

Study Of Urinary Tract Infection in Pregnancy and Its Effect on Maternal and Perinatal Outcome.

Dr. Tanzila Halim¹, Dr. Khairunnahar², Dr. Amena Khan³, Dr. Umme Kulsum⁴, Dr. Monowara Begum⁵, Dr. Hasina Khatun⁶

1. Associate Professor, Department of Obstetrics & Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, Mail: thbsmmu@gmail.com
2. Assistant Professor, Department of Obstetrics & Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.
3. Medical Officer, Department of Obstetrics & Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.
4. Associate Professor, Department of Fetomaternal Medicine, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.
5. Associate Professor, Department of Obstetrics & Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.
6. Assistant Professor, Department of Obstetrics & Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.

Corresponding author: Dr. Tanzila Halim, Associate Professor, Department of Obstetrics & Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, Mail: thbsmmu@gmail.com

KEYWORDS

Urinary tract infection, pregnancy, maternal outcomes, perinatal outcomes, Escherichia coli, preterm birth, low birth weight, screening.

ABSTRACT

Background: Urinary tract infections (UTIs) are common during pregnancy and can lead to significant maternal and perinatal complications if not properly managed. Early detection and treatment are essential to preventing adverse outcomes such as preterm birth, low birth weight, and pyelonephritis.

Aim of the study: The aim of this study was to investigate the prevalence of UTIs in pregnant women and their impact on maternal and perinatal outcomes.

Methods: A cross-sectional study was conducted at the Department of Obstetrics & Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh over a period of January 2021 to December 2021 with 100 pregnant women diagnosed with UTIs. Clinical symptoms, urine analysis, and urine culture were used to identify UTI cases. Maternal complications, such as preterm labor and anemia, and perinatal outcomes, including preterm birth and low birth weight, were recorded. Statistical analysis was performed using SPSS software.

Result: The majority of the women were aged 18-25 years (61.63%), with the second trimester being the most common period for UTI occurrence (60.47%). Escherichia coli was the most prevalent pathogen (66.28%). Maternal complications included preterm labor (22.09%) and anemia (25.58%), while perinatal outcomes showed preterm birth (26.74%) and low birth weight (33.72%).

Conclusion: UTIs in pregnancy are associated with significant maternal and perinatal complications. The early diagnosis and treatment of UTIs, particularly during the second trimester, are crucial to prevent adverse outcomes. Routine screening and appropriate antimicrobial therapy are recommended to improve maternal and fetal health..

INTRODUCTION

Urinary tract infections (UTIs) are among the most common bacterial infections affecting pregnant women worldwide, with a global prevalence of approximately 23.9% [1]. Pregnancy-induced physiological and anatomical changes in the urinary system make expectant mothers more susceptible to these infections, increasing the risk of maternal and perinatal complications [2]. UTIs during pregnancy can range from asymptomatic bacteriuria (ASB) to symptomatic lower urinary tract infections (cystitis) and severe upper urinary tract infections (pyelonephritis) [3]. The hormonal and mechanical changes occurring during pregnancy predispose women to UTIs. Elevated progesterone levels lead to smooth muscle relaxation, causing decreased ureteral peristalsis and urinary stasis, which facilitates bacterial colonization [4]. Additionally, the growing uterus exerts pressure on the bladder and ureters, further impairing urinary flow [5]. These factors create an environment conducive to infection, particularly by *Escherichia coli* (*E. coli*), which is responsible for nearly 80% of pregnancy-associated UTIs [6]. Other common pathogens include *Klebsiella pneumoniae*, *Proteus mirabilis*, and *Enterococcus* species [7]. UTIs during pregnancy are classified into ASB, cystitis, and pyelonephritis. ASB, defined as the presence of bacteria in the urine without symptoms, affects 2–10% of pregnant women [8]. If left untreated, ASB can progress to symptomatic UTIs, with up to 25–30% of cases developing pyelonephritis, a severe kidney infection that can lead to sepsis, preterm labor, and maternal hospitalization [9]. Cystitis typically presents with a range of symptoms, including dysuria, urinary urgency, increased frequency of urination, and, in some cases, suprapubic discomfort. On the other hand, pyelonephritis is characterized by more severe manifestations, such as fever, chills, flank pain, costovertebral angle tenderness, and systemic signs of infection, including nausea, vomiting, and general malaise [10]. Pyelonephritis remains a leading cause of hospitalization for severe infections in pregnancy and is associated with increased maternal morbidity [11]. The impact of UTIs extends beyond maternal health, significantly affecting perinatal outcomes. Studies have linked untreated UTIs in pregnancy to an increased risk of preterm birth, low birth weight, intrauterine growth restriction, and neonatal sepsis [12]. The inflammatory response triggered by infection may lead to placental insufficiency, contributing to fetal distress and adverse neonatal outcomes [13]. The risk of complications is particularly high in cases of recurrent or inadequately treated infections [14]. Several risk factors predispose pregnant women to UTIs, including a history of recurrent UTIs, diabetes mellitus, anemia, immunosuppression, and low socioeconomic status [15]. Additionally, multiparity, poor hygiene, and reduced prenatal care access further increase susceptibility. Given these risks, routine screening and early intervention play a crucial role in reducing maternal and neonatal complications [16]. Despite the known risks associated with UTIs in pregnancy, significant gaps remain in understanding the full extent of their impact on maternal and perinatal outcomes, particularly in resource-limited settings. This study aims to assess the prevalence, clinical characteristics, and outcomes of UTIs in pregnancy while evaluating their effects on maternal and neonatal health.

METHODOLOGY & MATERIALS

This hospital-based prospective observational study was conducted at the Department of Obstetrics & Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh over a period of January 2021 to December 2021. The study was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants before enrollment.

Study Population

A total of 86 pregnant women diagnosed with urinary tract infection (UTI) based on positive urine culture results were included. The inclusion and exclusion criteria were strictly applied to ensure homogeneity of the study cohort.

Inclusion Criteria:

- Pregnant women with microbiologically confirmed UTIs.
- Participants aged 18–39 years.

Exclusion Criteria:

- History of chronic medical conditions, including hypertension, diabetes mellitus, renal disorders, or hemorrhagic disorders.
- Previous adverse pregnancy outcomes such as miscarriage, stillbirth, or preterm birth.
- Refusal to provide informed consent.

Data Collection and Clinical Assessment

Detailed maternal demographic, clinical, and obstetric data were recorded at the time of enrollment. Information on age, parity, gestational age at diagnosis, and body mass index (BMI) was collected. Clinical presentation, including symptoms of UTI such as dysuria, urinary urgency, frequency, fever, and flank pain, was documented. Laboratory investigations included urinalysis, urine culture, and antimicrobial susceptibility testing. Routine and microscopic urine examinations were performed at the first antenatal visit and repeated in the second and third trimesters. A diagnosis of symptomatic UTI was made if patients presented with urinary symptoms and a positive urine culture, whereas asymptomatic bacteriuria was identified based on a significant bacterial colony count ($\geq 10^5$ CFU/mL) in the absence of clinical symptoms.

Maternal and Perinatal Outcomes

The primary maternal outcomes included pyelonephritis, preterm labor, preterm premature rupture of membranes (PPROM), gestational hypertension, and postpartum hemorrhage. Neonatal outcomes included preterm birth (<37 weeks), low birth weight (<2.5 kg), neonatal intensive care unit (NICU) admission, neonatal sepsis, and Apgar score at 5 minutes. Participants were followed throughout pregnancy and the postpartum period to assess maternal and neonatal outcomes.

Statistical Analysis

All data were systematically recorded and presented in relevant tables or graphs, with accompanying descriptions for clear interpretation. Statistical analysis was conducted using SPSS version 26.0 (IBM, USA). Descriptive statistics were reported as means with standard deviations (SD) for normally distributed data, while medians with interquartile ranges (IQR) were used for non-normally distributed variables. Categorical data were summarized as frequencies and percentages.

RESULT

A total of 86 patients participated in this study. The majority (61.63%) were aged 18–25 years, with 31.40% in the 26–30 years age group, and only 6.98% were older than 30 years. The mean age was 27.4 ± 5.2 years. The mean BMI for the study population was 25.3 ± 4.1 kg/m². Regarding gravidity, 55.81% were primigravida, 25.58% were second gravida, and 18.60% were multigravida (≥ 3). In terms of pregnancy trimester distribution, 60.47% were in the second trimester, 31.40% were in the third trimester, and 8.14% were in the first trimester (Table 1). The clinical presentation of urinary tract infections (UTI) in the study population revealed a diverse range of symptoms. Dysuria was the most common symptom, affecting 62.79%, followed by increased urinary frequency (55.81%), urgency (48.84%), and fever (39.53%). Suprapubic pain and flank pain suggestive of pyelonephritis were present in 36.05% and 18.60% of participants, respectively.

Asymptomatic bacteriuria was found in 26.74% of the patients, while nausea and vomiting were less common (24.42%). Urinalysis findings showed that 81.40% exhibited pyuria (WBC >10/HPF), and 61.63% tested positive for nitrites, indicating gram-negative bacteria. Leukocyte esterase was positive in 66.28% of cases, and hematuria was found in 27.91% of patients. Urine culture results confirmed the diagnosis of UTI in 88.37% of cases, with 9.30% exhibiting polymicrobial growth (Table 2). Figure 1 shows the seasonal prevalence of urinary tract infections (UTI) in pregnant women. The highest prevalence occurs in winter (59.3%), followed by summer (29.1%) and the lowest in the monsoon season (11.6%). The most prevalent bacterial pathogen identified in urine cultures was *Escherichia coli*, found in 66.28% of samples. Other pathogens included *Klebsiella pneumoniae* (17.44%), *Proteus mirabilis* (16.28%), and *Pseudomonas aeruginosa* (11.63%) (Table 3). Table 4 presented the maternal complications associated with urinary tract infections (UTI). Anemia was the most common, occurring in 25.58% of cases, followed by preterm labor (22.09%), pyelonephritis (18.60%), and gestational hypertension (15.12%). Additional complications included preterm premature rupture of membranes (12.79%) and abortion (11.63%). Perinatal outcomes showed that 26.74% of cases resulted in preterm birth, and 33.72% of infants had low birth weight. Neonatal ICU admission was required in 18.60% of cases, with 10.47% developing neonatal sepsis. Fetal growth restriction and perinatal mortality were also significant, affecting 15.12% and 1.16% of the infants, respectively (Table 5).

Table 1: Demographic characteristics of the study population (N=86)

Variables	Number (n)	Percentage (%)
Age in years		
18-25	53	61.63
26-30	27	31.40
>30	6	6.98
Mean± SD	27.4 ± 5.2	
BMI (kg/m ²)		
Mean± SD	25.3 ± 4.1	
Gravidity		
Primigravida	48	55.81
Second gravida	22	25.58
Multigravida (≥3)	16	18.60
Trimesters		
First trimester	7	8.14
Second trimester	52	60.47
Third trimester	27	31.40

Table 2: Clinical presentation and diagnosis of UTI

Parameter	Number (n)	Percentage (%)
Symptoms		
Asymptomatic Bacteriuria	23	26.74
Dysuria	54	62.79
Increased Urinary Frequency	48	55.81
Urgency	42	48.84

Suprapubic Pain	31	36.05
Fever (>38°C)	34	39.53
Flank Pain (Suggestive of Pyelonephritis)	16	18.60
Nausea/Vomiting	21	24.42
Urinalysis Findings		
Pyuria (WBC >10/HPF)	70	81.40
Hematuria (Microscopic RBCs in Urine)	24	27.91
Nitrite Positive (Suggestive of Gram-negative Bacteria)	53	61.63
Leukocyte Esterase Positive	57	66.28
Urine Culture Results		
Positive Urine Culture ($\geq 10^5$ CFU/mL)	76	88.37
Polymicrobial Growth	8	9.30
No Growth	10	11.63

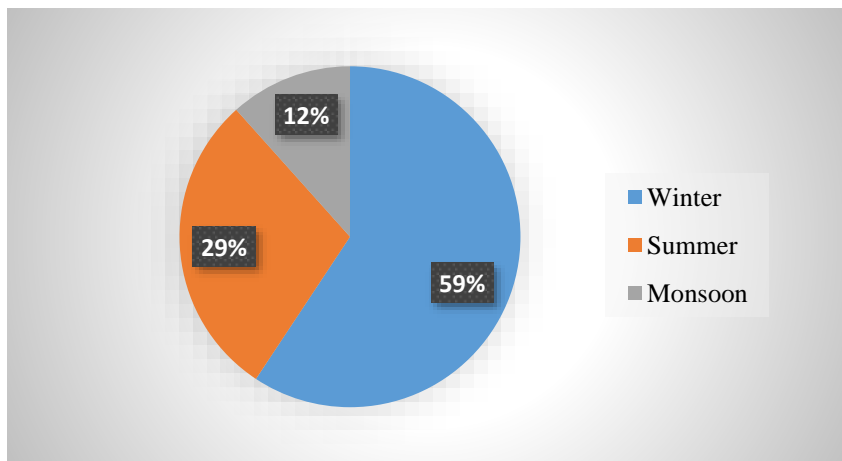


Figure 1: Prevalence of UTI in Pregnant Women in Relation to Seasons.

Table 3: Bacterial pathogens identified in urine culture.

Pathogens	Number (n)	Percentage (%)
Escherichia coli	57	66.28
Klebsiella pneumoniae	15	17.44
Proteus mirabilis	14	16.28
Enterococcus spp.	5	5.81
Staphylococcus saprophyticus	3	3.49
Pseudomonas aeruginosa	10	11.63
Staphylococcus aureus	8	9.30

Table 4: Maternal complications associated with UTI.

Complications	Number (n)	Percentage (%)
Preterm Labor	19	22.09
Abortions	10	11.63

Anaemia	22	25.58
Preterm Premature Rupture of Membranes (PPROM)	11	12.79
Pyelonephritis	16	18.60
Gestational Hypertension	13	15.12
Preeclampsia/Eclampsia	8	9.30
Postpartum Hemorrhage (PPH)	9	10.47
Chorioamnionitis	8	9.30

Table 5: Perinatal outcomes in pregnant women with UTI

Perinatal Outcome	Number (n)	Percentage (%)
Preterm Birth (<37 weeks)	23	26.74
Low Birth Weight (<2.5 kg)	29	33.72
Neonatal ICU Admission	16	18.60
Neonatal Sepsis	9	10.47
Apgar Score <7 at 5 min	15	17.44
Stillbirth	4	4.65
Fetal growth restriction	13	15.12
Perinatal mortality	1	1.16

DISCUSSION

Urinary tract infections (UTIs) are among the most common bacterial infections during pregnancy, posing significant risks to both maternal and neonatal health. The increased prevalence of UTIs in pregnant women is largely attributed to physiological and anatomical changes that occur during gestation [17]. Hormonal fluctuations, particularly elevated progesterone levels, reduce ureteral tone, leading to urinary stasis. Additionally, the enlarging uterus exerts mechanical pressure on the bladder and ureters, further obstructing urine flow and creating a favorable environment for bacterial proliferation. This elevated incidence of UTIs during pregnancy is a major public health concern, given its association with serious maternal and perinatal complications, as demonstrated in our study. If left untreated, UTIs can result in adverse outcomes such as preterm labor, low birth weight, and pyelonephritis. Therefore, timely screening, early diagnosis, and appropriate treatment are essential to reducing the risks associated with UTIs in pregnancy and improving maternal and neonatal outcomes [17-18]. Our study revealed that urinary tract infections (UTIs) during pregnancy were significantly associated with adverse maternal and perinatal outcomes. The majority of affected women were between 18 and 25 years of age (61.63%), with a mean age of 27.4 ± 5.2 years. This finding aligns with previous studies, including those by Esha et al. and Mahor et al., which reported a similar age distribution among pregnant women with UTIs [17,19]. The higher prevalence in this age group may be attributed to the fact that many women in this range experience pregnancy and marriage, and increased sexual activity during this period could further contribute to the elevated risk of infection. Additionally, 55.81% of participants were primigravida, a finding consistent with the study by Amit et al., which reported a 60% prevalence of UTIs among primigravida women, as well as the study by Mahor et al [19]. The majority of infections occurred during the second trimester (60.47%), corroborating previous research, including that of Mahor et al [19]. This increased susceptibility during the second trimester may be due to physiological changes such as urinary stasis, vesicoureteral reflux, or fluctuations in progesterone and estrogen levels [18]. Several studies have also reported a peak incidence of UTIs during this trimester, further supporting our findings [20]. Asymptomatic bacteriuria (ABU) was

detected in 26.74% of the participants in this study, a prevalence rate that aligns with previous research [18]. However, this prevalence was higher than the 12.2% by Mahor et al. and 9.8% reported by Marahatta et al [19,21]. Additionally, lower prevalence rates have been reported in some developed countries, such as in the studies by Mazor-Dray et al. from France (2.3%) and Siemefo Kamgang et al. from South Africa (5%) [22-23]. In terms of clinical presentation, dysuria (62.79%) and increased urinary frequency (55.81%) were the most common symptoms observed, both of which are frequently seen in urinary tract infections (UTIs) [24]. Notably, 39.53% of the women experienced fever, a symptom often linked to pyelonephritis, while flank pain was reported in only 18.60% of the cases, consistent with findings from other studies [21]. Our study revealed a higher prevalence of urinary tract infections (UTIs) during the winter season, which is consistent with previous research indicating seasonal variations in UTI incidence among pregnant women [25]. *Escherichia coli* was the most commonly identified bacterial pathogen in our study, responsible for 66.28% of infections. This finding aligns with previous studies that consistently report *E. coli* as the predominant causative agent of UTIs in pregnant women [17,26]. Additionally, other pathogens, including *Klebsiella pneumoniae*, *Proteus mirabilis*, and *Enterococcus* species, were also detected, all of which have been associated with urinary infections in pregnant women. Our study identified a significant association between urinary tract infections (UTI) during pregnancy and various maternal complications, including preterm labor (22.09%), anemia (25.58%), and pyelonephritis (18.60%). These findings are consistent with previous research by Esha et al. and Mahor et al., where a higher incidence of UTI was reported among pregnant women with anemia (21.6%) and preterm labor (8%), respectively [17,19]. Additionally, our study highlighted the correlation between UTI and preterm birth, with 26.74% of neonates being born prematurely. A notable proportion of neonates had low birth weight (33.72%) and required neonatal ICU care (18.60%), which aligns with the findings of Bhutta et al [27]. Perinatal mortality was recorded at 1.16%, with stillbirths occurring in 4.65% of cases. These results underscore the severe consequences of untreated or poorly managed UTIs on fetal outcomes, reinforcing the need for early detection and effective management during pregnancy. Previous studies have similarly highlighted the association between untreated UTIs and increased risks of stillbirth and neonatal sepsis [28].

Limitations of the study: Every hospital-based study has some limitations and the present study undertaken is no exception to this fact. The limitations of the present study are mentioned. Our study did not include molecular identification of bacterial pathogens, which could have provided more detailed insights into antibiotic resistance. Additionally, the impact of specific treatment regimens on outcomes was not assessed. Recall bias may have influenced self-reported symptoms and medical histories. Lastly, long-term maternal and perinatal outcomes beyond the postpartum period were not evaluated.

CONCLUSION AND RECOMMENDATIONS

Urinary tract infection (UTI) in pregnancy is a significant health concern with notable implications for both maternal and perinatal outcomes. In our study, we found a high prevalence of UTI, with *Escherichia coli* being the most common pathogen. Maternal complications such as preterm labor, anemia, and pyelonephritis, along with adverse perinatal outcomes like preterm birth and low birth weight, were significantly associated with UTI in pregnancy. These findings highlight the clinical relevance of early diagnosis and appropriate management to mitigate the risk of complications. Improving screening protocols and treatment strategies for UTI during pregnancy

could lead to better maternal and fetal health outcomes. Future research should focus on refining management strategies to further enhance the care of pregnant women affected by UTI.

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