

# A Study on Reoccurrence of UTI in Indian Women

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**Abstract:** *Urinary tract infections (UTIs) are most commonly occurring bacterial infection of the urinary tract, mainly caused by the Escherichia coli. UTI takes place in both males and females; however, women are more at risk of developing UTI than men. One in two women suffers from a UTI at least once in her life. In women, recurrent UTIs present a challenging problem. Several factors such as sanitation, pregnancy, menstruation, use of contraceptives, sexual activity, etc. are mainly responsible for the development of a recurrent episode of UTIs. The treatment strategies including general approaches and Pharmacotherapy for UTIs should be based on the most recent guidelines, considering resistance patterns in the local community. This review article focuses on the most common factors involved in the development of UTI along with the prevention and treatment strategies. Further research is required concerning the fast diagnosis of UTI, precise probable identification of patients with resistant microorganism and development of new pharmacotherapy for recurrent UTI.*

**Keywords:** Urinary Tract Infection, Common Factor, Recurrent Episode, Treatment strategies, Antibiotic Resistance

## 1. Introduction

Urinary tract infection (UTI) is the most serious and challenging global health problem in the 21st century. It affects the different parts of the urinary tract and characterized as the presence of microbial pathogens in the urinary tract<sup>1</sup>. It is known as pyelonephritis when it affects the upper urinary tract whereas known as cystitis when it affects the lower urinary tract<sup>2</sup>. UTI is caused by a range of pathogens commonly microbial pathogens involved in the induction of UTI are Escherichia coli, Proteus mirabilis, Klebsiella pneumonia, Staphylococcus saprophyticus, and Enterococcus faecalis<sup>3</sup>. It is extensively reported that Escherichia coli (80-85%) is the commonest causative organism since it is usually present in the cell lining of the urinary tract and gastrointestinal tract<sup>4</sup>. As per the study, UTI is a significant cause of morbidity in males and females of all ages<sup>1</sup>.

### Prevalence

Several studies addressed that UTIs are some of the most common types of bacterial infections, affecting 150 million people each year worldwide<sup>5</sup>. National Institutes of Health reported that approximately eight million episodes of UTI occur in the USA each year<sup>6</sup>. Naber and colleagues reported that UTIs result in approximately 8.3 million visits to outpatient clinics, 1 million visits to emergency departments and 100,000 hospitalizations annually<sup>7</sup>. UTI takes place in both males and females, however, women are more at risk of developing UTI than men due to shorter urethra providing less of a barrier to ascending bacteria and their urethral orifice being situated closer to the anus<sup>8</sup>.

UTIs are one of the most frequent clinical bacterial infections in women than in men and occurs at a ratio of 8:1. Studies mentioned that 1 out of 3 women compared with 1 out of 20 men will experience UTI within their lifetime with a more susceptibility to re-infection<sup>9</sup>. According to research data, 1 out of 3 women requiring treatment for UTI before age 24<sup>10</sup> and approximately 50–60% of women experience a UTI incident in their lifetime<sup>9,11</sup>.

### Types

Clinically, UTIs are classified as uncomplicated or complicated types of UTI. Uncomplicated type of UTIs is differentiated into cystitis and pyelonephritis<sup>12,13</sup>. Studies

reported that uncomplicated type generally affects a healthy person who have no structural or neurological urinary tract abnormalities<sup>12,14,15</sup>. Moreover, research data indicated that Uncomplicated type of UTI infections commonly affects adult women across the complete age range, with the mean annual incidence of 15% and 10% in those aged 15-39 and 40-79 years, respectively. Studies reported that the diagnosis of the uncomplicated type of UTI can be achieved best by a systematic evaluation of patient symptoms with or without the addition of a urine dipstick test<sup>16</sup>.

On the other hand, complicated type of UTI generally associated with factors that compromise the urinary tract or host defence, including urinary obstruction, urinary retention caused by neurological disease, renal failure, renal transplantation, immunosuppression, pregnancy and the presence of foreign bodies such as calculi, indwelling catheters or other drainage devices<sup>17,18</sup>.

### Symptoms

Studies reported that in most of the cases the symptoms of UTI are depended on the area of urinary tract affected. Painful reaction at the starting of/or during urination suggests a urethral site of disease, whereas pain after voiding implies pathology within the bladder or prostate area<sup>19</sup>. In case of cystitis, patients generally present with any or all of the following symptoms such as cloudy urine, dysuria, abnormal urine odor, urinary frequency, urgency, gross hematuria, suprapubic discomfort<sup>20,21</sup>. On the other hand, Pyelonephritis usually causes fever, chills, nausea/vomiting, flank discomfort, malaise, and/or abdominal pain, with or without concomitant lower urinary tract signs<sup>20,21</sup>.

### Etiology or Factors affecting UTIs

A range of factors involves in the induction and development of UTIs. Studies addressed that the prevalence of infections increases due to some predisposing factors such as alterations to the host's natural defence system, anatomical and physiological factors, poor hygiene, pre-menopausal/menopausal factors, advancing age, sexual activity, use of contraceptive, prostate problems, obstruction, mechanical instrumentation such as catheterization etc<sup>2,7,22,23,24</sup>.

Apart from this, genetic factors also influence vulnerability to UTI<sup>25</sup>. Studies reported that the risk of developing UTI in the male is also increased by the intake of antibiotics two to

four weeks previously, possibly due to a change of the physiological vaginal flora<sup>26</sup>. In this review, we will discuss several factors those are major contributors to the development of UTIs.

### Sanitization

One of the most common cause for UTI infection is a low hygienic condition or in proper maintenance of sanitary conditions. Studies reported that in India unhygienic toilets, where the bacteria usually found are the most common places for the induction of UTI<sup>27</sup>. Akshara and colleagues reported that insufficient knowledge of women about menstrual hygiene may also predispose to UTI<sup>4</sup>. Menstrual hygiene is of a big concern among a large proportion of rural women in India. Younis and colleagues mentioned that menstrual hygiene is the key to avoid many mild to serious infections including UTI, reproductive tract infections, bad, etc<sup>27</sup>.

The current use of sanitary pads among Indian women is on the lower side as only (10-11%) compared to developed countries like the USA (73-90%)<sup>28</sup>. Data from various studies revealed in India that high cost, insufficient knowledge and lack of dumping facilities are the major barriers to use sanitary pads<sup>27</sup>. Studies in India reported that between 43%- 88% of girls are washing and reusing cotton cloth rather than using sanitary napkins<sup>29,30</sup>. Furthermore, it has been addressed that the reuse of material without proper cleaning of clothes which are not been adequately sanitized also leads to the development of Infection<sup>30</sup>.

### Pregnancy Factor:

The prevalence of asymptomatic and symptomatic bacteriuria among women during pregnancy is more often<sup>31</sup>. It is reported that during pregnancy the prevalence of asymptomatic UTI among women varies from 2% - 15% in comparison of symptomatic UTI. Studies reported that 50 % of Pregnant women have an incidence of asymptomatic bacteriuria and more prone to encounter pyelonephritis which may lead to more terrible consequences during pregnancy<sup>32,33</sup>. Research data revealed that pyelonephritis is more common during the second trimester of pregnancy<sup>33</sup>. Various studies explored the significance of risk factors like anemia, low economic level, past incidence of UTI and sexual activity in causing UTI among women during pregnancy<sup>34</sup>.

Research data indicated that hormonal changes during pregnancy are associated with the development of UTI. Vasudevan (2015), systematically investigated the rate of prevalence and the outcome of asymptomatic bacteriuria during pregnancy using model studies<sup>31</sup>. Study results revealed that the incidence of the infection to be 56% among women during pregnancy and the frequency was up to 50% during the second trimester among the pregnant women. UTI is a consequence of poor diagnosis during pregnancy and this, in turn, enhances the chances of infection and pregnant women under such situations are more vulnerable to serious complication<sup>31</sup>.

It is very well known that pregnancy is associated with various anatomical alterations in women followed by hormonal and physical changes which raise the possibility of

urinary retention which in turn causes the backward flow of urine from the bladder to the ureter. This because of physical irregularities increases the incidence of UTI among women during pregnancy<sup>35</sup>.

Researchers have stated that the incidence of the UTI during pregnancy may be related to the socio-economic status of the woman as the poor group woman was more susceptible to the infection<sup>35</sup>. Being a developing country with large rural population, India has a large number of women in the childbearing age group with low socioeconomic status, owing to the lack of education and alertness of UTI<sup>36</sup>. These women tend to neglect minor symptoms and finally face complications like premature births, low birth weight and increased perinatal mortality<sup>36</sup>.

### Intercourse during menstruation

Research data evidenced that development of UTI in healthy premenopausal women seems to be associated with several behaviors. The literature reported that intercourse or sexual activity is also contributed to the development of UTIs. Moreover, it is reported that the incidence of UTI increases with age and sexual activity<sup>37</sup>. Sexual activity eases the entry of micro-organisms in the urinary tract results in UTI<sup>38</sup>. Buckley and Colleagues reported that approximately 30% of women have at least one log increase in bacteria in the bladder immediately following sexual intercourse.

Further, it is reported that frequency of sexual activity of women in the past month is also an independent risk factor for the development of UTI and these women are six times more likely to get infection<sup>39</sup>. Moreover, a woman with a new sexual partner in the previous year also has a high chance of getting UTI infection<sup>39</sup>.

### Use of contraceptives

Studies reported that the use of contraceptive during intercourse or after sexual activity is also a responsible factor involved in the development of the UTI. **Research data indicated a dose-response relationship between UTI infection and frequency of spermicidal use**<sup>40</sup>. Gupta and Colleagues reported **an increased vaginal pH and increased** colonization with a potential microorganism, mainly *E. Coli in women who use spermicides for birth control*<sup>40</sup>. Moreover, these women have five-time greater rate of UTI infection compared with women who do not use spermicides.

Several other studies reported that diaphragm use may also involve in the development of infection, irrespective of the simultaneous use of spermicide<sup>41</sup>. However, most diaphragm users also use spermicide it is difficult to compute the extra risk attributable to the diaphragm. The condom or birth control pill without spermicide is not associated with increased urinary infection<sup>41,42</sup>.

### Menopause

The incidence of UTI in women increases with advancing age. Studies reported that bacteriuria mostly occurs in approximately 10%–15% of women of aged 65–70 years and in 20%–50% of women aged over 80 years<sup>43</sup>. Moreover, these numbers are higher than the 5% rate of bacteriuria reported in premenopausal women. Studies reported that

hormonal changes such as menopause and loss of estrogen are accountable for the high prevalence of UTI in older women<sup>44</sup>.

Research Data indicated a strong relationship between anatomical and functional alterations of bladder emptying and recurrent UTI in a group of 149 postmenopausal women study<sup>45</sup>. The results of a placebo-controlled, double-blind study indicated a strong relationship between decreased post-menopause estrogenic hormone levels and the development of UTI<sup>46</sup>. With estrogen loss, the system ability to resist bacterial colonization is reduced making it liable to infection<sup>44</sup>.

It is extensively reported that estrogens prevent Enterobacteriaceae-mediated vaginal colonization by stimulating proliferation of *Lactobacillus* in the vaginal epithelium resulting in decrease vaginal pH<sup>47</sup>. Minardi and colleagues reported a significant reduction in estrogen secretion by the ovary post-menopause, which is frequently associated with vaginal atrophy<sup>47</sup>. The biological changes due to menopause results in women at high risk of getting both primary and recurring UTIs because, in the absence or loss of estrogen, the volume of the vaginal muscles decreases, the walls of the urinary tract become weak and as such it reduces its ability to resist bacteria colonization<sup>44, 47</sup>.

#### Prevention and Management:

Prevention and management approaches for Genitourinary tract infection includes, improving knowledge of genitourinary tract physiology, reasons for genitourinary infections, complications and proper health habits such as personal hygiene, drinking plenty of water which flush out the bacteria out of the urinary tract, emptying bladder completely soon as feel the urge, wear cotton undergarments, changing sanitary pads frequently during Menstruation<sup>4</sup>.

#### General Approaches

The gold standard for the diagnosis and treatment of a UTI in patients is the detection of the pathogen in the presence of clinical symptoms. Patients should be advised and encouraged to drink adequately amount of fluids (2-3 liters in a day) and to urinate regularly to help flush bacteria from the bladder, since holding urine for a long time allows bacteria to multiply within the urinary tract, resulting in cystitis. Moreover, preventive measures related to sexual intercourse may reduce the recurrence rate.

Moreover, several studies also reported that women should be encouraged to clean the genital areas before and after sexual activity, which will reduce the spread of micro-organism from the perigenital area to the urethra<sup>42</sup>. Avoiding multiple sexual partners will reduce the risk of UTIs. Further, Women are encouraged to avoid the use of spermicidal contraceptives, vaginal douching and diaphragms, which may irritate the vagina and urethra and ease the entry and colonization of microorganism within the urinary tract. Besides these, exposure of genital area to several skin allergens, such as bubble bath oils, bath liquids, vaginal lotions and creams, deodorant soaps or sprays are better to avoid as they may alter vaginal flora and result in UTIs<sup>48</sup>.

#### Pharmacological Treatments

The basic treatment of UTI starts with antimicrobial therapy and there are a lot of choices available, but before proceeding for the treatment the principles of antimicrobial therapy should be clear<sup>16</sup>. A large number of antibiotics are available for treating UTIs but alteration in antibiotic sensitivities make suitable empiric treatment a moving target over time<sup>49, 50, 51, 52, 53, 54</sup>. Antimicrobial therapy is the main treatment for UTIs, with the main objective to eradicate bacterial growth in the urinary tract through an efficacious, safe and cost-effective antimicrobial agent. This objective can be achieved within a short period of time if the concentration of antibiotics is maintained at enough urine levels<sup>55</sup>.

The selection criteria for most effective antibiotic agent depend on a patient's pattern of resistance, adverse effects, interaction with drugs, cost, the vulnerability of the causative bacteria, the concentrations of uropathogens in the urine and the urinary complaint. This is important to consider when there is septicemia or parenchymal infection, as antimicrobials are usually at higher levels in the urine than in serum<sup>51</sup>. Studies reported that penicillin and cephalosporins are considered safe antimicrobial treatment during pregnancy. However, trimethoprim, sulphonamides, and fluoroquinolones should be avoided<sup>56</sup>. Oral antibiotic therapy resolves 94% of uncomplicated UTIs, although recurrence is not uncommon.

#### Govt Schemes/ Awareness Programme

Various awareness schemes have been launched by Govt to restrict the prevalence of UTI, especially in the rural region of India. A general discussion was held between woman suffering from uncomplicated UTI and counselor to inform about the possible recurrences and the relationship between UTI and possible reason. Asking a patient about her own conception of the illness may improve mutual understanding.

The Menstrual Hygiene Scheme (MHS) from the Government of India aimed at adolescent girls. This agency conducted several awareness programs mostly in a rural area, so women may have adequate knowledge and information about menstrual hygiene. Reproductive and Child Healthcare scheme launched under (Reproductive and Child Health) RCH-2 component<sup>57</sup>. This scheme supplied sanitary napkins to cover 1.5 crore adolescent (10-19) girls in 152 districts across 20 states<sup>57</sup>. The supply of sanitary napkins in total 107 districts was envisaged initially in a central supply mode and rest 45 districts through Self Help Group (SHG) mode<sup>57</sup>.

## 2. Conclusion

UTIs are one of the most common bacterial infections seen in primary care. Women with UTIs need to be appropriately examined by using several techniques such as urinalysis, urine cultures and other radiological techniques to rule out possible causes of recurrence, as well as to assess possible anatomical or functional urinary tract abnormalities. Standard UTI therapy starts with antimicrobial therapy, however, alternative strategies / approaches also required to reduce high exposure to antibiotics and eradicate bacterial

infection quickly. Though there is a lot of research already focused on UTI pathophysiology, risk factors, and treatment strategies, there are still many problems that need to be studied.

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