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## Original Research Article

## Occurrence of urinary tract infection and asymptomatic bacteriuria during pregnancy and its association with maternal outcome

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## ABSTRACT

**Background:** The pregnancy increases the possibility of the case progressing from asymptomatic bacteriuria (ABU) to urinary tract infection (UTI) with symptoms, which may further lead to pyelonephritis and obstetric outcomes. The adverse outcome may result in premature delivery, low weight at birth, and increased foetal mortality. The present study was proposed to assess the occurrence of Symptomatic UTI and asymptomatic bacteriuria, the microorganisms causing UTI in pregnancy, to assess the socio-demographic characteristics involving the risk factors of UTI and the maternal outcome.

**Materials and Methods:** A total of 152 pregnant women with and without symptoms of urinary tract infection were included as a study subject from January 2011 to April 2011. Midstream urine samples were collected and processed following standard bacteriological tests.

**Results:** In the present study 85 (55.9%) cases were symptomatic UTI and 67 (44.1%) cases were having asymptomatic bacteriuria. *E.coli* was the predominant organism isolated in 61 (49.6%) cases followed by *Staphylococcus aureus* in 24 (19.5%) cases, *Klebsiella pneumonia* in 16 (13.0%) cases, CONS 12 (9.7%) cases and *Enterococcus faecalis* in 10 (8.1%) cases. The lower socio-economic status has contributed in 65 (42.8%) cases and the education status of the most of the cases was either high school (47.4%) or primary school (38.8%). Out of 118 cases of vaginal delivery, 101 (85.6%) cases had full term normal delivery, but among 17(14.4%) preterm delivery, 12 (10.2%) were having symptomatic UTI and 05 (4.2%) cases were having asymptomatic bacteriuria.

**Conclusion:** Our study findings showed that low socioeconomic status and education background were predominant factors associated with increased symptomatic UTI and ABU. There was no significant difference in the prevalence of UTI and ABU with respect to gestational age. It was concluded in the study that the prompt treatment of ABU early in pregnancy significantly reduces the chances of adverse pregnancy outcome. Thus, screening for ABU should ideally be done in the pre-conceptual period. It was also found in our study that higher incidence of UTI was found in third trimester. Hence all pregnant women should be checked for the presence of ABU in the 1st trimester, treated aggressively with suitable antibiotics and promptly followed up.

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## 1. Introduction

Incidence of urinary tract infection (UTI) is higher in women than men due to physiological changes. Around

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40% to 50% of women will suffer at least one clinical episode during their life time.<sup>1</sup> Majority of urinary symptoms were due to pregnancy related changes in the urinary system. The significant risk factors for UTI are past history of UTI, sexual activity, lower socioeconomic group and multiparity.<sup>2</sup> Approximately 90% pregnant women develop ureteral dilatation, which will persist until delivery and which may contribute to the increase urinary stasis and ureterovesicalreflex.<sup>3</sup>

Untreated urinary tract infections (UTIs) during pregnancy is associated with an increased risk of multiple maternal and neonatal complications, such as preeclampsia, preterm birth, intrauterine growth restriction and low birth weight.<sup>4</sup> Bacteriuric pregnant women also have increased susceptibility to other pregnancy related complications compared to pregnant women without bacteriuria.<sup>5</sup>

During pregnancy, asymptomatic bacteriuria (ASB) increases the possibility of the case progressing to UTI with symptoms, which may further lead to pyelonephritis and obstetric outcomes that are adverse in nature and may result in premature delivery, low weight at birth, and increased foetal mortality.<sup>6</sup> In addition, pre-eclamptic toxemia, anaemia, intrauterine growth retardation, preterm labour, preterm premature rupture of the membrane, and post-partum endometritis.<sup>7</sup> Furthermore, identifying the uropathogens in the obstetric populations is important in order to optimize the antibiotic regimens used for the empiric treatment.

The present study was proposed to know the occurrence of Symptomatic UTI and asymptomatic bacteriuria, the microorganisms causing UTI in pregnancy, to assess the socio-demographic characteristics involving the risk factors of UTI and the maternal outcome.

## 2. Materials and Methods

The prospective study was conducted on patients who were attending out-patient and in-patient department of OBG at Navodaya Medical College Hospital Research Centre, Raichur, Karnataka after obtaining ethical clearance from institutional ethical committee.

Participants: Women who satisfied the inclusion and exclusion criteria, and who gave consent for the study were considered

### 2.1. Inclusion criteria

1. Pregnant women in all trimesters in the age between 19-30 yrs attending antenatal OPD and IPD of NMCH&RC, Raichur,
2. Primigravida and multigravida are included

### 2.2. Exclusion criteria

1. Women with known underlying renal pathology and chronic renal disease.

2. Women with diabetes mellitus, hypertension and on immunosuppressive therapy and HIV infection.

### 2.3. Sample size

Totally 152 patients have been included in the study both out-patient and in-patient basis.

Sample collection: The women were asked to wash the vulva in sterile water, and collect the mid-stream clean catch urine in a wide mouthed sterile container, taking care not to touch the edges of the container.

The urine samples were immediately sent to the microbiology laboratory.

### 2.4. Laboratory methods

Un-centrifuged fresh (i.e., < 2 hours) urine was used to perform routine analysis & Culture/sensitivity:

1. Urine routine, which included pH, specific gravity, albumin, sugar, pus cells, epithelial cells, RBCs, casts and presence of motile organisms.
2. Culture and antibiotic sensitivity patterns:

Clean-catch midstream urine samples were collected in sterile disposable container (Uricol, Hi-Media Laboratories Ltd., Mumbai, India) and processed within one hour. Semi quantitative loop (Hi-Media Laboratories Ltd., Mumbai, India) measuring 2.2 mm diameter with a holding capacity of 0.005 ml was employed to culture urine on CLED agar and MacConkey's agar. The inoculated plates were incubated over night at 37°C. Isolates in significant number (colony count  $\geq 10^5$  CFU/ml) were identified by standard procedures.<sup>8</sup> Antibiotic susceptibility test was done by Kirby-Bauer disc diffusion method.<sup>9</sup> Colony counts of  $\geq 10^5$ CFU/ml were considered positive. Cultures which failed to grow colonies at the end of 24 hours were considered negative. Cultures with colony counts  $\leq 10^5$ CFU/ml were not considered and were abstained from the study. Cases which were clinically confirmed UTI but in culture insignificant growth was also included in the symptomatic UTI study group.

### 2.5. Statistical analysis

Statistical analysis was done by using software SPSS 19.0 version wherever necessary. Qualitative data was expressed in terms of frequencies and percentages. Association between two variables was done by using chi square test, Fishers exact test. The p value of <0.05 considered statistically significant and p value of <0.001 was considered highly significant.

## 3. Result

A total of 500 urine samples form pregnant women willing to participate in the study were screened from symptomatic

and asymptomatic UTI cases. In the present study, a total of 152 (30.4%) cases were included, of which 123 (24.6%) urine samples showed significant bacteriuria and 29 (5.8%) cases were clinically diagnosed as UTI but there was no significant growth of bacteria. In 152 cases selected for study, 85 (55.9%) cases were symptomatic UTI and 67 (44.1%) cases were having asymptomatic bacteriuria as shown in Table 1.

**Table 1:** Occurrence of urinary tract infection during pregnancy

Urinary Tract Infection		Frequency	Percentage
Symptomatic UTI n = 85 (55.9%)	Significant growth on culture	56	36.8%
	No significant growth on culture	29	19.1%
Asymptomatic Bacteriuria (ABU)		67	44.1%
Total		152	

Socio-demographic characteristics of pregnant women were recorded in the study to assess the risk factors (table-2). Among 152 pregnant cases, the predominant age group was 26-30 years contributing 44.1% (67 cases), followed by 40.8% (62 cases) in 21-25 years and 7.9% (12 cases) in 31-35 years of age group. The lower socio-economic status has contributed in 42.8% (65 cases) followed by lower middle class 40.1% (61 cases) and upper middle class 7.2% (11 cases). The education status of the most of the cases was either high school (47.4%) or primary school (38.8%). However, there is no significant difference symptomatic UTI and ABU as far as education status is concerned. A total of 108 (71.0%) cases have shown UTI in third trimester followed by 38 (25%) cases in second trimester and 06 (3.9%) in first trimester. In obstetric score, 81 (53.3%) caes were primi followed by gravida II 47 (30.9%) cases, Gravida III 23 (15%) cases and Gravida IV 1 (0.7%) case.

Out of 123 significant bacteriuria cases of Symptomatic UTI and asymptomatic bacteriuria, *E.coli* was the predominant organism isolated in 61 (49.6%) cases followed by *Staphylococcus aureus* in 24 (19.5%) cases, *Klebsiella pneumonia* in 16 (13.0%) cases, CONS 12 (9.7%) cases and *Enterococcus faecalis* in 10 (8.1%) cases as depicted in Table 3.

Out of 118 cases of vaginal delivery, 101 (85.6%) cases had full term normal delivery, but among 17(14.4%) preterm delivery, 12 (10.2%) were having symptomatic UTI and 05 (4.2%) cases were having asymptomatic bacteriuria. The preterm vaginal delivery was significantly high ( $p<0.05$ ) among symptomatic UTI cases compared to asymptomatic cases. However, there was no difference in the study group as far as instrumental vaginal delivery or LSCS is concerned (table-4).

#### 4. Discussion

The untreated UTI has been reported to be associated with multiple pregnancy complications like preeclampsia, preterm birth, intrauterine growth restriction and low birth weight.<sup>4</sup> The UTIs are also the causes of various obstetrical complications which can be prevented by appropriate treatment regimen.<sup>4,10-12</sup> The prevalence of UTI during pregnancy was shown between 2.3% to 17.9% by various workers.<sup>13</sup> In our study the prevalence UTI was 17%, which correlates with the study conducted by Mona Abdullah et al.<sup>13</sup> Similarly previous studies have recorded asymptomatic bacteriuria in a range of 2-14%, which is very much comparable to our study results of 13.4%.

Factors proposed to affect the frequency of bacteriuria during pregnancy include multiparity, gestational age, previous medical history of UTI, diabetes mellitus and anatomic urinary tract abnormalities.<sup>14,15</sup> Symptomatic and asymptomatic bacteriuria is commonly encountered in pregnant women. Untreated asymptomatic bacteriuria is a risk factor for pyelonephritis in pregnancy.<sup>16</sup> Screening for and treatment of ASB in pregnancy has become a standard of obstetric care and most antenatal guidelines include routine screening for ASB.<sup>17</sup> Knowing the uropathogens of each obstetric population is particularly important in the management of UTIs. There are various studies related to the most frequently observed microorganisms in UTIs during pregnancy. *Escherichia coli* is reported to be the most critical microorganisms which should be kept in mind.<sup>18-20</sup> In our study, we also have found that *E. coli* is the most common microorganism responsible from the UTI. The other organisms responsible for infection in our study were *Staphylococcus aureus*, *K. pneumonia*, CONS, and *E. faecalis*.

Our study showed that the low socioeconomic status (42.8%) was one of the factors that were significantly associated with increased symptomatic UTI and asymptomatic bacteriuria. Similar study on the same subject by Haider et al showed that pregnant women who had low income level were more likely to have bacteriuria than those who had high socioeconomic income level.<sup>21</sup> Another study in Dimetry et al on UTI also showed the presence of association between low income level and UTI.<sup>22</sup> This could be due to the association of low socioeconomic status with nutritive diet and immunity in pregnant women. There was no significant difference in the prevalence of UTI and asymptomatic bacteriuria with respect to gestational age. This finding was similar with previous studies.<sup>23,24</sup> In our study out of 118 vaginal deliveries, 17 (14.4%) were preterm with significantly ( $p<0.005$ ) high number of symptomatic UTI cases. Laura et al. have conducted retrospective studies regarding perinatal outcome and found out that prematurity, low birth weight will occur among patients with UTI.<sup>25</sup> Earlier Kincaid-Smith et al. had concluded that women with

**Table 2:** Socio-demographic characteristics and associated risk factors of UTI among pregnant women

Characteristics	Urinary Tract Infection, Number (%)		Total No. (%)
	Symptomatic UTI	ABU	
<b>Age</b>			
≤ 20 years	04 (4.7)	07 (10.4)	11 (7.2)
21-25 years	42 (49.4)	20 (29.8)	62 (40.8)
26-30 years	35 (41.2)	32 (47.7)	67 (44.1)
31 – 35 years	04 (4.7)	08 (11.9)	12 (7.9)
<b>Socio Economic Status</b>			
Upper	03 (3.5)	02 (2.9)	05 (3.3)
Upper Middle	04 (4.7)	07 (10.4)	11 (7.2)
Middle	06 (7.0)	04 (5.9)	10 (6.6)
Lower Middle	43 (50.5)	18 (26.8)	61 (40.1)
Lower	29 (34.1)	36(53.7)	65 (42.8)
<b>Educational Status</b>			
Read & Write	09(10.5)	08 (11.9)	17 (11.2)
Primary school	38 (44.7)	21 (31.3)	59 (38.8)
High School	35 (41.2)	37 (55.2)	72 (47.4)
Higher Education	03 (3.5)	01 (1.5)	04 (2.6)
<b>Gestational Age</b>			
First trimester	02 (2.3)	04 (5.9)	06 (3.9)
Second trimester	23 (27.1)	15 (22.4)	38 (25.0)
Third trimester	60 (70.6)	48 (71.6)	108 (71.0)
<b>Obstetrics score</b>			
Primi	42 (51.2)	39 (58.2)	81 (53.3)
Gravida 2	34 (40.0)	13 (19.)	47 (30.9)
Gravida 3	08(9.4)	15 (22.3)	23 (15.)
Gravida 4	01 (1.2)	00 (00)	01 (0.7)

**Table 3:** Organisms isolated from urinary tract infection during pregnancy

S.No.	Organisms isolated (n=123)	Number	Percentage
1	<i>E.coli</i>	61	49.6
2	<i>Staphylococcus aureus</i>	24	19.5
3	<i>Klebsiella pneumonia</i>	16	13.0
4	CONS	12	9.7
5	<i>Enterococcus faecalis</i>	10	8.1

**Table 4:** Urinary tract infection associated with delivery outcome

UTI	Vaginal Delivery			Instrumental Vaginal Delivery			LSCS		
	Term	Preterm	P value	Term	Preterm	P value	Term	Preterm	P value
Symptomatic UTI	29	12	P = 0.05	4	1	1.00	6	2	1.00
ABU	72	05	Chi = 18.6 P = 0.001	2	1	0.400	4	4	1.00
Total	101	17		6	2		10	06	

asymptomatic bacteriuria during pregnancy are more likely to deliver premature or low-birth weight infants and have a 20- to 30-fold increased risk of developing pyelonephritis during pregnancy compared with women without bacteriuria.<sup>26</sup> Women with ABU during pregnancy are more likely to deliver pre-mature or low-birth-weight infants and have a 20 to 30-fold increased risk of developing pyelonephritis during pregnancy compared with women

without bacteriuria.<sup>27</sup>

## 5. Conclusions

To conclude, prompt treatment of asymptomatic bacteriuria early in pregnancy significantly reduces the chances of adverse pregnancy outcome. Thus, screening for ABU should ideally be done in the pre-conceptional period. It is found in our study that higher incidence of UTI was

found in third trimester. It is suggested that all pregnant women should be checked for the presence of ABU in the 1st trimester, treated aggressively with suitable antibiotics and promptly followed up.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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