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Recurrence of Urinary Tract Infections in Women: Risk Factors and Clinical Profile

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Abstract

Background: UTI is the most common bacterial infection in women. In spite of appropriate first-line treatment, recurrence rates do remain high.

Objective: It is important to identify risk factors, clinical patterns, and preventive measures against recurrence of UTI in women.

Methods: It was a prospective observational study to identify the recurrence rates, pattern of microbes involved, and other contributing factors to recurrence in females with UTI.

Results: Behavioral, anatomical, and microbiological factors were associated with the incidence of recurrent UTI; Escherichia coli remained the predominant pathogen. The characteristics of recurrence and its associated risk factors are summarized in the following two tables.

Conclusion: Recurrent UTI is one of the big clinical problems in women; thus, its prevention has to be complex, including behavioral modification, timely diagnosis, and individualized prophylactic therapy.

Keywords: Urinary tract infection, recurrent UTI, women, Escherichia coli, risk factors, prophylaxis, reinfection, relapse

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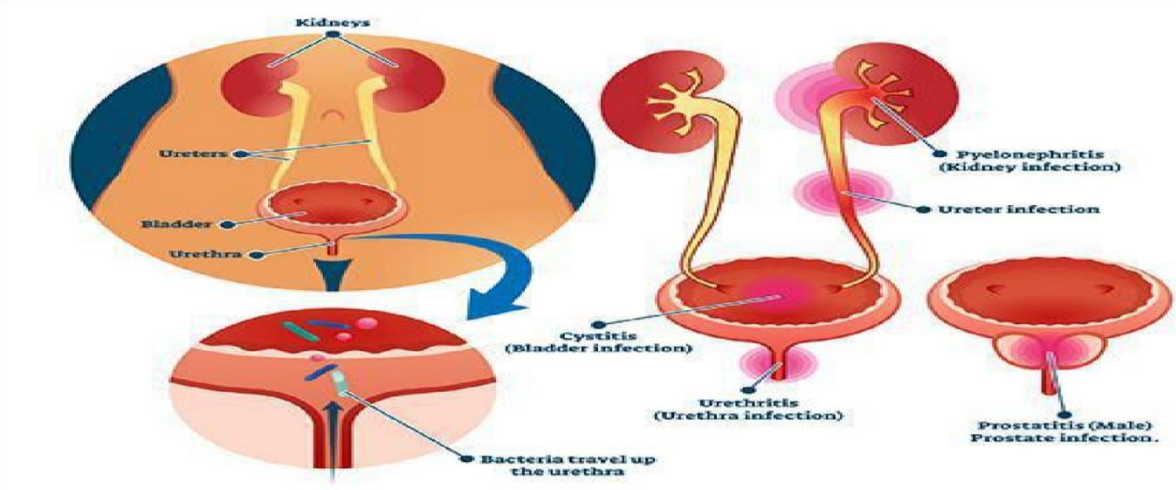
Introduction

On a hot summer's day, one may prefer a beer to just drinking plain water. A variation could be an energy drink, especially when one is engaging in strenuous exercise [1]. Most consumers have now started finding refreshment in sports drinks and other functional beverages. UTI is a significant health problem affecting millions of women throughout the world each year [2]. The estimated lifetime prevalence is more than 50% of all women, while almost one-third of women report that they experienced at least one episode requiring medical intervention in their early years as adults. Most acute UTIs are easily treated with short-term courses of antibiotics, yet the rate of recurrence has remained high [3].



Recurrent UTI generally refers to two or more infections within six months or three or more infections within one year. This condition places a heavy burden on patients and health care systems owing to the need for several doctor visits, repeated diagnostic studies, courses of antibiotics, and impaired quality of life [4]. Conditions that place women at risk for recurrent UTIs include frequent sexual intercourse, the use of spermicides, inadequate hydration, and postponed post-coital voiding [5]. Other anatomical or functional conditions that enhance the risk of recurrence include urinary stasis, pelvic organ prolapse, bladder dysfunction, and incomplete emptying. Besides these, hormonal changes in menopause are associated with a reduction in levels of estrogen leading to atrophic urogenital mucosa and reduced

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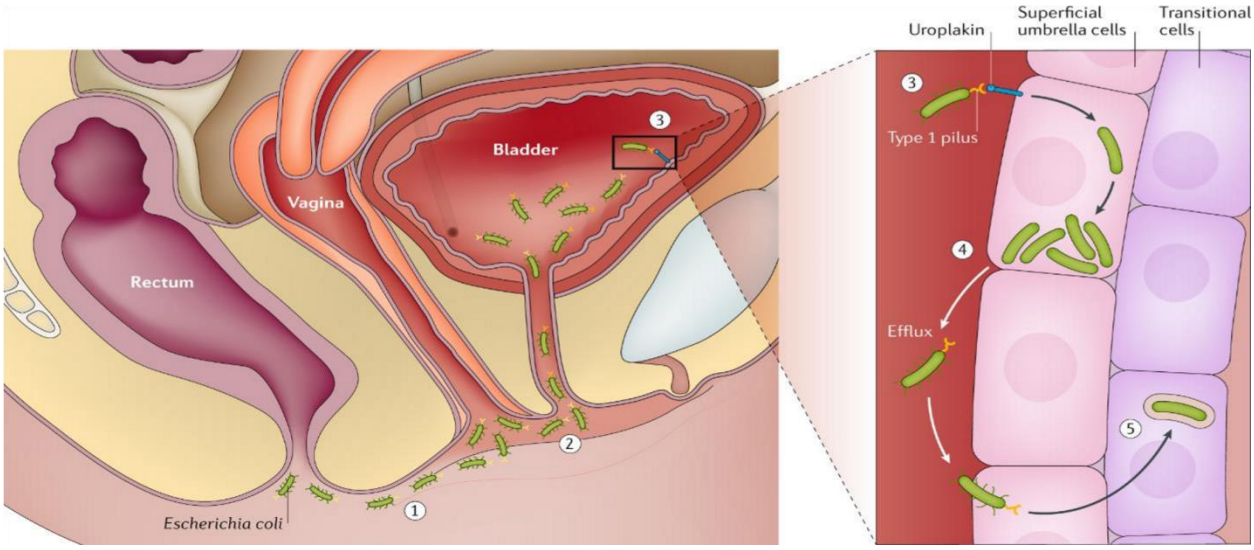
colonization by lactobacilli-conditions known to predispose to bacterial colonization and subsequent infection [6]. Microbiologically, most recurrences are due to uropathogen Escherichia coli strains that possess specific virulence factors like adhesion, invasion, and persistence within the urinary tract [7]. Whereas some of these recurrences are estimated as relapse due to a persisting bacterial reservoir, others are regarded as reinfection brought about by new strains of bacteria. The differentiation between these two forms is very important in the proper application of different prevention strategies [8].



Prevention of recurrences ranges from behavioral modification and hydration to antibiotic prophylaxis to non-antibiotic-based therapies, including probiotics, cranberry products, and topical estrogen in postmenopausal women [9]. These notwithstanding, recurrence is common, and thus further investigation into risk stratification and prevention is necessary This current study investigates the factors that can be associated with recurrence among women, describes patterns of clinical and microbial features, and outlines strategies for prevention that could decrease recurrence [10]. The study helps in the understanding of rUTI through the systematic reassessment of patient demographics, risk factors, and microbiological findings which will support the creation of tailored management plans.

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Methodology

This is a prospective observational study in a tertiary care hospital over a period of 18 months. Women aged 18 to 75 years old with a well-documented history of recurrence of UTI were enrolled into the study. Pregnancy, structural renal abnormality, indwelling catheters, recent urologic surgeries, and immunocompromised states comprised the criteria for exclusion. Data that were prospectively collected included demographic information, past medical history, sexual activity, contraceptive methods, voiding habits, and menopausal status. Laboratory work for all patients included urinalysis, urine culture, and renal/bladder ultrasound. Recurrent episodes were then characterized as a relapse or reinfection based on culture findings. All patients were followed up every three months thereafter for recurrence and symptoms, and the response to treatment was assessed. Statistical analysis was done for the frequency of recurrence in relation to various risk factors.

Results

A total of 210 women met the selection criteria. The average age for participants in this study was 41.3 years of age, ranging from 18 to 72 years of age. Of these, 62% were premenopausal and 38% postmenopausal. Overall recurrence rate during the study period stood at 46%. Most respondents reported a long history of UTIs with a mean of 3.4 episodes per year. Of all the organisms present in the urine cultures, 78% were Escherichia coli, 11% Klebsiella pneumonia, and 6% Proteus mirabilis. A high resistance rate to ampicillin and trimethoprim-sulfamethoxazole was present; nitrofurantoin and fosfomycin remained effective for most strains. It also identified that the major contribution towards recurrence was from behavioral factors. Thus, frequent sexual intercourse with low fluid intake along with spermicide usage demonstrated a statistically significant positive correlation with recurrence rates. Low estrogen states in postmenopausal women were associated with higher recurrences compared to premenopausal women. Functional abnormalities were noted in 14% participants who were detected to have either a thickened bladder wall or high post-void residual volume on ultrasound studies. Of the recurrences, approximately 28% were true recurrences or relapses with identical strains in repeated cultures, and 72% of recurrences were the results of reinfections, many with strains or types different

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from the originals involved. Among the women, relapse was associated with a higher incidence of bladder dysfunction and persistence of bacterial reservoirs. A variety of measures to prevent recurrences were tried, but the behavioral modifications generally adopted included increasing fluid intake and post-coital voiding; in compliant patients this resulted in a reduction in frequency of recurrence in 41% of patients. Antibiotic prophylaxis was tried in 38 patients with a dramatic fall in the rate of recurrence, though several developed gastrointestinal side effects or candidiasis. Generally speaking, recurrence of UTIs in women has been seen to be multifactorial; hence, the development of any prevention method has to be tailored and personalized. The following Tables summarize recurrence patterns and estimated associated risk factors. **Table 1. Microbial and Recurrence Characteristics**

Parameter	**Value**
Most Common Pathogen	*E. coli* (78%)
Recurrence Rate	46%
Recurrence Episodes	28%
Reinfection Episodes	72%
Antibiotic Resistance (Ampicillin)	63%

Table 2. Risk Factors for Recurrent UTI

Risk Factor	**% Affected**

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Frequent Sexual Activity	52%
Not Enough Hydration	47%
Spermicide Use	21%
Postmenopausal Status	38%
High Residual Urine Volume	14%

Discussion

The present study has eloquently illustrated the interplay of biological, behavioral, and anatomical factors that contribute to recurrent UTIs in women [11]. The recurrence rate of 46% is well in concert with global data regarding the persistence of this challenge for clinicians in the management of this common condition. E. coli predominance reflects its well-established role as the leading uropathogen [12]. Its virulence factors enable adhesion and invasion of bladder epithelial cells, thus contributing to both reinfection and relapse patterns. Of the behavioral factors, sexual activity has continued to remain regarded as one of the best predictors of the recurrence of UTI, especially among younger and sexually active women [13]. Inadequate hydration strongly resulted in a positive association with recurrence due to a decrease in urinary flow and enhancement of the ability of bacteria to proliferate. The finding that spermicide use was associated with an increased risk of UTIs is coherent with data where the use of spermicides disturbs normal vaginal flora, decreasing protective lactobacilli and facilitating colonization by uropathogen [14]. Postmenopausal women were especially prone to recurrence due to the absence of estrogen leading to atrophic urogenital mucosa and changed microbiota. This finding supports the use of topical estrogen in selected patients for long-term prophylaxis [15]. The differentiation between relapse and reinfection is of important clinical significance. Relapses point to persistence of bacterial reservoirs,

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which are most often due to suboptimal eradication or anatomic abnormalities like high post-void residual urine [16]. Reinfections represent new exposure or altered vaginal and urinary microbiota. Identification and management of such underlying causes would go a long way in ensuring clinical improvement. Resistance patterns of antibiotics emerging from this study reflect the evolving concern globally [17]. Resistance to common first-line antibiotics underlines the need for judicious use of antibiotics, keeping in mind the need for alternative preventive measures. Behavioral modification strategies were promising, with low risks, and had to be emphasized as the first line of prevention [18]. However, antibiotic prophylaxis is still effective in women with frequent or serious recurrences, though its side effects and resistance have to be weighed with care. Effective longterm management has to be individualized comprising behavioral interventions, targeted prophylaxis, investigation into the underlying abnormalities of anatomical or functional nature, and other measures [19]. Education is important for the patient to take measures to prevent disease burden from recurrent infection.

Conclusion

Recurrent UTI in women is a complex entity precipitated by behavioral, anatomical, hormonal, and microbial factors. Prevention of such an infection requires individualized modification of lifestyle, investigation of underlying abnormalities, and appropriate use of prophylaxis. General population awareness and education of the patient are very important in reducing recurrence and improving long-term outcomes.

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