

# Prevalence of Bacteriuria in Pregnant Women Visiting Provincial Hospital, Janakpur, Nepal

Nagendra Prasad Yadav<sup>1,2\*</sup>, Rudra Narayan Thakur<sup>2</sup>, Rakesh Kumar Yadav<sup>3</sup>

<sup>1</sup>Department of Microbiology, Janaki Medical College, Tribhuvan University, Nepal

<sup>2</sup>Department of Microbiology, Model Multiple College, Tribhuvan University, Nepal

<sup>3</sup>Department of Pharmacology, Institute of Agriculture and Animal Science, Tribhuvan University, Nepal

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### \*Correspondence:

Nagendra Prasad Yadav  
Department of Microbiology,  
Janaki Medical College,  
Tribhuvan University, Nepal.

### E-mail:

nagendrayadav2073@gmail.com

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## ABSTRACT

**INTRODUCTION:** Considering the importance of urinary tract infection (UTI) in pregnant women which is responsible for several complications, its diagnosis and treatment are essential to maintain the health of mother and baby. The purpose of the present study was to evaluate the isolation and identification of *Escherichia coli* from the UTI suspected pregnant women visiting at provincial Hospital Janakpur. **MATERIALS AND METHODS:** A total of 200 mid-stream urine samples were collected from UTI suspected pregnant women of 18 to 45 years visiting antenatal OPD in Provincial Hospital Janakpur in between February 2021 to April 2021. The collected urine samples were processed in the microbiology department of the Model Multiple College, Janakpur. Standard Microbiological procedures were followed. **RESULTS:** The *Escherichia coli* were predominant identified as 17 (35.41%). Patients aged between 25-30 years were mostly infected 35 (72.9%). The majority of bacteria isolated were more sensitive to Cephalexin and nitrofurantoin. **CONCLUSIONS:** *Escherichia coli* is one of the most important pathogen for UTI in pregnant women. The majority of bacteria isolated in the present study were more sensitive to Cephalexin and nitrofurantoin.

**Keywords:** *Escherichia coli*, pregnancy, urinary tract infection.

## INTRODUCTION

Urinary tract infection (UTI) means the presence of bacteria undergoing multiplication in urine within the urinary drainage system. UTI is mainly caused by bacteria like *E. coli*, *Proteus*, *Klebsiella*, *Staphylococcus* etc. Among them most of the UTI is caused by the single bacteria *E. coli*. [1]. Asymptomatic UTI is more common. About 5% of adult women have symptomless bacteriuria that can only be detected by urine culture. About 50% women suffer from UTI, sometimes during their adult lives; however, most of these infections remain undiagnosed and undergo spontaneous remission [2]. Approximately 95% of infections are urinary reinfections, most commonly occurring in individuals, who are healthy, and few are the cause of serious illness [3].

Pregnancy causes anatomical and hormonal changes that favor development of UTI, which is the most frequently seen medical complication in pregnancy [4]. Bacteriuria in pregnancy with or without clinical symptoms is frequent and increases the risk of pyelonephritis i.e. 20-40% of women in preterm labor and low birth weight infants. Asymptomatic bacteriuria in pregnancy without treatment may be complicated by acute pyelonephritis, hypertension, pre-eclampsia in mother, premature birth, low birth weight, habitual abortion, development of some congenital diseases in baby and increased fetal mortality. There is an association between maternal UTI and fetal death, mental retardation or developmental delay was seen in the children [2,5].

UTIs are common complications in pregnancy and the standard definition is a colony count of  $>10^5$  of urine; however, counts as low as  $10^2$  may represent active infection in pregnancy [6-8]. UTI is the common disease among Nepalese population. *E. coli* is the most common organism causing both community as well as hospital acquired UTI. Considering the importance of UTI in pregnant women which is responsible for several complications, its diagnosis and treatment are

essential to maintain the health of mother and baby. In Nepal, most of health care centers do not carry out routine urine culture test for every pregnant woman during her antenatal checkups presumably due to poor health education, high cost and time duration of culture result usually 2-3 days [8]. Therefore, the study was focussed to study the prevalence of bacteriuria in pregnant women visiting Provincial hospital, Janakpur, Province-2.

## MATERIALS AND METHODS

### Study design and setting

This was a cross-sectional study carried out in pregnant women of age group 18-45 years with or without urinary tract infection symptoms visiting antenatal OPD of Provincial hospital, Janakpur from February 2021 to April 2021.

### Patient's selection and study procedures

Two hundred urine samples were collected from UTI suspected pregnant women of age group 18-45 years in different trimester of pregnancy visiting antenatal OPD of Provincial Hospital Janakpur with and without urinary tract infection symptoms. The samples were processed for isolation and identification of probable organisms causing urinary tract infection. The samples were processed in the microbiology laboratory of Model Multiple College Janakpur. The patients were instructed carefully for collection of urine specimens. Clean voided mid-stream urine was desired specimen protocol followed for this study. Samples were

collected to dry clean and sterile container and were examined freshly. In case of delayed analysis, the specimens were refrigerated. Urine sample was inoculated in Mac Conkey agar (MA) plate. An inoculating loop of standard dimension was used to take up approximately fixed ( $\pm 10\%$  error is accepted) and known volume (0.001ml inoculating loop with 3 mm inner diameter) of mixed uncentrifuged urine. Culture plates were observed after 24 hours. Samples showing  $10^5$  or more organisms/ml of uncentrifuged urine as significant and colony counts less than this were considered non-significant. The MA plate was observed for lactose fermenter and non lactose fermenter. Identification of significant isolates was done by IMVIC test [9].

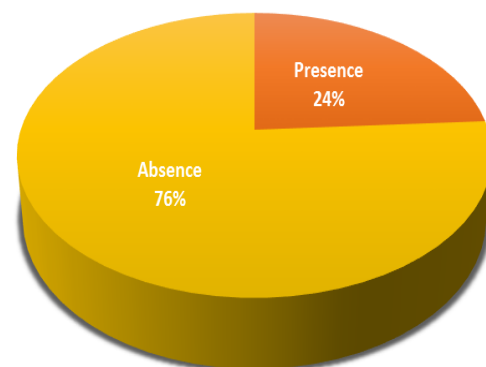
**Statistical considerations** Data were entered into Microsoft excel and the transferred to SPSS version 21 for analysis. Frequencies and percentages were used to present the data.

## RESULTS

A total of 200 urine samples included in the study, presence of bacteriuria was found among 48 (24%) of pregnant women (Figure-1).

Among the positive cases, higher percent of infection was found in the age group 25-30 years (72.9%) followed by 18-25 years (16.7%) and 30-40 years (10.4%) respectively (Table 1).

Fig-1: Prevalence of Bacteriuria in Pregnant Women



Out of the growth positive cases, 23 (47.9%) were symptomatic whereas 25 (52.1%) were asymptomatic cases. Among symptomatic patients, highest percentage of infection was found among pregnant women of 2<sup>nd</sup> trimester (60.8%) followed by 1<sup>st</sup> trimester (21.7%) and 3<sup>rd</sup> trimester (17.4%). Similarly, among the asymptomatic patients, higher percentage of infection was found among pregnant women of 2<sup>nd</sup> trimester (48.0%) followed by 1<sup>st</sup> trimester (28.0%) and 3<sup>rd</sup> trimester (24.0%) respectively, emphasizing that the number of infected patient was greater in 2<sup>nd</sup> trimester (Table 2).

Among the total growth positive isolates, the highest number of organisms was found to be *Escherichia coli* (35.4%) followed by COPS (Coagulase positive *Staphylococcus*) (22.9%), CONS (Coagulase negative *staphylococcus*) *Saprophyticus* (18.7%), Group D *Streptococci* (10.4%), *Enterobacter spp* (2.1%), *Klebsiella oxytoca* (2.1%), and *Proteus mirabilis* (8.3%) are as shown in Table 3.



**Fig 2: Media plate showing growth of *E. coli***

Table 4 reveals six antibiotics were used for the susceptibility testing. Highest percentage of sensitivity was found with Cephalexin (83.3%) followed by Nitrofurantoin (75.0%), Amoxicillin

| Age in years   | 18-25 | 25-30 | 30-40 |
|----------------|-------|-------|-------|
| Number         | 8     | 35    | 5     |
| Percentage (%) | 16.7  | 72.9  | 10.4  |

| Cases        | 1 <sup>st</sup> trimester |      | 2 <sup>nd</sup> trimester |      | 3 <sup>rd</sup> trimester |      |
|--------------|---------------------------|------|---------------------------|------|---------------------------|------|
|              | N                         | %    | N                         | %    | N                         | %    |
| Symptomatic  | 5                         | 21.7 | 14                        | 60.8 | 4                         | 17.4 |
| Asymptomatic | 7                         | 28.0 | 12                        | 48.0 | 6                         | 24.0 |

| Organisms                     | Number | Percentage |
|-------------------------------|--------|------------|
| <i>E. coli</i>                | 17     | 35.4       |
| COPS                          | 11     | 22.9       |
| CONS ( <i>saprophyticus</i> ) | 9      | 18.7       |
| Group D <i>Streptococci</i>   | 5      | 10.4       |
| <i>Enterobacter aerogens</i>  | 1      | 2.1        |
| <i>Proteus mirabilis</i>      | 4      | 8.3        |
| <i>Klebsiella oxytoca</i>     | 1      | 2.1        |

| Antimicrobial agents | Sensitive | Zone Diameter (mm)<br>Intermediate | Resistant |
|----------------------|-----------|------------------------------------|-----------|
| Ampicillin           | 29 (60.4) | 2                                  | 17        |
| Amoxicillin          | 33 (68.8) | 4                                  | 11        |
| Nalidixic acid       | 17 (35.4) | 0                                  | 31        |
| Nitrofurantoin       | 36 (75.0) | 4                                  | 8         |
| Cephalexin           | 40 (83.3) | 4                                  | 14        |
| Cloxacillin          | 28 (58.3) | 1                                  | 19        |

(68.8%), Ampicillin (60.4%), Cloxacillin (58.3%), and Nalidixic acid (35.4%). Highest percentage of resistant pattern was found with Nalidixic acid (31; 64.6%) followed by Cloxacillin (19; 39.6%),

## DISCUSSION

Even though all age groups are affected by UTI, pregnant women and immuno-compromised individuals are more susceptible [10, 11]. Generally, women are at greater risk of UTI as compared to males because of anatomical position and short urethra [11, 12]. If UTI occurs among pregnant women; it can be with symptoms or without symptoms. Urinary tract infection without signs and symptoms is known as asymptomatic bacteriuria [13].

In this study, the highest percent of infection was found to be in the age group 25-30 years followed by 18-25 years and 30-40 years respectively. In another similar study carried out at Saint Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia among 290 pregnant women the mean age of the participants was  $27 \pm 4.5$  years [14]. This study reveals among the growth positive symptomatic patients, highest percent of infection was found to be among 2nd trimester (60.8%) followed by 1st trimester (21.7%) and 3rd trimester (17.4%).

Similarly, among the asymptomatic patients, higher percent of infection was found among patients of 2nd trimester 48.0% followed by 1st trimester 28.0% and 3rd trimester 24.0% respectively suggesting that the number of infected patient is greater in 2nd trimester. Overall prevalence of symptomatic urinary tract infection among pregnant women was found to be 47.9% while that of asymptomatic was 52.1%.

In line with the study, the highest number of UTI cases found during pregnancy was in between age 21-25 years (52.22%) during 3rd trimester of pregnancy (49.68%) with *E. coli* as principal organism to cause AUTI (35.48%) during pregnancy reported by Yadav and Prakash [8].

Ampicillin (17; 35.4%), Amoxycillin (11; 22.9%), Nitrofurantoin (8; 16.7%), and Cephalexin (14; 8.3%).

In contrast, the prevalence of asymptomatic bacteriuria (ASB) among pregnant women has also been reported by Wabe et al. was 16.9% [14]. Similarly, a study conducted in Bangladesh reported as 16.5% [15] and Adama, Ethiopia as 16.1% [16]. However, the prevalence of ASB reported from Iraq (42.9%) [17], Nigeria (37.1%) [18] Saudi Arabia (32.1%) [19], and Ethiopia (21.2%) [20] is almost in proximity to our results.

In addition, the finding of the current study is higher than the prevalence of UTI reported from Nigeria (11%) [21] and Bahir Dar, Ethiopia (11.5%) [22].

The disparity could be attributed to social habits and education levels of the study participants. The occurrence of more infected women in 2nd trimester might be due to the growing fetus putting pressure on the bladder and urinary tract.

The present study presents the highest number of organisms was found to be *Escherichia coli* (35.4%) followed by COPS (Coagulase positive *Staphylococcus*) (22.91%), CONS (Coagulase negative *staphylococcus Saprophyticus*) (18.75%), Group *Streptococci* (10.41%), *Enterobacter spp* (2.08%), *Klebsiella oxytoca* (2.08%), and *Proteus mirabilis* (8.33%). The predominant bacteria were *E. coli* 21 (43%) and *S. aureus* 10 (20.4%) followed by *S. saprophyticus* 7 (14.3%), *K. Pneumoniae* 3 (6.1%), *Enterobacter cloacae* 2 (4.1%), *Enterococcus faecalis* 2 (4.1%), *Klebsiella oxytoca* 1 (2.1%), and *Enterobacter aerogens* 1 (2.1%) in the study conducted by Wabe et al., [14]. This finding is comparable with the study conducted in Iraq (25.0%) [17] and Kenya (29.7%) [23]. The proportion of *S. saprophyticus* (14.3%) in the previous studies is comparable with report from Adigrat, Ethiopia (12.7%) and to our study [20].

In contrast, a high proportion of *S. saprophyticus* was reported from Bahir Dar, Ethiopia (48.2%) [22] and Nigeria (44.5%) [10]. The results of the previous studies are in parallel to our study. This could be due to virulence factors harbored by the bacteria to colonize the urinary epithelium and difficulty of maintaining personal hygiene during pregnancy.

The present study depicts the highest percentage of sensitivity was found with Cephalexin (83.3%) followed by Nitrofurantoin (75%), Amoxicillin (68.8%), Ampicillin (60.4%), Cloxacillin (58.3%), and Nalidixic acid (35.4%). The highest percentage of resistant pattern is found to be with Nalidixic acid (64.6%) followed by Cloxacillin (39.6%), Ampicillin (35.4%), Amoxicillin (22.9%), Nitrofurantoin (16.7%), and Cephalexin (8.3%). Majority of Gram-

negative bacteria isolated in the current study conducted by Wabe et al., were susceptible to nitrofurantoin (93.1%), gentamicin (85.2%), ceftriaxone (82.2%), cefuroxime (79.3%), meropenem (75.2%), and ciprofloxacin (75.2%) [14].

This finding is comparable with a study conducted in Dessie, Ethiopia, [24] Hawassa, Ethiopia, [11] and Bale, Ethiopia [25]. However, most Gram-negative bacteria were resistant to amoxicillin (79.3%), amoxicillin-clavulanic acid (37.9%). Similar type of results was also obtained in the study conducted by Yadav and Prakash [8].

The easy accessibility, indiscriminate and frequent use of antibiotics might cause the emergence of bacteria which are resistant to amoxicillin and amoxicillin-clavulanic acid.

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## CONCLUSIONS

The highest percent of infection was found to be in 2nd trimester of pregnancy. The prevalence of *E. coli* was found to be most predominant.

The majority of bacteria isolated were more sensitive to Cephalexin and nitrofurantoin.

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## ADDITIONAL INFORMATION AND DECLARATIONS

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### Competing interest:

The authors declare no competing interests.

### Author Contributions:

All authors contributed to all-analysis, interpretation of results, literature review, and revision of the manuscript, and all have read and agreed with the contents of the final manuscript.

### Data Availability:

Data will be available upon request to corresponding authors after valid reason.

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