Study of incidence of urinary tract infection during pregnancy and its effect on maternal and perinatal outcome

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ABSTRACT

Background: Urinary tract infection is the commonest bacterial infection in pregnancy, especially in developing countries like India. It has several adverse outcomes not only in the mother but also in the fetus. This study aims to determine the incidence of UTI during pregnancy, the commonest micro-organism causing UTI, and to find out the impact of such infection on maternal and fetal outcomes.

Methods: This observational study was carried out in the department of obstetrics and gynecology Deen Dayal Upadhyay Hospital, New Delhi over a period of 10 months. A total of 196 pregnant women attending the outdoor hospital for ANC check-up without any medical disorder or previous adverse pregnancy outcomes were included in this study. Urine routine microscopy was done as a screening test for UTI. They were followed through their pregnancy and puerperium due to any pregnancy complication and perinatal outcome.

Results: Incidence of urinary tract infection was 12.2%, of which 8.2% were asymptomatic and 4.08% were symptomatic. It was found that the incidence of UTI was highest in the age group of 18 to 25 years and also found that UTI was more common in the second (16.7%) and third (16.7%) trimester and lowest in the first trimester (5.7%). Women who had anaemia, pregnancy-induced hypertension, preterm labour, chorioamnionitis, perinatal mortality, and puerperal pyrexia had a high incidence of UTI than those who had not.

Conclusions: From this study, we concluded that screening for UTI should be a part of routine antenatal care, and also there is a need to initiate an awareness program to educate women about UTI and their adverse fetomaternal outcome so that prompt and effective treatment can be done.

Keywords: FGR, LBW, PPROM, UTI

INTRODUCTION

UTI is the commonest bacterial infection in pregnancy, it occurs more frequently in developing countries, prevalence rate of UTI in pregnant women in America to be 2.5-8.7%, whereas the prevalence of UTI in pregnant women to be 12-40% in developing countries, this was due to difference in the socio-economic levels and standards of living.¹,3 UTI is the infection of the urogenital system, which can involve urethra, bladder and kidney. UTI during pregnancy is classified as either asymptomatic or symptomatic.⁴ Although asymptomatic bacteriuria is the most common, this refers to persistent, actively multiplying bacteria, within the urinary tract in asymptomatic women. If asymptomatic bacteriuria is not treated, approximately 25% of infected women will develop symptomatic infection during pregnancy.⁴ Symptomatic and asymptomatic bacteriuria have been reported among 17.9% and 13% pregnant women respectively.⁵ UTI was said to be 4-10 times more common in pregnant women than in the nonpregnant women.⁶ This was because, during pregnancy, there is a
change in urine chemical composition with an increase in glucose and amino acids, which facilitate bacterial growth in urine.\textsuperscript{7}

The organisms that cause UTI during pregnancy are same as those found in nonpregnant patients.\textsuperscript{8}

Antepartum UTI has been implicated as a risk factor for adverse maternal and fetal outcome like- abortion, recurrent UTI, Anaemia, pregnancy-induced hypertension, PPROM, Chorioamnionitis, FGR, LBW, Preterm birth, Perinatal death and Puerperal pyrexia.\textsuperscript{9,10}

Thus screening for UTI should be a part of routine antenatal care.

**METHODS**

**Study area**

Department of Obstetrics and Gynaecology Deen Dayal Upadhyay Hospital, New Delhi.

**Study design**

Prospective observational study.

**Study population**

The study population comprised all pregnant women attending the Department of Obstetrics and Gynaecology, Deen Dayal Upadhyay Hospital, New Delhi.

**Study period**

July 2017 to June 2018.

**Inclusion criteria**

All antenatal women of age between 18-35 years with no medical disorders (Haemorrhagic disorders, Hypertension, Diabetes and Renal disorders). No previous adverse pregnancy outcome (abortion, perinatal deaths, prematurity or low birth weight).

**Exclusion criteria**

All immunocompromised patients.

**Sampling method**

The informed consent, detailed history, physical examination, relevant lab investigations, were done and the master chart was prepared

**Sample size**

196 pregnant women attending outdoor hospital were taken.

This sample size is based on previous study Mazor-Dray et al. “Maternal urinary tract infection: is it independently associated with adverse pregnancy outcome”

The sample size was calculated using the following formula (Charan and Biswas, 2013):

\[ n = 4 \times pqd^2 \]

The required sample size is 196 subjects.

**Methodology**

The pregnant women attending the department of obstetrics and gynaecology of DDU Hospital for an antenatal checkup, who fulfil the required criteria were included in this study. After proper counselling, written informed consent was taken from all the selected patients.

A detailed history, thorough clinical examination and routine investigations, was carried out in all cases. The biochemical investigation included haemoglobin estimation and serum urea and creatinine. Routine examination of urine and urine culture was done during 1st antenatal checkup and were repeated in 2nd and 3rd trimester.

The women who had a positive screening test of urine defined as \( >5 \) pus cell/HPF on routine examination of urine were subjected to urine culture and sensitivity. All the above information were recorded on predesigned proforma.

If the women with a positive urine examination complained of urinary symptoms like frequency of micturition, burning sensation during micturition, loin pain, fever, lower abdominal pain they were classified as having symptomatic urinary tract infection. The women who didn’t have such symptoms were classified as having asymptomatic urinary tract infection.

Depending upon findings patients were divided into two groups: Those with UTI (both Asymptomatic and Symptomatic UTI) and Those without UTI. All the patients of both groups were followed up throughout the pregnancy and puerperium.

**Outcome of study**

**Maternal:** Outcomes were measured in terms of; Anaemia, Pregnancy-induced hypertension, Premature rupture of membrane, Chorioamnionitis, Puerperal pyrexia.

**Perinatal:** Perinatal outcome is measured in terms of FGR, Preterm birth and Perinatal mortality.

**Statistical methods**

The results are presented in frequencies, percentages and mean\( \pm SD \). The Chi-square test was used for comparisons. The p-value<0.05 was considered significant. All the
RESULTS

Out of 196 pregnant women incidence of UTI was found to be 12.2% of which 8.2% were asymptomatic and 4.08% were symptomatic.

Table 1: Distribution of patients according to the incidence of UTI.

<table>
<thead>
<tr>
<th>Incidence of UTI</th>
<th>No. (n=196)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>24</td>
<td>12.2</td>
</tr>
<tr>
<td>Absent</td>
<td>172</td>
<td>87.8</td>
</tr>
</tbody>
</table>

Table 1 shows the distribution of patients according to the incidence of UTI.

Table 2: Incidence of asymptomatic and symptomatic urinary tract infection during pregnancy.

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>% of total pregnant women with UTI</th>
<th>% of total pregnant Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic UTI</td>
<td>16</td>
<td>66.7%</td>
<td>8.16%</td>
</tr>
<tr>
<td>Symptomatic UTI</td>
<td>8</td>
<td>33.3%</td>
<td>4.08%</td>
</tr>
<tr>
<td>Total No of Pregnant women with UTI</td>
<td>24</td>
<td>100%</td>
<td>12.2%</td>
</tr>
</tbody>
</table>

Table 3: Association of Incidence of UTI with age.

<table>
<thead>
<tr>
<th>Age in years</th>
<th>No. of patients</th>
<th>Incidence of UTI</th>
<th>p-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Present</td>
<td>Absent</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>18-25</td>
<td>107</td>
<td>16</td>
<td>15.0</td>
<td>91</td>
</tr>
<tr>
<td>26-30</td>
<td>45</td>
<td>2</td>
<td>4.4</td>
<td>43</td>
</tr>
<tr>
<td>&gt;30</td>
<td>44</td>
<td>6</td>
<td>13.6</td>
<td>38</td>
</tr>
</tbody>
</table>

Chi-square test.

Table 4: Association of incidence of UTI with gravida.

<table>
<thead>
<tr>
<th>Gravida</th>
<th>No. of patients</th>
<th>Incidence of UTI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>One</td>
<td>124</td>
<td>16</td>
<td>12.9</td>
</tr>
<tr>
<td>Two</td>
<td>53</td>
<td>6</td>
<td>11.3</td>
</tr>
<tr>
<td>≥Three</td>
<td>19</td>
<td>2</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Chi-square test.

Table 2 shows the Incidence of asymptomatic and Symptomatic urinary tract infection during pregnancy. Among patient with UTI, about 66.7% were asymptomatic and 33.3% were symptomatic. Incidence of asymptomatic UTI among pregnant women was 8.16% while that of symptomatic UTI was 4.08%.

Figure 1 shows the association of the incidence of UTI with trimester. The incidence of UTI was higher among the patients in whom trimester was 2nd (16.7%) than 3rd (11.3%) and 1st (5.7%) years, however, the association was statistically insignificant (p>0.05).

Table 3 shows the association of the incidence of UTI with age. The incidence of UTI was higher among the patients aged 18-25 years (15%) than >30 (13.6%) and 26-30 (4.4%) years, however, the association was statistically insignificant (p>0.05).

Table 4 shows the association of the incidence of UTI with gravida. The incidence of UTI was higher among the patients in whom gravida was one (12.9%) than two (11.3%) and ≥Three (10.5%) years, however, the association was statistically insignificant (p>0.05).
DISCUSSION

Incidence

Table 1 and Table 2 shows the overall incidence of UTI and incidence of asymptomatic and symptomatic UTI during pregnancy respectively. Incidence of UTI in our study was about 12.2 %. Out of this, about 33.3% of the pregnant women with UTI were found to be symptomatic while about 66.7% were asymptomatic UTI. Incidence of UTI as found by different authors have varied widely like Mazor dray E et al from France had found the incidence of UTI to be 2.3%.11 Marahatta R et al from Nepal placed the incidence at 9.8%, while Francoise de paul from South Africa at 5%.12,13

On contrary, Anjana Verma et al from Udaipur, Rajasthan found the incidence of UTI to be 12.27%.14 Prabhavathi et al from Northem Andhra Pradesh found the incidence of UTI to be 11.33%.15 Researchers of developed countries have found a lower incidence of UTI than their counterparts in developing countries.1 The difference in incidences may be explained by the differences in socioeconomic status and standards of hygiene in which the women live. This could also be due to a difference in criteria and technique adopted by different researchers.16 In most of the studies incidence of asymptomatic UTI in pregnancy is much more common than symptomatic UTI.17,18 So the results of the current study match with those of the earlier studies available.14

Demography

Age

Table 3 shows the association of incidence of UTI with age. In our study more than half of the patients (54.6%) were between 18 to 25 yrs followed by 26 to 30 yrs (23%) and > 30 yrs (22.4%). The highest incidence was seen in 18-25 yrs age group in whom the incidence was about 15% followed by 13.6% in the age group of more than 30 years and lowest was seen in 26-30 year age group in whom the incidence was 4.4%.
Parity

Table 4 shows the association of incidence of UTI with gravidity. In our study, most of the patients were primigravida (12.9%), followed by second gravida (11.3%) and in three or more than three gravid incidence was lower (10.5%). Hence in our study parity was not found to be a significant factor influencing the incidence of UTI.

Trimester

Figure 1 shows the association of the incidence of UTI with trimester. In our study, most of the cases (16.7%) of UTI were detected during the second trimester, followed by 11.3% in the third trimester and the lowest incidence was found in the first trimester (5.7%). This difference may be as a result of either change in urinary stasis and vesicoureteral reflux or decrease in urinary progesterone and estrogens in the various trimester of pregnancy.19 Most of the studies found that the incidence of UTI was highest in the second trimester.20,21

The causative organism of UTI

Figure 2 shows the distribution of organisms. In our study, E.coli was the commonest offending organism found in 10 pregnant women out of 14, (71.4%). This was followed by klebsiella which was seen in 2 cases out of 14 (14.3%), and Staphylococcus and Proteus were seen in 2 cases out of 14 (7.1% each). Most of the studies have identified E.coli as the commonest organism causing urinary tract infection.14,22

Maternal outcome

In our study, the incidence of UTI was higher among the pregnant women in whom anaemia (21.6%), PIH (21.7%), Chorioamnionitis (18.2%) and Puerperal pyrexia (23.5%) was present than in whom it was absent.

Table 7: Maternal outcome.

<table>
<thead>
<tr>
<th>Maternal outcome</th>
<th>UTI present</th>
<th>UTI absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anemia</td>
<td>21.6%</td>
<td>9%</td>
</tr>
<tr>
<td>PIH</td>
<td>21.7%</td>
<td>11%</td>
</tr>
<tr>
<td>Chorioamnionitis</td>
<td>18.2%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Puerperal pyrexia</td>
<td>23.5%</td>
<td>11.2%</td>
</tr>
</tbody>
</table>

But except for anaemia (statistically significant, p=0.01), in all other maternal outcomes, the association was statistically insignificant (p>0.05).

Fetal outcome

In our study the incidence of UTI was higher among the patients in whom preterm birth (24.4%) and perinatal mortality (16.7%) was present than in whom it was absent. However, in our study association of the incidence of UTI with FGR was not found.

Table 8: Fetal outcome.

<table>
<thead>
<tr>
<th>Fetal outcome</th>
<th>UTI present</th>
<th>UTI absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preterm birth</td>
<td>24.44%</td>
<td>11.3%</td>
</tr>
<tr>
<td>FGR</td>
<td>13%</td>
<td>12.1%</td>
</tr>
<tr>
<td>Perinatal mortality</td>
<td>16.7%</td>
<td>12.2%</td>
</tr>
</tbody>
</table>

CONCLUSION

UTI in pregnancy leads to adverse maternal and fetal effects due to anatomical changes occurring in pregnancy, short urethra in females, easy contamination of urinary tract with faecal flora, immunodeficiency of pregnancy and various other reasons. The highest incidence of UTI is found maximum in the second trimester, maybe due to the physiological changes occurring mostly in the second trimester. UTI affects premature labour directly through development of amnionitis. Bacterial enzymes such as collagenase may weaken the fetal membrane. Pregnant women with UTI are at an increased risk for adverse maternal and fetal outcomes which could be prevented by antimicrobial treatment. Hence pregnant women should be screened for bacteriuria and treated if results are positive. Public educational programmes on the importance of personal hygiene and good environmental sanitation habits mostly during pregnancy should be carried out as a part of routine antenatal care.

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