



## Determination of Prevalence of Urinary Tract Infection Among the Pregnant Women with Lower Abdominal Pain

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### Abstract

The present study was aimed to determine the prevalence of urinary tract infection among the pregnant women with lower abdominal pain and its aetiological micro-organism. Cross sectional study was done at Mount meru hospital laboratory, Arusha, Tanzania. 225 pregnant women attending an antenatal clinic in Levulosi hospital (Arusha, Tanzania) were enrolled. To diagnose urinary tract infection in the enrolled participants, mid stream urine was collected and culture on Macconkey agar media and blood agar media. Urine analysis was done using dipstick test, urine microscopy and biochemical tests. The prevalence of urinary tract infection was found to be 31.6%. High incidence of infection was found in 33-40 years age group (41.6%). The incidence of infection was high in the third trimester of pregnancy compared to first and second trimester. The prevalence of infection is more in participants who had past history of infection. The bacterial pathogens isolated include *E.coli* (40.8%), *Staphylococcus* species (30.0%), *Klebsiella* species (14.1%), *Proteus* species (11.3%), *Citrobacter* species (1.4%) and *Enterobacter* species (1.4%). Diagnosis of urinary tract infection in pregnant women during all antenatal visits should be considered a vital care in the community. This helps to keep away from complications in pregnancy at an early stage.

### 1 Introduction

A variety of micro organisms can attack the urinary tract and is responsible for the pathogenesis of urinary tract infection<sup>1-4</sup>. These are the most common bacterial infections during pregnancy accounting to 10% of hospital visits by women<sup>5</sup>. Urinary tract infection and its associated complications are responsible for the death of nearly 150 million per year, worldwide. The disease can be developed in 40-50% of women<sup>6</sup>. Urinary tract infections are the second common complications in pregnant women after anemia. If urinary tract infection is not controlled, it can badly affect the health of fetus and pregnant women<sup>7,8</sup>. Urinary tract infection during pregnancy may be symptomatic or asymptomatic<sup>9,10</sup>. The involvement of lower and upper urinary tract can lead to asymptomatic bacteriuria and symptomatic bacteriuria, respectively. Asymptomatic bacteriuria is mostly responsible for the cause of

urinary tract infection in women during pregnancy. The symptomatic bacteriuria is characterized by acute Pyelonephritis<sup>11</sup>. The prevalence of symptomatic and asymptomatic urinary tract infection in pregnant women was observed as 17.9% and 13%, respectively. The asymptomatic infection may lead to various clinical manifestations in pregnant women and newborn<sup>10,12</sup> if not treated properly.

The factors that increase the risk of urinary tract infections in pregnant women include increased age, number of intercourses per week, number of childbirths, recessive sickle cell anemia, diabetes, immunodeficiency and urinary tract abnormalities<sup>13,14</sup>. Microorganisms responsible to cause urinary tract infections are: *Saprophyticus Staphylococcus*, *Escherichia coli*, *Proteus*, *Acinetobacter*, *Pseudomonas aeruginosa* and *Klebsiella pneumonia*<sup>11-15</sup>.

The probability of urinary tract infection initiated around the sixth week and reaches the maximum during 22-24 weeks of gestational age. The increased probability of infection in pregnant women is most likely due to increased bladder volume, its expansion and expanded ureter<sup>13,16</sup>.

Considering the importance of urinary tract infection in pregnant women, the present investigation was aimed to study the prevalence of urinary tract infection among pregnant women. The prevalence of urinary tract infection among pregnant women in Arusha (Northern part of Tanzania) is not known. Therefore, the study was carried out at Mount Meru hospital and Levulosi hospital, located at Arusha.

## 2 Materials and methods

### 2.1 Study Design

A Cross sectional study type of research design was used to access the prevalence of urinary tract infections in pregnant women. The study involved the collection of data from the subjects in the form of questionnaires. Data regarding demographic and reproductive characteristics were collected.

The participants were randomly selected among women attending antenatal clinics in Levulosi hospital (Arusha, Tanzania) with lower abdominal pain. The inclusion and exclusion criterion was applied. Clean catch urine specimens were collected from each of the 225 study participants. This was tested with urine dipsticks, microscopy. The samples are cultured for bacterial growth and subjected to isolation of bacterial species causing urinary tract infections by performing biochemical tests.

### 2.2 Study Area

The study was conducted at Mount Meru hospital laboratory. For culture technique, samples were collected from the clinic of maternal at Levulosi hospital. This maternity clinic was chosen since it is a referral hospital with many patients of varied socio-demographic & reproductive characteristics and large number of patient turn over making it easy to achieve the desired sample size. Dipstick tests, urine microscopy tests and culture & biochemical tests were done at the Mount Meru hospital laboratory.

### 2.3 Sample size

The sample size was determined by using formula<sup>17</sup>.

$$N = (Z^2 P (1-P))/E^2$$

Where,

N = minimum sample size required;

Z = Standard normal deviation set at 1.96 (corresponding to confidence level of 95%);

P = prevalence of urinary tract infections in pregnancy women which was estimated from previous studies=17.9%<sup>10</sup>;

E = maximum error allowed, assumed to be 5%

$$N = (1.96^2 \times 17.9(100 - 17.9))/5^2$$

$$N = 225$$

Therefore, the minimum sample size required was 225 and the same number of pregnant women was sampled for the study.

### 2.4 Study Population

All pregnant women having signs of urinary tract infections and abdominal pain during the period of the study were included. A total number of 225 of pregnancy women were considered.

### 2.5 Inclusion criteria and exclusion criteria

Pregnant women attending the antenatal clinic in Levulosi hospital with lower abdominal pain and willing to participate in the study by giving informed consent were included. No prior treatment in the preceding one week with antibiotics or any other medications that may affect the culture results and  $\geq 20$  weeks of gestation were included. Pregnant women who are already on antibiotics treatment for any other reason were excluded from the study.

### 2.6 Ethical consideration

Permission to conduct the study at regional Mount Meru hospital, Levulosi hospital was obtained from Regional Medical Officer, District Medical Officer, Doctor of city referring to city nursing and laboratory officer at Mount Meru hospital and Levulosi hospital. Pregnant women permission was obtained by their consent, 225 consent forms were filled. All the information obtained from the participants was treated confidentially.

### 2.7 Sampling procedure

Simple random sampling was used to choose women to include in study with strict application of the inclusion criteria. Eligible participants were approached and requested to give a voluntary consent to participate in the study. Upon consenting, a study number with a code was assigned for identification. Inclusion into the study was done consecutively until the required sample size of 225 women was achieved.

### 2.8 Social demographic profile

A prior prepared set of specific questions was administered to participants with regard to their socio demographic information (age, socio economic status, personal hygiene, education level of mother, pregnancy duration, postcoital washing and use of

contraceptives) and any other information of relevance to the study. This was done in Levolosi clinics labour ward.

**2.9 Urine sample collection**

Urine samples were collected with clear instructions for the participants. The participants are instructed to collect mid stream urine after vulval swabbing with clean water. The specimen was kept in a cool box packed with ice and delivered to the laboratory within one hour of collection.

**2.10 Urinary dipstick test, urine microscopic & culture technique and biochemical tests**

The clean catch midstream urine collected from the participants was subjected to a dipstick test, urine microscopy, culture and biochemical tests. The results were entered into the data base. The urine specimens were cultured on Macconkey media agar and blood agar media to determine the microorganisms involved. Any organism isolated with colony counts of greater than 100000/ml of urine was considered significant and indicative of a urinary tract infection. Bacterial identification was done by performing biochemical tests.

**3 Results**

225 pregnant women with lower urinary tract pain were recruited in this study. The majority of women were aged between 25-32yrs (60.4%), married (74.2%), with above standard seven level (68%) and employed (70.6%). Among 225 pregnant women, greater percentage of women was in 35-39 weeks of gestation (14.6%) with no previous urinary tract infection (83.1%) and kidney & bladder problems (94.2%). The results are shown in Table 1.

Among the 225 pregnant women, some of them were having the symptoms like discharge, pain during urination and itching at genital part. The results are summarized in Table 2. This sign indicated characteristics of positive urinary tract infection. When culture was done to the urine sample of those participants, most of them were positive for urinary tract infection.

In the present investigation, two hundred and twenty five (225) urine samples were collected from the participants and analyzed. Seventy one (71) samples showed significant bacterial growth, which amounted to a prevalence of 31.6%. The percentage of prevalence of urinary tract infection according to age, gestation week and marital status is presented in Table 3. From the results, it was found that the prevalence of urinary tract infection is more in the unmarried (48.2%), age group 33-40 years (41.6%) with gestational age 35-39 weeks (44.1%).

Among 225 pregnant women screened for urinary tract infection, 68 (30.2%) cases were dipstick positive and 40 (17.7%) cases were urine microscopic positive Table 4. Among a urine dipstick positive and urine microscopic positive, 71 (65.7%) were culture positive. Hence these predict that

screening of urinary tract infection by dipstick and urine microscopic tests valid to sensitivity test.

Bacterial identification was done using biochemical tests. The frequency of various pathogens isolated is shown in Table 5. Out of 225 urine samples, 154 urine bacterial samples had no growth and 71 urine samples were positive for urinary pathogens. Among the significant isolates, *E.coli* had the highest percentage of isolation (40.8%), while the lowest was *citrobacter* and *enterobacter* species (1.4 %).

**Table 1: Social demographic characteristics of interviewed pregnant women**

Characteristics variables	Population	Freq. (%)
<b>Age</b>		
17-24	48	21.3
25-32	136	60.4
33-40	36	16
41-48	27	12
<b>Marital status</b>		
Married	167	74.2
Unmarried	58	25.7
<b>Education level</b>		
Standard 7	72	32
Above standard 7	153	68
<b>Social economic status</b>		
Employed	159	70.6
Unemployed	66	29.4
<b>Previous urinary tract infection</b>		
YES	38	16.9
NO	187	83.1
<b>Chronic kidney &amp; bladder disease</b>		
YES	13	5.8
NO	212	94.2
<b>Gestational age in weeks</b>		
20-24	24	10.6
25-29	30	13.3
30-34	58	25.7
35-39	86	38.2
40-44	27	12.0

#### 4 Discussions

To establish the prevalence of urinary tract infection in pregnant women at Mount Meru Hospital (Arusha, Tanzania) and Levulosi Hospital (Arusha, Tanzania), a cross-sectional study was conducted. The results show that the prevalence of urinary tract infection (31.6%) is one fourth of 225 pregnant women presenting with lower abdominal pain had bacterial urinary tract infection. The prevalence of urinary tract infection reported in Addis Ababa<sup>18</sup>, Nairobi<sup>19</sup>, Sudan<sup>20</sup> and Dhaka<sup>21</sup> were 11.6%, 26.7%, 14.0%, 26.0%, respectively.

**Table 2: Genital urinary symptoms by considering level of education about the disease managements**

Symptom	Population	Frequency (%)
<b>Bleeding from birth canal</b>		
YES	2	0.9
NO	223	99.1
<b>Pain during urination</b>		
YES	36	16
NO	189	84
<b>Itching</b>		
YES	72	32
NO	153	68
<b>Discharge</b>		
YES	26	11.6
NO	199	88.4

From the results, it was observed that the prevalence of urinary tract infection in the current study is higher than the former reports. The variation in the prevalence of urinary tract infection in the current and earlier reports may be due to the differences in the environment, the standard of personal hygiene, social habits of the community and education.

The microbial profile included *E.coli*, *Staphylococcus* species, *Klebsiella* species, *Proteus* species, *Citrobacter* species and *Enterobacter* species. *E. coli* was the major pathogen with an overall isolation rate of 40.8%. Comparable findings have been reported by Vazquez & Villar<sup>22</sup> and Nabbugodi *et al.*<sup>19</sup> In the present study, there was no relationship between age and marital status with the urinary tract infection. This was the same as with studies by Mohamed in Tanzania<sup>23</sup>. In the present study, in the 3<sup>rd</sup> trimester the frequency of urinary tract infection was higher when compared to the 1<sup>st</sup> and 2<sup>nd</sup> trimester. This is in agreement with Leigh<sup>24</sup>, who reported the same. However, this report does not agree with Onuh *et al.*<sup>25</sup> According to Onuh *et al.* prevalence of urinary tract infection is higher in the 2<sup>nd</sup>

trimester when compared to the 1<sup>st</sup> and 3<sup>rd</sup>. This variation may be either due to change in vesicoureteral reflux and urinary stasis or may be due to decrease in urinary progesterones and oestrogens in the various trimester of pregnancy.

In this study, past history of urinary tract infection was the important risk factor. In our study, out of 225 pregnant women 38 (16.9%) women had past history of urinary tract infection. Symptoms of urinary tract infection like bleeding from birth canal (2 cases, 0.88%), pain during urination (36 cases, 16.4%), itching at a genital organ (72 cases, 32%) and discharge (26 cases, 11.6%) are seen in the pregnant women.

**Table 3: Prevalence of urinary tract infection in pregnant women**

Characteristic variable	Bacterial culture positive/Total	Prevalence (%)±SD
<b>Age groups</b>		
17-24	12/48	25.0±0.324
25-32	38/136	27.9±0.267
33-40	15/36	41.6±0.268
41-48	6/27	22.2±0.651
<b>Mean</b>		29.1
<b>Gestational age in weeks</b>		
20-24	6/24	25.0±0.268
25-29	5/30	16.6±0.621
30-34	18/58	31.0±0.581
35-39	38/86	44.1±0.695
40-44	4/27	14.8±0.514
<b>Mean</b>		26.3
<b>Marital status</b>		
Single	28/58	48.2±0.562
Married	43/167	25.7±0.427
<b>Mean</b>		36.95

All the samples from the pregnant women with the above symptoms showed positive for bacterial culture. In a study of Gulfareen *et al.*<sup>26</sup> prevalence of bacteriuria was 100% in women who previously had urinary tract infection. The study of Nabbugodi *et al.*<sup>19</sup> had shown that a previous episode of urinary tract infection was not a risk factor for urinary tract infection in pregnancy.

Results showed that the dipstick test, and the urine microscopy tests have high sensitivity and specificity in screening for urinary

tract infection. These are simple and inexpensive tests that can be used to predict urinary tract infection in centres where urine cultures are not available.

**Table 4: Relationship between dipstick positive, microscopy positive and culture positive**

Tests	Among culture positive ± SD	Among culture negative ± SD	Total
Dipstick positive	42±0.258	26±0.267	68
Urine microscopic positive	29±0.264	11±0.348	40
Total	71	37	108

There was high correlation between positive testing on dipstick and urine microscopy and culture positive specimens. Of all 71 women with culture positive urine, 68 were also positive on the dipstick.

**Table 5: Number and percentage of bacterial pathogens isolated from urine sample**

Bacterial species	Number of isolates ± SD	Percentage (%)
<i>E.coli</i>	29±0.560	40.8
Klebsiella species	10±0.621	14.1
<i>Proteus</i> species	8±0.391	11.3
<i>Enterobacter</i> species	1±0.426	1.4
<i>Citrobacter</i> species	1±0.483	1.4
<i>Staphylococcus</i> species	22±0.662	31.0
Total	71	100

**5 Conclusion**

This study showed the prevalence of urinary tract infection in pregnant women attending the antenatal clinic in Levolosi hospital, Arusha, Tanzania. One fourth of 225 pregnant women with lower abdominal pain had bacterial urinary tract infection. *E.coli* was the major isolated pathogen. Good correlation was found between urine microscopy, urine dipstick test and positive urine culture in urinary tract infection. Routine diagnosis of urinary tract infection in pregnant women is important to prevent adverse results for the mother and the fetus.

**6 Recommendations**

Community participation in providing health education to all women about the maternal clinics should be improved. Routine screening of all antenatal women with lower abdominal pain with urine dipstick test to determine the presence of urinary tract infection should be done before initiation of antibiotics. Regular microbial screening and sensitivity profiles have to be done with a broader microbial profile to include non bacterial aetiology like candida, mycoplasma, etc., and others. Dipstick testing of urine

and simple microscopy of centrifuged urine sediment is recommended as a screening test for antenatal women with lower abdominal pains suspected of urinary tract infection.

**7 Conflicts of interest**

The authors have no current conflict of interests

**8 Author's contribution**

All the authors have equally contributed in the work

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