

A Prospective Comparative Study of Asymptomatic and Symptomatic Bacteriuria in Pregnant Women: Maternal and Fetal Outcome

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Abstract:

Introduction and background:

Urinary tract infection (UTI) is a widely prevalent condition in developing countries like India. Urinary tract infections have a global annual incidence of 150 million cases. Around 40% of women and 12% of men experience at least one symptomatic UTI episode in their lifetime, and at least 40% of affected women have recurrent UTI. The overall prevalence of UTI in India was found to be 34.91%¹. UTI prevalence in pregnant women ranges from 3- 24% in India². These occur primarily due to anatomical and physiological changes in the genitourinary tract in pregnancy. The prevalence of asymptomatic bacteriuria has been estimated to range from 2% to 10%³ in various studies globally.

Methods: This was a prospective, cross-sectional, comparative study done at a Tertiary Care Hospital –GMH, Tirupati, Andhra Pradesh, India – A Tertiary Care Center equipped with all necessary facilities.

Duration: 1year, from the date of approval of the institutional ethical committee.

Results: In the current study, we assessed maternal outcomes and fetal outcomes in pregnant women with urinary tract infection. The maternal complications in pregnant women with UTI were anemia in 38%, preterm labor in 28%, PROM in 13%, PPROM in 15%, IUGR in 16%, PIH in 10% and 11% had developed puerperal pyrexia.

Fetal outcomes in pregnant women with UTI were Low birth weight and NICU admissions were increased in pregnant women with UTI compared to pregnant women without UTI.

Conclusion: UTI in pregnancy leads to various harmful maternal and fetal outcomes, Adverse outcomes can be prevented with appropriate antibiotic therapy. So, all pregnant women should be routinely screened for bacteriuria at regular intervals. Public educational programs on maintaining proper personal hygiene and good environmental sanitation habits can mainly decrease UTI incidence, especially in India.

Key words: Pregnant women, Bacteriuria, maternal outcome, fetal outcome.

Date of Submission: 21-07-2022

Date of Acceptance: 05-08-2022

I. Introduction

Urinary tract infection (UTI) is a widely prevalent condition in developing countries like India. Urinary tract infections have a global annual incidence of 150 million cases. Around 40% of women and 12% of men experience at least one symptomatic UTI episode in their lifetime, and at least 40% of affected women have recurrent UTI.

The overall prevalence of UTI in India was found to be 34.91%¹. UTI prevalence in pregnant women ranges from 3- 24% in India². These occur primarily due to anatomical and physiological changes in the genitourinary tract in pregnancy. The prevalence of asymptomatic bacteriuria has been estimated to range from 2% to 10%³ in various studies globally.

Various factors, likely anatomical differences, hormonal changes, and behavioral patterns, make UTI predominantly a disease affecting females. Progesterone released in pregnancy causes relaxation of ureteric smooth muscle leading to upper urinary tract dilation and growing uterus displacing bladder superiorly and anteriorly causing bladder emptying impairment thereby stasis of urine causing bacterial organisms to colonize

and multiply^{4,5}.

The physiological rise in plasma volume decreases urine concentration and condensation of glucose; amino acids encourage bacterial growth⁶ during pregnancy. Also, an already shorter female urethra (3-4cms) increases urinary tract infection frequency in pregnancy.

UTI is of two types: Asymptomatic bacteriuria and Symptomatic bacteriuria⁷- Asymptomatic bacteriuria refers to the presence of bacteriuria with no symptoms.

Symptomatic bacteriuria can be uncomplicated or complicated. Uncomplicated UTI refers to the presence of a normal genitourinary tract along with urgency, frequency, dysuria, or suprapubic pain in women. Complicated UTI refers to the presence of functional or structural abnormalities of a woman's genitourinary tract, which interferes with the normal flow of urine or voiding mechanisms and urinary tract defensivemechanisms.

Symptomatic UTI is also classified depending on the part of the genitourinary tract affected. In Upper UTI, the location of infection is the kidney (pyelonephritis). Lower UTI where the site of infection can be bladder (cystitis) or urethra (urethritis).

All patients with urinary tract disease have a positive urine culture diagnosed based on the presence of >100000 colonies per millimeter of a single organism in a clean-catch midstream urine sample.

Pregnant women are at increased risk of recurrent bacteriuria. 30 to 40% of these pregnant women will develop symptomatic UTI without treatment. By treating asymptomatic bacteriuria in pregnant women, the risk of developing symptomatic UTI can be reduced by 70 to 80%⁸.

UTI is usually associated with adverse maternal and fetal outcomes like preterm birth, low birth weight infant, perinatal mortality, and sepsis.

Despite the rise in hospital-based ante-natal checkups and more deliveries in hospitals compared to home, which has significantly reduced maternal and fetal morbidity and mortality. Maternal and fetal deaths due to complications from urinary tract infection still occur, which should ideally be prevented. Pregnant women with urinary tract infections, if untreated, can result in severe consequences that are causing maternal and fetal morbidity^{9,10}.

It can cause maternal anemia, pregnancy-associated hypertension^{1,2}, abortion, pyelonephritis in late pregnancy³, septicemia, chronic renal failure, pulmonary insufficiency, and even maternal death. It can also cause intrauterine growth restriction, premature rupture of membranes, preterm labor, low birth weight babies, and fetal death.

It can be prevented by screening for asymptomatic bacteriuria. The Infectious Diseases Society of America (IDSA) and The American College of Obstetricians and Gynecologists (ACOG) guidelines recommend universal screening and treating asymptomatic bacteriuria among pregnant women. With the increasing incidence of extended-spectrum beta-lactamase (ESBL) infections in the community, the cost of treating a urinary tract infection is more compared to screening and treating for asymptomatic bacteriuria. Screening of all pregnant women for the presence of asymptomatic bacteriuria and effective antimicrobial therapy for those with positive urine culture not only reduce progression to symptomatic UTI in later life but also decreases maternal and fetal morbidity.

The reason for choosing this study is that we could determine the adverse maternal and fetal outcomes due to UTI. This helps us prevent these outcomes by accurate detection and on-time treatment for all patients.

PHYSIOLOGICAL AND ANATOMICAL CHANGES IN PREGNANCY AND LINK WITH UTI:

Dilatation of the pelvicalyceal system and ureters start as early as the 6th week of pregnancy, often greater on the right side compared to the left side, causing physiological hydronephrosis and hydroureter. This peaks at 22-26 weeks (80%) and continues to persist till delivery¹¹.

The reason for hydronephrosis and hydroureter is the mechanical compression effect of the gravid uterus. Progesterone-induced smooth muscle relaxation also has a role.

Increased progesterone and estrogen levels during pregnancy lead to decreased ureteral, bladder, and urethral tone and decrease ureteric peristalsis.

Increased plasma volume during pregnancy decreases urine concentration and increases bladder volume. Also, incomplete emptying of the bladder causes a rise in residual urine volume of around 20ml. Increased urinary stasis and vesicoureteric reflux and may facilitate ascending migration of bacteria, thereby increasing the risk of UTI¹². The renal medulla has a hypertonic environment that inhibits leukocyte migration, phagocytosis, and complement activity predisposing to infection.

Increased alkalization of urine by increased excretion of bicarbonates also enhances colonization of the urinary tract by uropathogens¹³. Alteration in the chemical composition of urine in pregnancy with elevated glucose and amino acid levels causing glycosuria, aminoaciduria can facilitate bacterial growth.

In pregnancy, immune response modulation occurs from a cell-mediated immunity to a humoral response. This mechanism does not solely rely on recognizing cell surface MHC proteins, leading to inefficient responses to

bacterial cell surface proteins¹⁴.

II. Aim and Objectives

AIM:

To compare obstetrical outcomes of asymptomatic and symptomatic bacteriuria pregnant women along with pregnant women without urinary tract infection at a tertiary care center.

OBJECTIVES:

- To compare the maternal outcomes of asymptomatic and symptomatic bacteriuria among pregnant women with Urinary tract infection.
- To compare the fetal outcomes of asymptomatic and symptomatic bacteriuria among pregnant women with Urinary tract infection.
- To find out and isolate organisms causing urinary tract infection in pregnancy and ascertain antibiotic susceptibility patterns.

III. Materials and Methods

Study type, duration, and place:

This was a prospective, cross-sectional, comparative study done at a Tertiary Care Hospital –GMH, Tirupati, Andhra Pradesh, India – A Tertiary Care Center equipped with all necessary facilities.

Duration: 1 year, from the date of approval of the institutional ethical committee.

INCLUSION CRITERIA:

- Pregnant women >20 weeks attending our tertiary care center both inpatients and outpatients with or without symptoms of urinary tract infection.
- Pregnant women who are not taking any antibiotic treatment for any cause.
- Pregnant women willing to give consent and are willing for follow-up till delivery.

EXCLUSION CRITERIA:

- Pregnant women with underlying renal pathology, renal calculi, chronic renal disease.
- Pregnant women with diabetes mellitus, hypertension, under any immunosuppressant therapy or on antibiotic treatment.
- Pregnant women with any other infection / medical illness.

SAMPLE SIZE:

200 pregnant women includes 100 pregnant women with UTI and 100 pregnant women without UTI. In pregnant women with UTI, each 50 cases of pregnant women with asymptomatic bacteriuria and symptomatic bacteriuria were included.

Study subjects: Pregnant women who come under the inclusion criteria and given consent were taken into the present study in Government Maternity Hospital, Tirupati.

Complete clinical workup was done for all the patients, which include:-

- Demographic details – name, age, address, socioeconomic status, literacy, occupation are taken.
- Obstetrical, menstrual and medical history, relevant past and family history were taken.
- General physical examination, Vital data, Systemic examination recorded.
- Per abdominal examination
- Routine blood investigations- blood grouping typing, HIV, Hbs Ag, hemoglobin levels, random blood sugar levels blood urea, serum creatinine.
- Urine sample collection – urine albumin and sugar, urine microscopy, urine culture, and sensitivity.

METHOD OF COLLECTION OF SPECIMEN:

Specimen collection:

Early morning clean catch mid-stream urine specimens were collected from pregnant women in a sterile wide-mouthed bottle with the lid after explaining the technique of urine sample collection.

Procedure:

Urine samples collected from pregnant women are labeled with name, number, date, and transported to the laboratory as early as possible. Urine samples were cultured within 4 hours. The urine samples were inoculated on dried plates of blood agar, Macconkey agar by the standard loop method which could carry 0.01 ml of urine. The plates are incubated aerobically for 24 hours at 37°C.

The data from Clinical microbiology on urine and blood culture characteristics were collected for assessing the antimicrobial susceptibility pattern.

The plates are examined to identify the organisms by appearance and morphology of colonies. The antimicrobial susceptibility of these organisms, which are relatively safe to be prescribed in pregnancy, likely Nitrofurantoin, Ampicillin, Amoxicillin with Clavulanic acid, Cefotaxime, Ceftazidime, Amikacin, Gentamicin, and Imipenem was tested by standard Kirby Bauer disc diffusion test.

Samples that showed a bacterial count of $>10^5$ colony forming units per ml of a single organism were labeled as culture-positive cases. If no growth is detected, incubate the plates for another 24 hours before issuing a negative report. Samples showing colony counts $<10^5$ colony forming units/ml were labeled as culture-negative groups and considered controls.

All the pregnant women diagnosed as culture-positive were given treatment with appropriate antibiotics. Urine culture is repeated after two weeks of completion of antibiotic therapy. If any woman has the persistence of bacteriuria, another course of proper antibiotics is given. All the women were followed up till delivery and one week post partum.

Ethical considerations:

We took permission from the Institutional ethical committee attached to SVMC before conducting the study. We explained to every woman the whole process and advantages of the study. After she accepted, we gave an informed consent form in the local language or parent or guardian understandable language. The person was asked to sign it or put a thumb impression. The procedure for assessing study parameters had minimal interference. We told them that their information was kept confidential. All women were informed that their participation was purely voluntary and of free will. Data was entered into M.S.- Excel and analyzed by using SPSS software. We represented descriptive statistics with frequencies and percentages.

IV. Results:

UTI in pregnancy leads to various harmful maternal and fetal outcomes.

Our study's most common maternal morbidity was anemia, followed by Preterm labor.

In our study, there are no significant differences in maternal anemia, PROM, PPRM, PIH, pyrexia, IUGR, maternal parity, neonatal APGAR score, and neonatal birth weight between pregnant women with symptomatic and asymptomatic bacteriuria, as per the obtained odds ratio and P-value. So, we are accepting the null hypothesis for this research as there is no significant difference between the two groups of women with UTI.

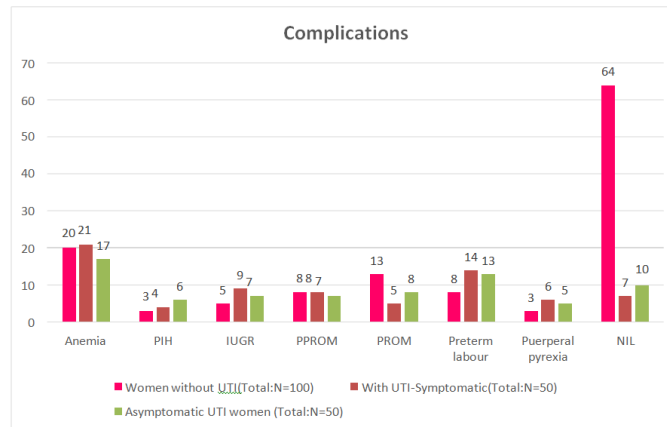
There is a significant difference in NICU admissions between symptomatic and asymptomatic mothers with UTI.

In our study, a statistically significant difference was observed in maternal anemia, PROM, PPRM, PIH, pyrexia, IUGR, maternal parity, neonatal APGAR score, NICU admissions, and neonatal birth weight between pregnant women with UTI and without UTI.

Maternal outcomes:

Table 1: Summary of Maternal Outcomes

Parameters	Women without UTI (Total: N=100)	With UTI- Symptomatic (Total: N=50)	Asymptomatic UTI women (Total: N=50)
Anemia	20(20%)	21(42%)	17 (34%)
PIH	3(3%)	4(8%)	6(12%)
IUGR	5(5%)	9(18%)	7(14%)
PPROM	8(8%)	8(16%)	7(14%)
PROM	13(13%)	5(10%)	8(16%)
Preterm labor	8(8%)	14(28%)	13(26%)
Puerperal pyrexia	3(3%)	6(12%)	5(10%)
NIL	64(64%)	7(14%)	10(20%)



Graph 1: Summary of Maternal Outcomes

Fetal outcomes:

Table 2: Summary of Fetal Outcomes

Parameters	Women without UTI (Total: N=100)	With UTI- Symptomatic (Total: N=50)	Asymptomatic UTI women (Total: N=50)
Preterm Delivery	14(14%)	15(30%)	11(22%)
APGAR Score < 7	7(7%)	9(18%)	7(14%)
Low Birth weight	9(9%)	14(28%)	11(22%)
NICU Admissions	6(6%)	15(30%)	6(12%)

V. Discussion

Urinary tract infections during pregnancy are known to be associated with adverse maternal and fetal outcomes as mentioned in various studies. However, by early detection and appropriate treatment, UTI is a preventable cause for adverse maternal and fetal outcomes. This study compared maternal and fetal outcomes in pregnant women with symptomatic and asymptomatic bacteriuria. Of 200 pregnant women involved in the study, 100 are not having UTI. Among 100 women with UTI, we have chosen 50 symptomatic and 50 asymptomatic women with UTI. We have compared various maternal and neonatal complications parameters, including demographic variables between pregnant women with UTI and without UTI, also between symptomatic and asymptomatic women with UTI.

Table 3: The comparison of incidences is shown with the Sabiha Naz¹⁵ study.

Pregnancy complication	Sabiha et al ¹⁵		Present study	
	Symptomatic	ASB	Symptomatic	ASB
Anemia	31%	42%	42%	34%
PIH	2%	8%	8%	12%
PPROM	13%	16%	16%	14%
Preterm labor	13%	26%	28%	26%
IUGR	11%	16%	18%	14%

Table 4: The comparison of incidences with another similar study.

Maternal outcome	Anjely pulparampil ¹⁶	Present study
	Sebastian study	
Anemia	32.5%	42%
PIH	11.8%	8%
PROM	2%	10%
PPROM	17.3%	16%
IUGR	18.3%	18%
Puerperial pyrexia	8.9%	12%

Table 5: comparison of fetal outcome with various other studies

Fetal outcome	Anjely pulparampil ¹⁶ Sebastian study	Sabiha et al ¹⁵		Present study	
		Symptomatic	ASB	Symptomatic	ASB
Low birth weight	30.6%	18%	22%	28%	22%

Preterm delivery	28.2%	13%	15%	30%	22%
Low APGAR	3.8%	17%	22%	14%	18%
NICU admission	25.8%	21%	40%	30%	12%

VI. Conclusion

UTI in pregnancy leads to various harmful maternal and fetal outcomes. It occurs due to anatomical changes, short urethra, easy contamination of urinary tract with fecal flora, immunodeficiency of pregnancy, and various other reasons.

Adverse outcomes can be prevented with appropriate antibiotic therapy. So, all pregnant women should be routinely screened for bacteriuria at regular intervals.

Public educational programs on maintaining proper personal hygiene and good environmental sanitation habits can mainly decrease UTI incidence, especially in India.

Knowing about the uropathogens of the patient population is beneficial in the management of patients and better planning of future medical treatments.

LIMITATIONS OF THE CURRENT STUDY

In this study, the sample size was 200, indicating that the study sample was small, and the primary limitation was the interpretation of results.

The symptoms seen in urinary tract infection are also seen in pregnancy and during labor, rendering it difficult to assess the symptomatic urinary tract infection.

Recommendations for future studies:

1. Studies on maternal UTI in gestational diabetes mothers can be done
2. Studies on UTI in pregnancy in women with uro-renal pathologies can be done
3. Meta-analysis of existing research could be done.
4. Systematic reviews and multi-center studies can be done which carry more scientific validity.

References

- [1]. Vr C, Athinarayanan, Mariselvam, Dhasarathan, Raja S. Epidemiology of urinary tract infection in south India. *Biomed Res Clin Pract* [Internet]. 2019 [cited 2021 Dec 23];4(3).
- [2]. Jayalakshmi J, Jayaram VS. Evaluation of various screening tests to detect asymptomatic bacteriuria in pregnant women. *Indian J Pathol Microbiol* 2008;51:379-81.
- [3]. Dwyer PL, O'Reilly M. Recurrent urinary tract infection in the female.
- [4]. *Curr Opin Obstet Gynecol* 2002;14:537-43.
- [5]. Schnarr J, Smaill F. Asymptomatic bacteriuria and symptomatic urinary tract infections in pregnancy. *Eur J Clin Invest*. 2008 Oct;38Suppl2:50-7.
- [6]. Kant S, Lohiya A, Kapil A, Gupta SK. Urinary tract infection among pregnant women at a secondary level hospital in Northern India. *Indian J Public Health* 2017;61:118-23
- [7]. Jeyabalan A, Lain KY. Anatomic and functional changes of the upper urinary tract during pregnancy. *Urol Clin North Am*. 2007 Feb;34(1):1-6.
- [8]. Sheiner E, Mazor-Drey E, Levy A. Asymptomatic bacteriuria during pregnancy.
- [9]. *J Matern Fetal Neonatal Med*. 2009 May;22(5):423-7.
- [10]. Smaill FM, Vazquez JC. Antibiotics for asymptomatic bacteriuria in pregnancy.
- [11]. In: *The Cochrane Library* [Internet]. John Wiley & Sons, Ltd; 2015 [cited 2018 Jul 23].
- [12]. Mazor-Dray E, Levy A, Schlaeffer F, Sheiner E. Maternal urinary tract infection: is it independently associated with adverse pregnancy outcome? *J Matern Fetal Neonatal Med*. 2009 Feb;22(2):124-8.
- [13]. Schieve LA, Handler A, Hershow R, Persky V, Davis F. Urinary tract infection during pregnancy: its association with maternal morbidity and perinatal outcome. *Am J Public Health*. 1994 Mar;84(3):405-10.
- [14]. Fried AM. Hydronephrosis of pregnancy: ultrasonographic study and classification of asymptomatic women. *Am J Obstet Gynecol*. 1979 Dec 15;135(8):1066-70.
- [15]. Kalita D, Deka S. Asymptomatic bacteriuria in pregnancy *The New Indian Journal of OBGYN*. 2015;2(1):8-19.
- [16]. Guntoory I et al. *Int J Reprod Contracept Obstet Gynecol*. 2018 Jan;7(1):80-87.
- [17]. Habak PJ, Griggs RP Jr. Urinary Tract Infection In Pregnancy. In: *Stat Pearls* [Internet]. StatPearls Publishing; 2021.
- [18]. Sabiha Naz, Priyanka Burdak, Vimla Dhakar et al. FETO Maternal Outcome in Patients with Urinary Tract Infection During Pregnancy. *Indian J Obstet Gynecol*. 2019;7(3):379-384. <http://repository-tnmgrmu.ac.in/11196/>