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Frequency of Urinary Tract Infection in Patients Presenting with Preterm Labor

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ABSTRACT

Background: Preterm labor remains a major contributor to neonatal morbidity and mortality worldwide, with infections such as urinary tract infection recognized as significant precipitating factors. Physiological changes in pregnancy predispose women to bacterial colonization, which may trigger uterine contractions and cervical ripening. Limited data are available on the burden of urinary tract infection among preterm labor cases in Abbottabad. **Objective:** To determine the frequency of urinary tract infection in patients presenting with preterm labour at Ayub Teaching Hospital Abbottabad. **Study Design:** Cross-sectional study. **Duration and Place of Study:** The study was conducted from October 2024 to March 2025 in the Department of Obstetrics and Gynaecology, Ayub Teaching Hospital, Abbottabad. **Methodology:** A total of 127 pregnant women aged 18–40 years with singleton gestations below 37 completed weeks were enrolled. Urine samples were collected for microscopic and microbiological analysis, and urinary tract infection was diagnosed by pyuria or positive culture. **Results:** The mean age of participants was 29.32 years. Urinary tract infection was detected in 50 of 127 patients (39.40%). Gestational age greater than 30 weeks (p=0.022) and rural residence (p=0.017) were significantly associated with infection, while age, parity, and socioeconomic status were not. **Conclusion:** Urinary tract infection is a common finding in women with preterm labor, particularly among rural residents and those beyond 30 weeks of gestation.

INTRODUCTION

Preterm labor is a clinical condition in which regular uterine contractions begin and cervical dilation occurs before completion of 37 weeks of gestation.[1] It remains a leading cause of neonatal morbidity and mortality globally, especially in low-resource settings where antenatal surveillance and early risk assessment are inadequate.[2] The etiological factors of preterm labor include endocrine imbalance, placental insufficiency, maternal infection, and genetic predisposition.[3] Despite advancements in obstetric management, prevention and early diagnosis remain difficult due to its multifactorial pathophysiology and variable clinical manifestations.[4] Infants born prematurely are at higher risk of respiratory distress syndrome, intracranial hemorrhage, enteric infection, and long-term neurodevelopmental delay, leading to increased familial and healthcare burden.[5]

Infectious pathology is recognized as a significant precipitating factor of preterm labor.[6] Even subclinical intrauterine infection can initiate biochemical cascades resulting in uterine contractility and cervical ripening.[6] Ascending microorganisms from the lower genital tract may invade the amniotic cavity and stimulate production of inflammatory mediators such as cytokines and prostaglandins, which induce premature uterine activity.[6] Multiple clinical and microbiological studies have established a strong correlation between bacterial infection and spontaneous preterm labor.[7] Systemic infections may further aggravate the immune response, facilitating premature delivery.[7] Bacterial endotoxins weaken fetal membrane integrity and increase prostaglandin production, thus causing preterm rupture of the membranes.[8] Therefore, early detection and antimicrobial treatment of infections are necessary to reduce infection-related preterm labor.

Among infective etiologies, urinary tract infection (UTI) is one of the most prevalent and clinically significant conditions in pregnancy.[9] Physiological and anatomical alterations such as urinary stasis, vesicoureteral reflux, and hormone-mediated smooth muscle relaxation predispose to bacterial proliferation.[10] The presence of pathogens within the urinary system provokes localized and systemic inflammatory responses, resulting in increased uterine irritability.[10] Clinical evidence indicates that untreated or recurrent UTI elevates the risk of preterm labor, intrauterine growth restriction, and

perinatal morbidity.[11] Screening for asymptomatic bacteriuria and timely antimicrobial management markedly reduce such complications.

In a study by Dheepthambiga G, et al. has shown that frequency of urinary tract infection was 30.1% in patients with preterm labour.[12]

Rationale for this research in Abbottabad lies in Abbottabad's unique maternal health profile and patterns of infection. Healthcare facilities there are often challenged to have pregnant females presenting in preterm labor, but the contributing role of urinary tract infection has been areas of unexplored research. Access to regular antenatal screening being limited, diagnostic practice differing, and uniform application of infection control being a challenge, further challenges timely diagnosis and control. Determination of urinary tract infection prevalence in women who deliver preterm in Abbottabad will facilitate determination of preventable causes, make antibiotic policy, and enhance maternal and neonatal outcome through evidence-based local application.

METHODOLOGY

This cross-sectional investigation was carried out in the Department of Obstetrics and Gynaecology at Ayub Teaching Hospital, Abbottabad, over a six-month period extending from October 2024 to March 2025. Approval for the research was obtained from the institutional ethical review committee prior to patient enrollment, ensuring compliance with ethical standards for clinical research. The study included a total of 127 participants. The required sample size had been calculated using the World Health Organization sample size calculator, based on a 95% confidence level, 8% margin of error, and an anticipated urinary tract infection prevalence of 30.1% among women with preterm labor.[12] Participants were recruited through a non-probability consecutive sampling approach to ensure comprehensive coverage of eligible cases during the study period.

Eligible participants were women aged between 18 and 40 years with a singleton pregnancy confirmed by ultrasonography and a gestational age of less than 37 completed weeks determined by the last menstrual period. Preterm labor was identified when uterine contractions occurred at a frequency of two or more within ten minutes, each lasting approximately thirty seconds and strong enough to cause progressive cervical effacement and dilation beyond four centimeters, verified through vaginal examination or ultrasonography. Women with known uterine or fetal anomalies, intrauterine fetal demise, or chronic systemic illnesses such as uncontrolled hypertension, diabetes mellitus, nephritis, or cardiac decompensation were not included. Those who had received prior antibiotic therapy were also excluded to eliminate confounding factors. Before data collection, each participant provided informed written consent after being briefed about the study's purpose, potential benefits, and confidentiality of information. Baseline demographic data were recorded using a predesigned proforma.

A midstream urine specimen was collected aseptically from each participant and sent to the hospital laboratory for microscopic and microbiological analysis. Urinary tract infection was diagnosed when either of the following findings was present: pyuria on urinalysis, defined as ≥10 white blood cells per cubic millimeter or ≥5 white blood cells per high-power field, or a positive urine culture yielding a single bacterial species with a colony count of ≥5 × 10^4 colony-forming units per milliliter. All data were entered and analyzed using IBM SPSS version 26. Continuous variables were presented as mean ± standard deviation, while categorical variables were described in frequencies and percentages. Urinary tract infection was further stratified by demographic and obstetric parameters to identify significant associations. The chi-square test was applied post-stratification, and a p-value of ≤0.05 was considered statistically significant.

RESULTS

The study enrolled 127 patients with a mean age of 29.32±5.99 years and mean gestational age of 32.91±2.11 weeks. The mean parity was 1.57±1.34, mean BMI was 25.07±1.36 Kg/m^2, and mean duration of preterm labor was 10.17±3.14 hours. Regarding residential distribution, 75 patients (59.1%) were from rural areas while 52 (40.9%) were from urban areas. Socioeconomic stratification revealed that 51 patients (40.2%) belonged to poor socioeconomic status, 53 (41.7%) to middle class, and 23 (18.1%) to rich class (as shown in Table-I).

Table I

Patient Demographics

Demographics	Mean ± SD
Age (years)	29.32±5.99
Gestational Age (weeks)	32.91±2.11
Parity	1.57±1.34
BMI (Kg/m^2)	25.07±1.36
Duration of PTL (hours)	10.17±3.14
Residential Status	
Rural n (%)	75 (59.1%)
Urban n (%)	52 (40.9%)
Socioeconomic Status	
Poor n (%)	51 (40.2%)
Middle n (%)	53 (41.7%)
Rich n (%)	23 (18.1%)

The frequency of urinary tract infection among patients presenting with preterm labor showed that 50 patients (39.40%) tested positive for UTI while 77 patients (60.60%) were negative (as shown in Table-II).

Table II

Frequency of Urinary Tract Infection in Patients Presenting with Preterm Labor

Urinary Tract Infection	Frequency	% age
Yes	50	39.40%
No	77	60.60%
Total	127	100%

Stratified analysis demonstrated no significant association between UTI and age groups, with 29 patients (38.7%) aged ≤30 years and 21 patients (40.4%) aged >30 years testing positive (p=0.846). Gestational age showed a statistically significant association, where none of the patients with gestational age ≤30 weeks had UTI compared to 50 patients (42.0%) with gestational age >30 weeks (p=0.022). Parity showed no significant association, with 45 patients (39.8%) having parity ≤3 and 5 patients (35.7%) having parity >3 testing positive for UTI (p=0.784). Residential status demonstrated a significant association, with 36 rural patients (48.0%) and 14 urban

patients (26.9%) having UTI (p=0.017). Socioeconomic status showed no significant association, with 26 poor patients (51.0%), 16 middle-class patients (30.2%), and 8 rich patients (34.8%) testing positive for UTI (p=0.084) (as shown in Table-III).

Table III

Association of Urinary Tract Infection with Demographic Factors

Demographic Factors		Urinary Tract Infection		p-value
		Yes n(%)	No n(%)	
Age (years)	≤30	29 (38.7%)	46 (61.3%)	0.846
	>30	21 (40.4%)	31 (59.6%)	
Gestational Age (weeks)	≤30	0 (0.0%)	8 (100.0%)	0.022*
	>30	50 (42.0%)	69 (58.0%)	
Parity	≤3	45 (39.8%)	68 (60.2%)	0.784*
	>3	5 (35.7%)	9 (64.3%)	
Residential Status	Rural	36 (48.0%)	39 (52.0%)	0.017
	Urban	14 (26.9%)	38 (73.1%)	
Socioeconomic Status	Poor	26 (51.0%)	25 (49.0%)	0.084
	Middle	16 (30.2%)	37 (69.8%)	
	Rich	8 (34.8%)	15 (65.2%)	

***Fischer Exact Test**

DISCUSSION

The present study revealed that 39.40% of patients presenting with preterm labor had urinary tract infection, indicating a substantial burden of UTI in this high-risk obstetric population. This considerable frequency can be attributed to the physiological changes during pregnancy, including urinary stasis due to progesterone-induced smooth muscle relaxation and mechanical compression of the ureters by the gravid uterus, which create an environment conducive to bacterial colonization and ascending infection. The finding that gestational age greater than 30 weeks was significantly associated with UTI presence suggests that as pregnancy advances, the increasing size of the uterus leads to more pronounced ureteral compression and bladder displacement, thereby facilitating bacterial growth and infection development. The significant association between rural residential status and higher UTI frequency can be explained by limited access to clean water, poor sanitation facilities, inadequate hygiene practices, and reduced availability of antenatal care services in rural settings compared to urban areas. The lack of significant association with age and parity indicates that UTI in preterm labor is more dependent on environmental and anatomical factors rather than demographic characteristics. Although socioeconomic status showed a trend toward higher UTI rates in the poor category, the lack of statistical significance may reflect the complex interplay between multiple socioeconomic factors, though poverty generally correlates with compromised nutritional status, reduced healthcare-seeking behavior, and limited access to clean water and sanitation, all of which predispose to urinary tract infections.

The frequency of urinary tract infection in the present study was 39.40%, which closely aligns with the findings of Hameed N et al. who reported a UTI prevalence of 41.5% in women presenting with preterm labor [13] demonstrating remarkable consistency in the Pakistani population. This similarity can be attributed to comparable healthcare infrastructure, socioeconomic conditions, and patient demographics. Similarly, Ghunage V et al. reported a 34% prevalence of urogenital infections in preterm labor cases [14] while Dheepthambiga G et al. found a UTI prevalence of 30.1% [12] both in reasonable proximity to our findings. The slightly lower rates in these Indian studies may reflect differences in diagnostic criteria or variations in population characteristics across different regions.[15] In contrast, Aleem S et al. reported a lower frequency of asymptomatic bacteriuria at 27.83% [16] which is expected since this represents only a subset of total UTI cases excluding symptomatic infections. Aslam I et al. reported a considerably lower overall UTI prevalence of 28% in their general pregnant population [17] which is understandable as their study included all pregnant women rather than specifically those presenting with preterm labor. The significantly lower UTI incidence of 19% reported by Kerure RD et al. [18] can be explained by their inclusion of pregnant women across all trimesters rather than focusing exclusively on preterm labor cases.

The present study found a significant association between gestational age greater than 30 weeks and UTI presence, with 42.0% of patients beyond 30 weeks having UTI compared to none at or below 30 weeks. This finding contrasts with Hameed N et al. who reported no significant difference across gestational age groups [13] which may reflect differences in sample size or stratification cutoff points. The significant association between rural residential status and higher UTI frequency in our study, with 48.0% of rural patients having UTI compared to 26.9% of urban patients, strongly correlates with Dheepthambiga G et al. who reported that 91.8% of UTI cases were from rural backgrounds [12] reinforcing the critical role of environmental and healthcare access factors. This rural predominance can be attributed to limited access to clean water, inadequate sanitation facilities, and delayed antenatal care in rural settings.

The lack of significant association between age and UTI in the present study aligns with Hameed N et al. [13] suggesting that UTI in preterm labor is relatively age-independent. However, this contrasts with Aslam I et al. who reported that 40% of UTI cases occurred in women younger than 20 years [17] reflecting different population characteristics. The present study also found no significant association between parity and UTI, which differs from Dheepthambiga G et al. who reported that multiparous women were more affected [12] and Kerure RD et al. who found 56% of UTI cases in primigravida women.[18] Although socioeconomic status showed a trend toward higher UTI rates in the poor category at 51.0%, the lack of statistical significance contrasts with Dheepthambiga G et al. who found 75.9% of UTI cases in low socioeconomic status [12] likely due to more evenly distributed socioeconomic representation in our sample. The

pathophysiological mechanism linking UTI to preterm labor is supported by Muthoharoh N et al. who demonstrated that UTI increases the risk of imminent preterm labor by 23-fold [19] and Rafique S et al. who found that 29.59% of women with second-trimester UTI delivered preterm [20] emphasizing that infection triggers inflammatory mediators and prostaglandin release that initiate premature uterine contractions.

Various limitations are present in the current study that must be taken into account. First, due to the fact that this is a single-center study with participation at a single hospital, the result is not necessarily transferable to the larger group, as geographic variations in health practices, patient populations, and environmental exposures might have affected findings. Second, due to the cross-sectional study design, we are not able to establish temporal association and causality regarding the onset of preterm labor with urinary tract infection. Third, we did not evaluate specific causative organisms or antimicrobial susceptibility patterns, which would have been interesting information for targeted approaches to treatment. Furthermore, putative confounding variables like a past history of UTI, gestational diabetes mellitus, hypertensive diseases, and pre-presentation antibiotic exposure were not tested and could have affected findings observed associates.

CONCLUSION

This study has confirmed that urinary tract infection is highly prevalent among patients presenting with preterm labor, representing a significant obstetric concern that requires urgent attention. The findings demonstrate that UTI occurrence is significantly influenced by gestational age and residential status, with rural patients being disproportionately affected compared to their urban counterparts.

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