%		
Anemia	Yes	42	11	26.2	31	73.8	0.00
	No	120	06	5	114	95	
Preterm labor	Yes	42	06	14.2	36	85.8	0.01
	No	120	03	2.5	117	97.5	
Surgical intervention	Yes	42	05	11.9	37	88.0	0.01
	No	120	02	1.7	118	98.3	
Complicated UTI	Yes	42	04	9.5	38	90.5	0.04
	No	120	01	0.9	119	99.1	

There were highest numbers of preterm labor, anemia, need for surgical intervention and complicated UTI in culture positive UTI patients. Surgical interventions like double “J” stenting and nephrostomy tube insertion were performed. Similarly, complicated UTI included

pyelonephritis and pyonephrosis. The association between maternal outcomes and UTI was statistically significant.

**Table 6. Association of fetal outcome and culture positive UTI**

Fetal outcome		Number of patients	UTI				P-value
			Culture positive		Culture negative		
			N	%	N	%	
Preterm	Yes	42	6	14.2	36	85.8	0.01
	No	120	3	2.5	117	97.5	
LBW	Yes	42	6	14.2	36	85.5	0.01
	No	120	3	2.5	117	97.5	
IUGR	Yes	42	4	9.5	38	90.5	0.07
	No	120	3	2.5	117	97.5	
NICU	Yes	42	5	11.9	37	88.1	0.01
	No	120	2	1.7	118	98.3	

Culture positive UTI was higher among the patients with preterm delivery and LBW; and those whose babies shifted to NICU. The association was statistically significant but the association between culture positive UTI with IUGR was not statistically significant.

## DISCUSSION

The prevalence of culture positive UTI in pregnant women in this study was 25.9%, symptomatic being 10.5% and asymptomatic 15.5%. The prevalence was higher than study findings of Marahatta et al. (9.8%) and Mahor et al. (12.2%).<sup>15,16</sup> The prevalence was further lower in certain developed countries like Mazor-Dray et al. from France (2.3%) and Siemefo Kamgang et al. from South Africa (5%).<sup>17,18</sup> These differences might be due to differences in socio-economic status and standards of hygiene in which the women live. Additionally, this could be due to a different research methodology adopted by different researchers.

Many studies also have found the prevalence of culture positive UTI in pregnant women to be higher than in our study. In a study by Parajuli et al. and Thakur et al. found that 44.6% of culture positive UTI among pregnant women in 520 clinically suspected cases and 37.4% respectively.<sup>4,19</sup>

The prevalence of asymptomatic bacteriuria during pregnancy done by Yadav et al. (42%).<sup>20</sup> And Yadav et al. (51.83%) at tertiary level hospital in Nepal were found to be higher than in our study.<sup>7</sup>

In a study by Sescon et al. found that age has no detectable influence on the frequency of bacteriuria.<sup>21</sup> However, in this

study nearly half of the patients (47.8%) were between age group of 15-20 years. This is probably because of teen-age pregnancy, lack awareness regarding the personal hygiene and increased sexually activity.

In our study, UTI was found more common in primigravida (30.18%). Michael et al. also found it to be more common in primigravida.<sup>2</sup> In a study conducted by Lavanya et al. showed the higher incidence among primigravida (66.0%) which was more than twice than that of our findings.<sup>22</sup>

Many studies found that the incidence of UTI was highest in the second trimester.<sup>2,23</sup> In our study also, UTI was common during second trimester (40.4%) followed by third trimester (33.3%) then first trimester. This difference might be as a result of either change in urinary stasis and vesicoureteral reflux or decrease in urinary progesterone and estrogens in different trimester.<sup>24</sup>

The most common organism isolated in our study was *E. coli*. Out of 42 positive culture, *E. coli* was isolated in 38 (90.4%) ladies. Other organisms isolated were *Klebsiella oxytoca* (7.1%) and *Enterobacter* (2.3%). This finding is similar to other study findings where *E. coli* are most frequently isolated organism.<sup>2,19</sup> One of Nepalese study also showed the predominant organisms being *E. coli* in pregnant ladies.<sup>25</sup>

In this study, ceftriaxone and nitrofurantoin showed the greatest effectiveness against *E. coli* isolates. Similar results were observed in study by Johnson et al.<sup>26</sup> Similarly, the study done by Ali et al. from Saudi Arabia also found ceftriaxone as the most sensitive antibiotic for *E. coli*.<sup>27</sup> Ceftriaxone and cefixime were sensitive against *Klebsiella* whereas ceftriaxone and amikacin were sensitive against *Enterobacter*.

We did ultrasonological evaluation in pregnant women with culture positive UTI. We found nephrolithiasis in nine pregnant women (21.4%) and three cases each of pyelonephritis (7.1%) and bilateral moderate hydronephrosis (7.1%). In a study by Sharma et al. also found similar findings with five ladies with nephrolithiasis and nine had hydronephrosis.<sup>25</sup> Dawkins et al. from Jamaica revealed ten cases of hydronephrosis and four cases of ureteric stones.<sup>28</sup>

In this study, the higher incidence of UTI was associated with anemia, preterm labor, surgical intervention and complicated UTI. The association between maternal outcomes and UTI was statistically significant. In study by Esha et al. and Mahor et al. and the incidence of UTI was higher among pregnant women with anemia (21.6%) and preterm labor (8%) respectively.<sup>2,16</sup>

In our study, the incidence of UTI was higher among the pregnant women who had preterm birth, LBW and NICU admission, which was statistically significant. This study finding was similar to that of Bhutta et al.<sup>29</sup> However, we did not get any case of neonatal death. Urinary tract infection

leads to low birth weight through preterm delivery rather than growth restriction.

Short period of study time of one year and Sample size is small.

## CONCLUSION

Our study showed that one fourth of the pregnant ladies with UTI had positive urine culture, commonest organism being *E. coli* and the commonest sensitive antibiotic being ceftriaxone. Culture positive UTI was highest among early age and primi gravida and common in second trimester.

We conclude that UTI in pregnancy is associated with adverse maternal outcomes like preterm labour, anaemia, complicated UTI and need of surgical intervention; and adverse fetal outcomes like preterm delivery, low birth weight babies and need for NICU admission. We recommend urine culture and sensitivity at each trimester so that UTI can be diagnosed early and treated with appropriate antimicrobial therapy.

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