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Original Article

Trimester-wise UTI Prevalence and Associated Risk Factors among Pregnant Women in Bangladesh

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Abstract

Background: Urinary Tract Infection (UTI) susceptibility increases during pregnancy due to hormonal and physiological changes and resulting multiple adverse outcomes for both mother and fetus. Several factors are associated with this infection, including age, anatomical deformity, and comorbidities. **Objectives:** Assessing the prevalence of UTI among pregnant women in different trimesters and associated factors. **Methods:** This is a cross-sectional study conducted in a government healthcare facility of Bangladesh. Pregnant women attending for ante-natal check-up were interviewed after taking consent. A total of 100 pregnant ladies from different trimesters participated in this study. Midstream urine was collected to detect UTI and other examinations were done to find out associated risk factors. **Results:** The mean age of the respondents was 33.6 (±7.1) years, and most of them (n=59, 59%) were in their second trimester, and (n=71, 71%) were multigravida. Among the participants, 39% (n=39) were tested positive for UTI. The prevalence of UTI in the first trimester was 29.4% and increased in the second and trimester and the prevalences were 35.6% and 54.2%, respectively. A statistically significant association was found between UTI and risk factors like hypertension (OR=21.7), diabetes (OR=22.1), and anemia (OR=16.7) which increase the risk of developing UTI manifolds during pregnancy. **Conclusion:** A higher prevalence of UTI was found among pregnant women, and mostly in their third trimester. A notable association was found between UTI and certain risk factors, emphasizing the early screening and treatment for UTI during antenatal care (ANC) visits. A study with a larger sample may give a clearer image.

Keywords: *Co-Morbidities; Pregnancy; Risk Factors; UTI*

Introduction

Urinary tract infection (UTI) implies the infection caused by the presence and growth of microorganisms anywhere in the urinary tract involving the urethra, bladder, ureters, and kidneys (Chu & Lowder 2018). Women are more susceptible to UTI than men because of certain anatomical differences such as shorter length of urethra, absence of prostatic secretion, and lesser distance between anus and urethra (Minardi *et al.,* 2011). During pregnancy, the susceptibility to UTI increases manifolds as pregnant mothers undergoes physiological and hormonal transformations. These changes comprise dilatation of the urethra, increased bladder volume, decreased bladder tone and reduced urethral tone. All these factors lead to urinary stasis and vesicoureteric reflux, which in turn creates a favorable environment for organisms responsible for UTI during pregnancy (Taye *et al.,* 2018). Moreover, around 70% of women manifest glycosuria at the time of pregnancy that facilitates bacterial growth in the urine (Jeyabalan & Lain, 2007). Therefore, UTI is highly prevalent in pregnant women. Among all bacterial

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infections during pregnancy, UTI accounts for 25% of cases. Whereas around 23.9% of women suffer from UTI at any point in time of their pregnancy (Salari *et al.,* 2023).

The range of clinical manifestations in UTI may vary among individuals. For some women, the infection is apparent due to overt expression of symptoms, while others show mild symptoms or no symptoms at all. Early detection and treatment become crucial because of such peculiar characteristics of UTI leading to adverse maternal and neonatal outcomes. Studies have found that those who are suffering from UTIs are prone to delivering premature or low-birthweight babies 20-30 times more than the non-infected ones (Colgan *et al.,* 2006). If it remains untreated, this may lead to anemia, cystitis, acute pyelonephritis, generalized sepsis, and premature rupture of membrane in pregnant women (Haider *et al.*, 2010). Also, a significant association between UTI and preterm labor has been revealed through several studies (Wang *et al.,* 2024). Nonetheless, maternal and neonatal adverse outcomes caused by UTI during pregnancy can be significantly reduced if proper ante-natal screening and appropriate antibiotic treatment are provided in time.

Among other communicable diseases, South Asia is heavily burdened with UTIs in the general population, as antenatal screening and treatment of UTIs in low- and medium-income countries (LMIC) is challenging due to high expense and limited logistic support (Lee *et al.,* 2020). Bangladesh, a country in South Asia, is home to hundreds of millions of people and is also experiencing the same. The prevalence of UTI according to previous studies among the pregnant women in Bangladesh ranges from 8.9% to 26% (Lee *et al.,* 2020; Parveen *et al.,* 2011). It is difficult to get the actual picture with widely varied prevalence due to the inadequacy of studies. Therefore, this research aims at exploring the prevalence of UTIs among pregnant women in different trimesters and risk factors associated with it.

Methodology

Study Design and Settings

This cross-sectional study included pregnant women from all trimesters who attended antenatal check-up at the Maternal and Child Health Training Institute, Azimpur, Dhaka, Bangladesh. Women with severe pre-existing systemic illness, renal disease, immunocompromised conditions, or documented chronic hypertension before pregnancy were excluded; however, pregnancy-related or ANC-documented conditions such as hypertension during pregnancy, diabetes/gestational diabetes status, and anemia were recorded as clinical variables and analyzed as potential risk factors for UTI. Among the participants, 17 were in their first trimester, 59 were in their second trimester, and 24 were in their third trimester. Data was collected for the period of twelve months- from January to December, 2024- upon receiving informed consent from the participants. This healthcare center was selected as a dedicated maternal and childcare hospital. People from diverse socio-economic backgrounds live in the capital city; therefore, the data collection site was selected to receive a diverse response. Moreover, this health center is well-known, accessible, and a referral center for maternal and child health. This study was carried out in a government health facility, which is under the director general of family planning and is located in the center of the capital city, Dhaka. This metropolitan city is located roughly in the middle of Bangladesh and provides accommodation to almost 20 million people.

Sample Size Estimation and Study Population

The sample size was calculated based on a study done previously. According to calculation, a minimum sample size of 166 participants was obtained, assuming a prevalence of 12.3% bacteriuria reported in the same setup (Akhter *et al.,* 2024). However, the research team was able to collect 100 completed responses for the study. Participants who attended for their antenatal check-up and aged were between 18 to 42 years were selected purposively irrespective of their term of pregnancy. Those who were on antibiotic therapy or had completed antibiotic therapy within the last two weeks of data collection were excluded from the study. Women with a history of immunocompromised conditions such as cancer, renal disease, severe systemic illness, or documented chronic hypertension before pregnancy were not included in the study. However, clinical conditions identified or recorded during the current pregnancy,

including hypertension in pregnancy, diabetes/gestational diabetes status, and anemia, were not considered exclusion criteria and were included in the analysis as potential risk factors.

Sample Collection and Culture of the Urine

Sterile urine samples were collected from each participant for urinalysis. The women were given instructions on how to collect a clean-catch midstream sterile urine sample. They were then asked to clean the private parts properly. They were to pass out urine into the toilet pot for a few seconds, then collect a portion of the midstream urine before emptying their bladder into the toilet pot. About 3 mL of the specimen was poured into another wide-mouth container and used for urine dipstick analysis and microscopy. To confirm the presence of a UTI, urine culture was performed on all collected samples using standard microbiological techniques. Cultures demonstrating growth of a single uropathogen at a concentration of $\geq 10^5$ colony-forming units (CFU) per milliliter were considered diagnostic of significant bacteriuria. The isolated organisms were identified, and their antimicrobial susceptibility was tested using the Kirby-Bauer disk diffusion method. This culture-based diagnosis allowed differentiation between symptomatic UTI, asymptomatic bacteriuria, and contamination.

Data Analysis

Data was entered into a spreadsheet of Microsoft Excel and later exported to IBM SPSS Statistics for Windows (Version 27.0). IBM Corp. for statistical analysis. Both descriptive and inferential statistics were used to summarize the findings. Quantitative variables are expressed as mean and standard deviation, whereas categorical variables are expressed as count or frequency and percentage. A bivariate analysis was performed to investigate the level of association of the risk factors (exposure) to the outcome variable (presence of UTI). Ninety-five percent (95%) confidence intervals and odds ratios (OR) were reported for key parameters under investigation to quantify associations where OR > 1 were considered as positive associations and OR < 1 were considered as negative associations. Statistical significance was set at p value ≤0.05.

Ethical Consideration

The ethical clearance obtained from Ethical Review Committee (ERC) of Lincoln University College, Malaysia with approval number Memo no-5596/LUC/2024 in January, 2024.

Results

In total, 100 pregnant women of ages between 18 and 42 years were recruited with a mean age of 33.6 (±7.1) years. Majority of women were above 30 years of age (59%), married (81%), housewife (61%) and had tertiary level education (36%). Most of them were multigravida (71%) and were in their second trimester (59%). Some participants had ANC-documented clinical conditions during their current pregnancy, including hypertension in pregnancy or raised blood pressure status (19%), diabetes/gestational diabetes status (27%), and anemia (47%) (Table 1).

Table 1: Characteristics of Study Participants

Parameter	Characteristics	n (%)
Age	≤ 30	41 (41)
	>30	59 (59)
Educational Level	Uneducated	12 (12)
	Primary	17 (17)
	Secondary	35 (35)
	Tertiary	36 (36)
Marital Status	Married	81 (81)
	Separated	13 (13)
	Widow	6 (6)
Occupation	Employed	17 (17)
	Housewife	61 (61)
	Self-employed	22 (22)
Gestational Age	1st trimester	17 (17)
	2nd trimester	59 (59)
	3rd trimester	24 (24)

Gravidity	Primigravida	29 (29)
	Multigravida	71 (71)
Hypertension	Absent	81 (81)
	Present	19 (19)
Diabetes	Absent	73 (73)
	Present	27 (27)
Anemia	Absent	53 (53)
	Present	47 (47)
UTI	Absent	61 (61)
	Present	39 (39)

Significant bacteriuria was found in 39 of 100 participants, yielding a prevalence of 39%. From them, 54.2% of mothers from third trimester were suffering from UTI which is higher than the prevalence of UTI in first (29.4%) and second (35.6%) trimester (Figure 1).

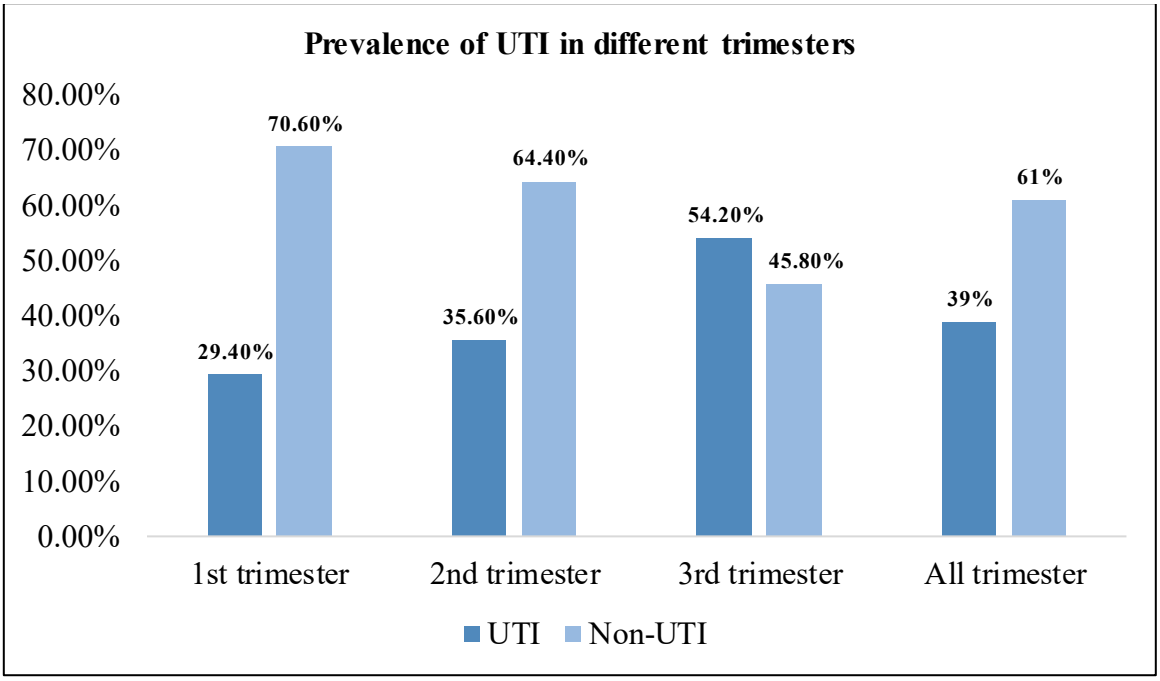

Figure 1: Prevalence of UTI among Pregnant Women

Vulnerabilities for UTI related to maternal, obstetric and clinical features are presented in Table 2. There was no statistically significant association among maternal age, marital status, level of education, occupation with UTI. Risk factors like hypertension (OR=27.7, 95% CI= 4.1-115.9), diabetes (OR=22.1, 95% CI= 4.7-102.9) and anemia (OR=16.7, 95% CI= 3.9-70.9) seem to have statistically significant relationship with UTI in this study. Multiple logistic regression showed that pregnant ladies with both hypertension and diabetes are around 22 times more susceptible to developing UTI than the non-hypertensive and non-diabetic ladies. On the other hand, those who had anemia were 17 times more vulnerable to getting UTI during pregnancy (Table 2).

Table 2. Demographic, Obstetric and Clinical Characteristics as Risk Factor for UTI

Risk Factors	Parameter	Negative n (%)	Positive n (%)	OR (95% CI)
Gravidity	Primigravida	7 (75.9)	22 (24.1)	0.26
	Multigravida	32 (54.9)	39 (45.1)	(0.06–1.18)
Gestational Age	1st trimester	12 (70.6)	5 (29.4)	
	2nd trimester	38 (64.4)	21 (35.6)	
	3rd trimester	11 (45.8)	13 (54.2)	
Maternal Age	≤ 30	27 (65.9)	14 (34.1)	0.68
	>30	34 (57.6)	25 (42.4)	(0.19–2.34)
Marital Status	Married	47 (58)	34 (42)	0.37
	Separated	9 (69.2)	4 (30.8)	(0.06–2.34)

	Widow	5 (83.3)	1 (16.7)	
Level of Education	Primary	10 (58.8)	7 (41.2)	0.99 (0.19–1.15)
	Secondary	24 (68.6)	11 (31.4)	
	Tertiary	21 (58.3)	15 (51.7)	
	Uneducated	6 (50)	6 (50)	
Occupation	Employed	9 (52.9)	8 (47.1)	0.50 (0.14–1.72)
	Housewife	35 (57.4)	26 (42.6)	
	Self-employed	17 (77.3)	5 (22.7)	
Hypertension	No	56 (69.1)	25 (30.9)	21.7 (4.1–115.9)
	Yes	5 (26.3)	14 (73.7)	
Diabetes	No	55 (75.3)	18 (24.7)	22.1 (4.7–102.9)
	Yes	6 (22.2)	21 (77.8)	
Anemia	Absent	42 (79.2)	11 (20.8)	16.7 (3.9–70.9)
	Present	19 (40.4)	28 (59.6)	

Discussion

Among the 100 women who took part in this study, 39 (39%) were affected by UTI. This number is higher than the studies conducted in Ethiopia (31% and 23.5%) (Ngong *et al.,* 2021), Bangladesh (26.1%) (15), and India (35%) (Ranjan *et al.,* 2017). However, one study in Nigeria showed a higher prevalence of UTI (47.5%) among the pregnant women than the current study (Okonko *et al.,* 2009). The discrepancies in the prevalence of UTIs may be explained by differences in patients' adherence to Ante-Natal Care (ANC) visits in respective countries. The probability of being diagnosed and getting required treatment is closely related to ANC visits. In Bangladesh pregnant women, on average, get 3 ANC visits, and only 22% of them manage to avail basic supports from ANC services (Islam & Masud, 2018). WHO specifies that there is about an 8% depletion in mortality and morbidity during the perinatal period if eight ANC visits are ensured (World Health Organization, 2016).

Studies have shown that UTIs are more common in the first and second trimesters (Habak *et al.,* 2025). However, the current study demonstrated that a large number of pregnant women from the third trimester had UTIs at the time of the study. A study conducted in Saudi Arabia found similar results where women from the third trimester were affected more than women from the other two trimesters (Al-Haddad, 2005). It can be explained by an enlarged uterus and urinary stasis during the third trimester resulting in the growth of microorganisms in the lower urinary tract (b).

Findings from the current study are similar to those of Ngong *et al.* (2021), which showed no significant association between obstetric characteristics and UTI. However, parity was significantly related to UTI in the present study, and this can be explained by the results of some previous studies that showed that chances of getting a UTI increase with the advancing number of parties (Shahreen, 2020). Another explanation can be that the mean age (33.6 years) of the participants of this study is a bit higher than many studies done before. A similarity of this fact can be found with a study conducted in Saudi Arabia where most of the participants belonged to the 30–40-year age group (Ashshi *et al.,* 2013). On the other hand, some studies have found significant association between UTI and obstetric risk factors like age and gestational age (Parveen *et al.,* 2011; Okonko *et al.,* 2009). Studies have also revealed that with advancing age there is a fall in estrogen secretion that may make the individuals susceptible to UTIs (Rodriguez-Mañas, 2020).

It is evident that early visits to the ANC, most likely within the first trimester, enhance the probability of being diagnosed with infectious disease in advance and taking appropriate treatment that safeguards the mother from carrying infections throughout the pregnancy. As a result, it helps in limiting UTI-related adverse pregnancy outcomes. However, the majority of the participants of the current study are from the second and third trimesters and thus may explain the higher prevalence of UTIs.

The findings resonate with the previous studies conducted by Marlina *et al.* (2025) and Yan *et al*. (2018), showing that pregnant women with UTIs are several times more susceptible to developing hypertension in the future (Marlina *et al.,* 2025; Yan *et al.,* 2018). This study also found that the vulnerability to developing a UTI among pregnant women multiplies in the presence of diabetes. Earlier studies conducted in Israel and Iraq support the findings, implying the chance of getting a UTI is strongly

associated with the presence of diabetes among the pregnant women (Yefet *et al.,* 2023) irrespective of time of onset (Al-Bash *et al.,* 2016). This study uncovered a strong relationship between anemia and UTI, which is backed by previous research. A study from India found a 40% high prevalence of UTIs among pregnant ladies with anemia (Bembalagi & Sojitra, 2018). Another research study from Iraq showed 50% of anemic women suffered from UTIs during their pregnancy.

In this study, 64% (n=64) of the respondents have less than a tertiary level of education. Respondents with lower literacy may remain unaware of UTI prevention and subsequently suffer from complications related to infection. Previous studies have revealed that preventive education plays a vital role in the reduction of contracting UTIs (Tynan *et al.,* 2026). Early prevention may have beneficial effects on both maternal and child health.

Limitations

Like other scientific studies, this study also has some limitations. This study was conducted in a government hospital of the capital city of Bangladesh. As the standard of living, socio-economic attributes, and accessibility to medical care differ widely between city dwellers and rural pregnant women, the result from this study may not be representative of all the pregnant women of the country. Another limitation of this study is lower response rate than the calculated numbers' response. Moreover, the data enumerator team was unable to collect information on sexual activities and personal hygiene because of the conservative nature of cultural and religious conviction.

Future Scope

Future studies should be conducted with larger sample sizes across multiple hospitals, including both urban and rural areas, to obtain more representative findings. Longitudinal research is needed to assess the impact of UTI on maternal and neonatal outcomes throughout pregnancy. Further studies should also explore additional risk factors such as personal hygiene, sexual activity, antibiotic resistance patterns, and the effectiveness of routine ANC screening and preventive education in reducing UTI among pregnant women.

Conclusion

A high prevalence of UTI was observed among pregnant women from diverse socioeconomic backgrounds. Hypertension, diabetes, and anemia were significantly associated with UTI during pregnancy, whereas age, parity, educational status, gestational age, and occupation showed no significant association. These findings highlight the need for improved preventive education and strengthened early screening for risk factors to reduce susceptibility to UTI and related adverse perinatal outcomes. Larger longitudinal studies are warranted to clarify the impact of UTIs on pregnancy outcome.

CRediT Authorship Contribution Statement

Z.F: Conceptualization; Supervision; Data Curation; Investigation; Software; Formal Analysis; Writing – Original Draft; Writing – Review & Editing. N.S: Methodology; Data Curation; Validation; Visualization; Original Draft; Writing – Review & Editing.

Instruction for AI Assistance Declaration

The author hereby declares that, during the preparation of this manuscript, generative AI tools such as ChatGPT, Microsoft Copilot, and Google Gemini were utilized to assist with language enhancement and grammar correction. Following the use of these tools, the author thoroughly reviewed and revised the content and takes full responsibility for the final version of the manuscript, ensuring its accuracy and adherence to the required academic standards.

Conflict of Interest

The authors declare that there is no conflict of interest as the research was not conducted for commercial or financial purposes.

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