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Behavioral and Hygienic Risk Factors for Recurrent Urinary Tract Infections in Women: Results of a Questionnaire Study

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Abstract **Introduction:** Recurrent urinary tract infections (UTIs) remain an urgent problem in the practice of obstetricians, gynecologists, and urologists. Despite anatomical predisposing factors, in recent years, increasing attention has been paid to the role of behavioral and hygiene habits in the pathogenesis of recurrent cystitis. **Goal:** To evaluate the influence of behavioral factors and intimate hygiene features on the risk of recurrent urinary tract infections in women. **Materials and methods:** A cross-sectional study was conducted with the participation of 348 women who applied to PHC with symptoms of cystitis. The main group included 118 patients with ≥2 episodes of UTI in the last 6 months or ≥3 in the last year; the control group consisted of 230 women without relapses. The survey was conducted using an author's questionnaire (50 questions, 8 thematic blocks). The analysis included the χ^2 criterion, OR, Cramér's V, and Spearman correlations. **Results:** Statistically significant risk factors for UTI recurrence were: no urination act after sexual intercourse (OR=11.2; p<0.001), incorrect direction of hygiene (OR=4.9; p<0.001), sexual intercourse during menstruation (OR=4.5; p=0.001), sexual intercourse with symptoms of bacterial vaginosis (OR=4.7; p=0.151), frequent loose stools (OR=2.5; p=0.009), touching genitals without washing hands (OR=1.9; p=0.033), and lack of confidence in partner hygiene (OR=2.0; p=0.014). The majority of women did not receive hygienic recommendations from medical practitioners (89% of the main group and 83% of the control group), but patients in the main group were more likely to show awareness (93% vs. 41%, p<0.001). A high correlation was found between the level of education and compliance with hygiene standards (r=0.75 and r=0.81; p<0.001). **Conclusions:** The key behavioral risk factors for UTI recurrence include improper intimate hygiene, no postcoital urination act, and low awareness. Increasing the level of education and including hygiene issues in specialist consultations can significantly reduce the frequency of relapses.

Keywords Recurrent Urinary Tract Infections, Intimate Hygiene, Behavioral Factors, Prevention, Women

1. Introduction

Urinary tract infections (UTIs) remain one of the most common women's health problems: according to data, at least one in two women experiences an episode of acute cystitis during their lifetime [1, 2]. Among these infections, a special place is occupied by recurrent cystitis, which has a pronounced effect not only on the physical condition, but also on the psycho-emotional well-being, quality of life, ability to work and sexual health of women [3, 4]. Recurrent forms occur, according to various data, in 20-30% of women after the first episode of cystitis [5], especially in premenopausal and postmenopausal age [6].

Anatomical features of the female genitourinary system, including the short urethra and its proximity to the anus, are traditionally considered as predisposing factors [7]. However, modern research highlights the importance of behavioral factors, including personal hygiene, sexual hygiene, the use of tampons or pads, habits during menstruation and after sexual intercourse [8-11]. These aspects form the so-called "behavioral risk window", especially pronounced in young sexually active women [12, 13].

Some studies have revealed a clear link between non-compliance with the rules of intimate hygiene (in particular, the direction of washing and infrequent change of underwear) and the risk of recurrent infections [14, 15]. In addition, sexual intercourse remains the key behavioral trigger of cystitis in many women, especially without subsequent urination, which contributes to the retrograde penetration of microorganisms [16-18]. Participation in sexual intercourse during menstruation is also described as a separate factor that increases the risk of relapse [19].

Nevertheless, despite the availability of international and local publications evaluating individual behavioral aspects, there is still insufficient systematic research on the impact of a set of behavioral factors related to hygiene and sexual activity on the development of recurrent cystitis in women, especially in a regional context. This stipulates the need for a more detailed study of the prevalence, structure, and interlinkages between such factors.

The purpose of this study was to identify behavioral factors related to personal hygiene and sexual activity associated with the risk of recurrent cystitis in women.

2. Materials and Methods

2.1. Study Design, Sample Size, and Calculation

This comparative cross-sectional study was conducted in outpatient primary health care facilities (PHC) providing services within the framework of the Compulsory Social Health Insurance (CSHI) system and the Guaranteed Volume of Free Medical Care (GVFMC) in Almaty, Republic of Kazakhstan, from September 2024 to March 2025.

During this period, a total of 1,231 visits by women to obstetrician-gynecologists were registered across four medical facilities. Among them, 314 patients (25.5%) presented with complaints characteristic of lower urinary tract infections (LUTIs) — dysuria, frequent and painful urination, sensation of incomplete bladder emptying, cramping, urgency, changes in urine color or odor, and low-grade fever.

Following clinical and laboratory assessment, it was determined that:

- 94 women had their first episode of UTI associated with intestinal flora;
- 102 patients were diagnosed with sexually transmitted infections;
- 118 women fully met the clinical criteria for recurrent UTI associated with intestinal flora (≥ 2 episodes within the last 6 months or ≥ 3 episodes within the last year) and were included in the main study group, with urine culture results confirming growth of uropathogenic microorganisms ($\geq 10^5$ CFU/mL), including Escherichia coli, Klebsiella pneumoniae, Enterococcus faecalis, Proteus mirabilis, and Citrobacter spp.

The control group (n = 230) was composed of women who visited the same facilities during the study period, matched for age and reproductive status, but without any UTI episodes in the past year (and no more than one episode in their lifetime after sexual debut). The control-to-case ratio was approximately 2:1 to achieve sufficient statistical power.

The sample size was calculated using Cochran's formula for proportions:

$$N_0 = Z^2 \times p \times (1-p) / e^2,$$

where Z = 1.96 (95% confidence interval), e = 0.05 (margin of error ±5%), and p = 0.20 — the average prevalence of LUTIs among women of reproductive age according to published data. The reference population was the number of women over 18 years living in Almaty during the study period. The minimum required sample size was approximately 246 women.

All consecutive patients meeting the inclusion and exclusion criteria and presented to the selected PHC facilities during the study period were enrolled, regardless of the causative pathogen. The final sample included 348 women, exceeding the minimum required size and ensuring adequate statistical precision for analysis.

Thus, 348 participants (main + control groups) were included in the analysis. The crude prevalence of recurrent UTI associated with uropathogenic intestinal flora among all women presenting during the study period was 9.6% (118/1231).

Inclusion criteria: women aged ≥18 years, with sexual debut at least 12 months prior to enrollment; confirmed diagnosis of recurrent cystitis based on clinical symptoms and urine culture demonstrating growth of uropathogenic intestinal flora; and provision of written informed consent to participate in the study.

Patients were excluded if they had: acute pyelonephritis; urolithiasis; pelvic organ prolapse; overactive bladder; urogenital or pelvic tumors; primary or non-recurrent cystitis not meeting inclusion criteria; or sexually transmitted infections.

2.2. Questionnaire Development and Expert Review

A structured questionnaire was developed for data collection based on a review of the literature and expert opinion, including input from a clinical microbiologist and four practicing obstetrician-gynecologists. The final instrument consisted of 50 questions grouped into the following thematic blocks:

1. General information about the patient – 4 questions
2. Personal intimate hygiene practices – 7 questions
3. Behavior before, during, and after sexual intercourse – 8 questions
4. Partner hygiene and sexual practices – 8 questions
5. Dietary habits – 7 questions
6. Hydration regime – 7 questions
7. Work and rest schedule – 5 questions
8. Emotional state – 4 questions

The questions were designed to collect descriptive information and were heterogeneous in type: nominal (e.g., socio-demographic characteristics), categorical, quantitative, and open-ended (for free-text comments from participants). Since the items were not combined into scales, psychometric testing (e.g., Cronbach's alpha) was not performed.

The questionnaire was originally developed in Russian and underwent linguistic adaptation using forward–backward translation by two obstetrician-gynecologists fluent in both Russian and Kazakh. External expert review was performed by two additional obstetrician-gynecologists and two urologists. Content validity was assessed in a focus group of 10 bilingual patients to identify unclear wording; all ambiguities were corrected.

The final version was approved by the expert panel and implemented in all participating facilities. The full questionnaire is available to any interested researcher upon written request to the authors. The survey was completed under the supervision of a researcher after obtaining informed consent. For ethical reasons, the names of the medical facilities are not disclosed in open-access publications and can be provided only upon an official written request in compliance with confidentiality and bioethics principles.

2.3. Statistical Analysis

The data were analyzed using IBM SPSS Statistics, version 26.0 (Chicago, IL, USA). The authors created the drawings based on the original data using Python (Matplotlib).

Quantitative variables were analyzed using the Student's t-test (with a normal distribution) and the Mann–Whitney U–test (with a non-normal distribution).

Qualitative variables were evaluated using Pearson's chi-square (χ^2) and Fisher's Exact Test. The strength of the correlation was also assessed using V-Cramer.

To assess the strength of associations, odds ratios (Odds Ratios, OR) were calculated with 95% confidence intervals.

2.4. Correlation Analysis

Additionally, a nonparametric correlation analysis was performed using Spearman's rank correlation coefficient to assess the relationship between quantitative and ordinal variables, which reflect behavioral and hygiene habits and the frequency of episodes of recurrent cystitis. The interpretation of the strength of correlations was carried out on the Chaddock scale.

The level of statistical significance is set at $p < 0.05$.

3. Results

According to bacteriological research, Escherichia coli was found in 81.5% of patient cases.

Boxplot shows median, interquartile range (IQR), and outliers for each group (Figure 1). The control group (n=230) had a significantly higher mean age (41.5 ± 9.53 years, median 41.0, IQR = 12.9) compared to the study group (n=118; mean 36.3 ± 13.71 years, median 36.0, IQR = 18.5), p = 0.021.

The proportion of patients with higher education was higher in the control group (57% (131 patients) versus 31% in the main group (37 people), and specialized secondary education was in 23% of the control group (53 patients) and in 19% of the main group (22 patients). 50% of the patients in the main group (59 patients) and 20% of the control group (46 patients) had secondary education; 11 patients in the control group (5%) had postgraduate education, while none in the main group did (Figure 2). The groups differed statistically significantly in the distribution of educational level with a relatively strong correlation (p < 0.001, Kramer's V = 0.601).

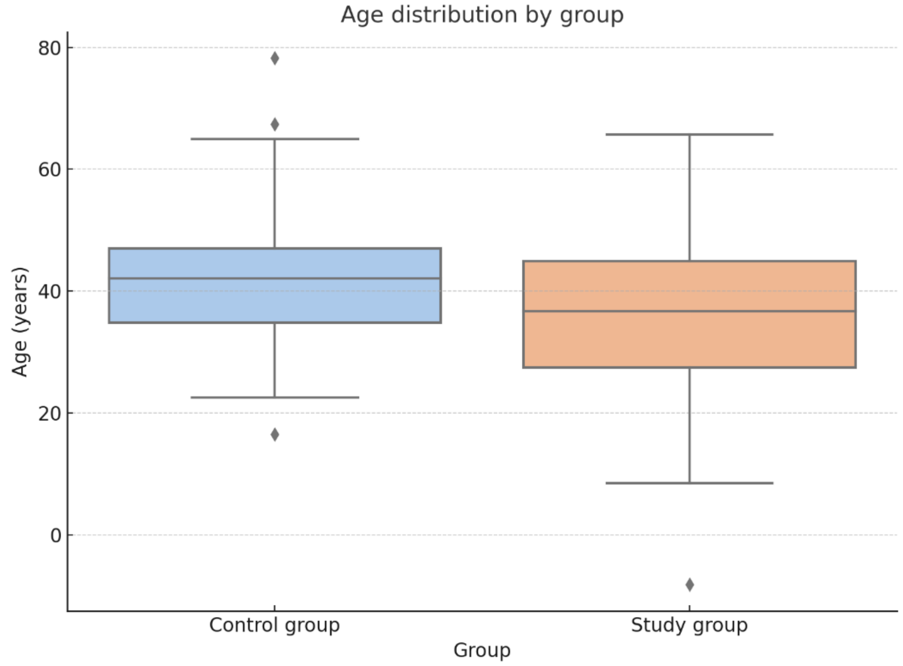

Figure 1. Age distribution in the study and control groups

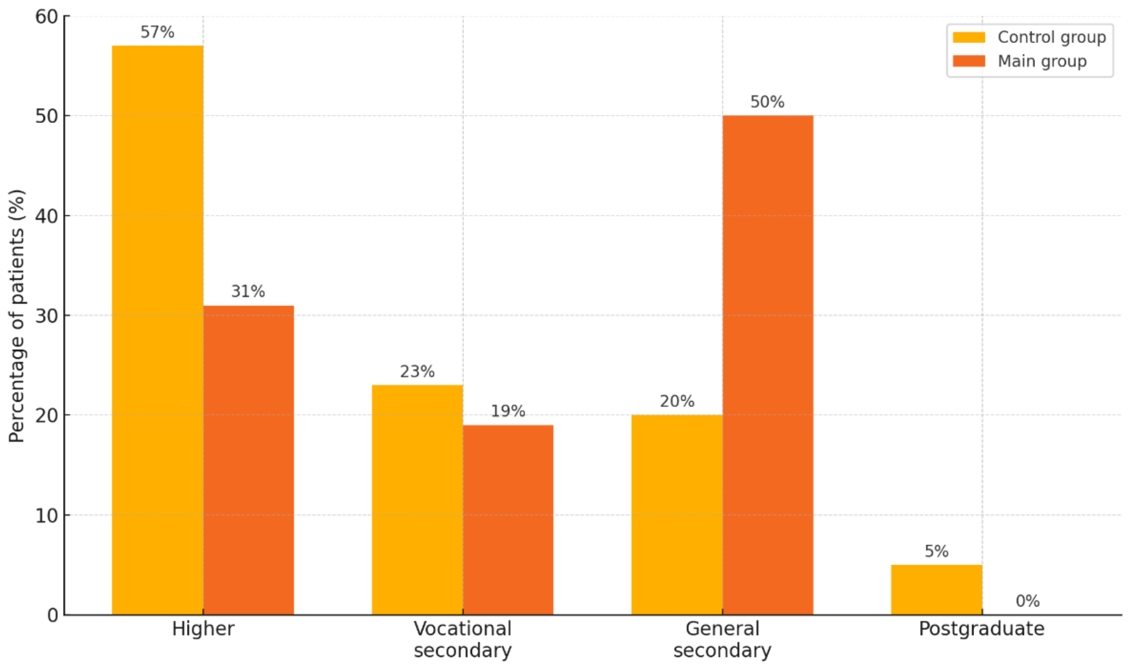

Figure 2. Comparative distribution of educational attainment in the main and control groups

Improper hygiene of the external genital tract (non-compliance with the EGT hygiene rule - from front to back) increased the chance of repeated UTI episodes by 4.9 times with an average strength of correlation (CI: 2.72-8.86, $p < 0.001$, Kramer's $V = 0.300$); in the main group 39 people (33%) had improper EGT hygiene, while as in the control group this figure was 21 (9.1%). The use of special products for intimate hygiene, antibacterial soap and other antiseptics had no statistically significant effect. Such a factor as sexual intercourse during menstruation in the main group was present in 15 patients (12%), compared to the control group in 7 patients (3%) and increased the chance of developing recurrent UTIs by 4.5 times with a weak correlation (DI: 1.86-11.88, $p = 0.001$, Kramer's $V = 0.189$). Sexual intercourse in the presence of symptoms of bacterial vaginosis increased the chance of developing recurrent urinary tract infections by 4.7 times with a weak correlation and occurred in 7 (5.9%) patients of the main group and in 2 (0.8%) of the control group (CI: 1.47-35.77, $p = 0.151$, Kramer's V = 0.189). This factor did not have a statistically significant increase, probably because it was also assessed on the basis of a survey. The symptoms of bacterial vaginosis were listed and the patient was asked to indicate whether there was an intimate relationship with such symptoms and how often, which is quite subjective, but most patients noted that they could not say for sure whether they had sexual intercourse with these symptoms (71 patients in the main group – 61%, and 119 in the control group – 52%). The number of sexual partners did not have a statistically significant effect on the occurrence of recurrent UTIs. Also, the use of condoms during sexual intercourse, spermicides, vaginal suppositories after sexual intercourse or douching did not have a statistically significant protective effect in this study.

Frequent loose stools increased the chance of developing recurrent cystitis 2.5 times with a weak correlation (DI: 1.24-5.33, $p = 0.009$, Kramer's V = 0.149) and occurred in 18 patients of the main group (15.25%) and in 15 patients of the control group (6.5%), whereas in our study constipation was not statistically significant factor for recurrent cystitis. According to our survey, nutrition, the use of probiotics, vitamin D3, and the amount and nature of fluid consumed did not have a statistically significant effect on the chance of relapse. Touching the external genitalia without prior hand hygiene increased the chance of developing recurrent forms of urinary tract infections by 1.9 times with low correlation and occurred in 20 (17%) women of the main group and in 21 (9.1%) women of the control group (CI: 1.032-3.84, $p = 0.033$, Kramer's V = 0.115). Most often, in 65% of cases of both groups, the patients held a phone in their hands, but in 53% (62 patients) of the main group and 47% (108 patients) of the control group, the patients did not focus on this and admitted that they may have touched any objects or surfaces before sexual intercourse. Most patients simply do not know whether their partner adheres to hygiene, more often they note that it is impolite to ask a man about his hygiene habits, then this factor statistically significantly increased the risk of developing urinary tract infections by 2 times with a weak correlation (DI: 1.15-3.67, $p = 0.014$, Kramer's V = 0.132). The removed foreskin and partner's health data also did not significantly increase or decrease the chance of developing a recurrent UTI. The most significant risk factor is the absence of urination act after sexual intercourse, which increased the chance of developing a recurrent UTI by 11.2 times with a relatively strong correlation (CI: 6.45-19.38, $p < 0.001$, Kramer's V = 0.5), and the prevalence of this factor in the control group was 25 cases (10%) versus 68 (57%) cases in the main group. Statistically significant risk factors are shown in Figure 3.

As for awareness of hygiene standards, the majority of patients in both groups noted (89% of the main group - 105 patients and 83% of the control group – 190 people) that they had never received detailed recommendations on intimate hygiene from a gynecologist; however, patients in the main group were more aware of preventive measures and in 93% of cases were interested in these issues on their own. Whereas in the control group, only 41% of cases (48 patients) were interested in these issues, the differences are statistically significant with a relatively strong correlation ($p < 0.001$, Kramer's V = 0.585, Figure 4).

Direct positive high correlations were found between the level of education of patients and the peculiarities of personal hygiene ($r_{xy} = 0.75$, $p < 0.001$), as well as the level of education and behavior before and after sexual intercourse ($r_{xy} = 0.81$, $p < 0.001$). No other correlations were found between education and the questionnaire blocks, nor were there any statistically significant correlations between age and the questionnaire blocks.

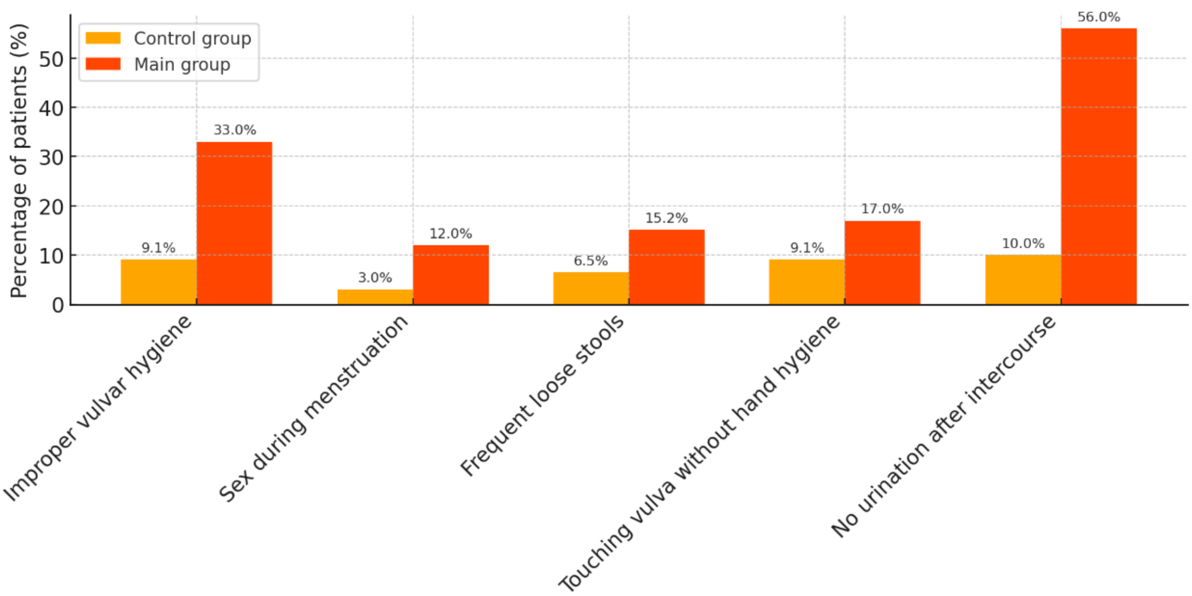

Figure 3. Prevalence of behavioral risk factors for recurrent UTIs in the main and control groups (%)

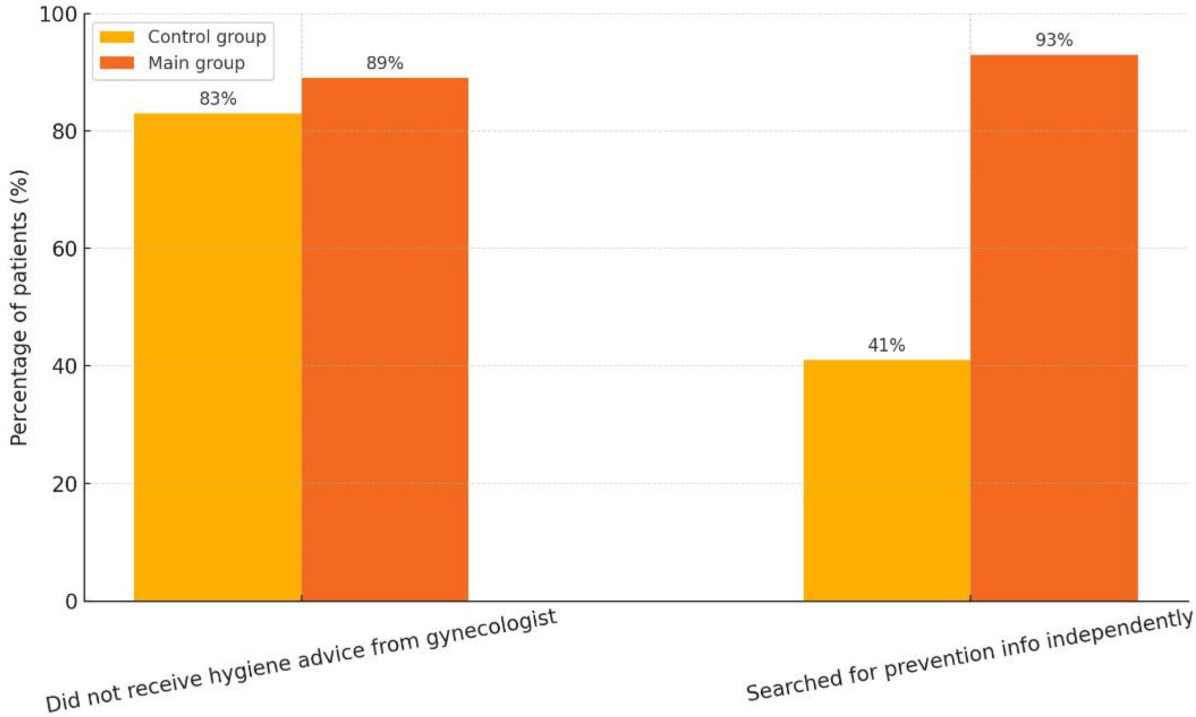

Figure 4. Patient awareness and self-education on intimate hygiene

4. Discussion

The results obtained confirm that behavioral and hygienic features play an important role in the development of recurrent urinary tract infections (UTIs) associated with the uropathogenic intestinal flora (Escherichia coli in 81.5% of cases). Violation of the direction of intimate hygiene (from front to back) increased the risk of UTI recurrence by 4.9 times ($p<0.001$), which is consistent with the data of the study by Mishra et al. [8], where improper wiping was also a significant risk factor (OR = 2.52). The influence of the direction of hygiene of the external genitalia is also consistent with the results of Demir I. [20], which confirms the importance of informing women about proper hygiene practices.

In the study by Mishra et al. [8], vaginal infection was also a significant factor (OR = 3.23), while similar results were obtained in the study by Elorfaly [9], which highlights the role of impaired vaginal flora in the pathogenesis of urinary tract infections. In our study, the effect of sexual intercourse during bacterial vaginosis was not statistically significant, probably because it was evaluated retrospectively and based on a survey of symptoms; most of the patients were not sure what they had.

Frequent loose stools increased the risk of recurrent cystitis 2.5-fold ($p=0.009$), whereas constipation was not statistically significant in our study. This contradicts the data from Mishra et al. [8], Zhu et al. [11], Wan et al. [15], which showed that chronic constipation was associated with an increased risk of urinary tract infections. The differences are probably explained by the age and anatomical and physiological characteristics of the populations included in the study.

Touching the external genitals without washing hands increased the risk of recurrence by 1.9 times ($p=0.033$), which is partially consistent with the conclusions of Elorfaly [9], who emphasized the role of impaired personal hygiene in the pathogenesis of urogenital infections, although there was no direct mention of hands in the study. Additionally, the possible transfer of microorganisms from mobile phones used before sexual intercourse (65% of patients indicated) may explain the high level of indirect infection. Phones, as found in the study by Sadeeq et al. [21], demonstrate an extremely high degree of microbial contamination, especially when used in medical and public settings [22, 23]. Other studies have also assessed the risk of microbial contamination of phones, which may conditionally increase the risk of transmission of pathogens to the genitourinary organs in the absence of proper hand hygiene [22-26]. We did not investigate this factor directly, as the study was retrospective in nature, and even conducting a bacteriological study of mobile phone contamination could not directly confirm its role in the presence of UTI symptoms over the past year, but it would incur significant financial costs.

Sexual intercourse during menstruation increased the risk 4.5-fold ($p=0.001$), whereas in the study Mishra et al. [8], the interval between sexual intercourse and the current episode of UTI <5 days was a significant factor (OR = 2.27, 95% CI = 1.22–4.23), as well as anal sex (OR = 3.68, 95% CI = 1.59–8.52) and use of cloth during the menstrual cycle (OR = 2.36, 95% CI = 1.31–4.26), which was not confirmed in our study.

The most significant risk factor was the absence of urination after sexual intercourse, which increased the chance of recurrence by 11.2 times ($p<0.001$), and it corresponds to the data of Jagtap et al. [10] and Zhu et al. [11], where urinary retention and lack of postcoital urination had a strong association with urinary tract infections.

Also in the study by Mishra et al. [8], stress urinary incontinence was a significant risk factor, but we excluded patients with prolapse, as well as those with functional disorders of the pelvic organs, in order to study the role of behavioral factors and hygiene habits.

Interest in prevention and awareness also correlated with a lower incidence of relapses. In the main group, 93% were interested in prevention, compared with 41% in the control group ($p<0.001$), which confirms the conclusions of Bey et al. [12] and Wyman et al. [13] on the importance of education and self-care of the bladder. A higher level of education was associated with better hygiene awareness and behavior before and after sexual intercourse ($r_{xy}=0.75$ and $r_{xy}=0.81$), respectively. However, most of the women independently searched for information about the norms of hygiene habits and also noted. The role of education in research by Ahn et al. [4] and Sosland et al. [6] is quite significant, and gynecologists, especially those in primary care, need to focus patients' attention on such simple measures like hygiene.

The use of intimate products, syringing, vitamins, probiotics, the amount of fluid, the number of sexual partners, the use of condoms and vaginal suppositories had no statistically significant effect, although in other studies these factors had a significant effect on urinary tract infections in women [8-15].

This study has limitations due to the fact that risk factors are assessed retrospectively based on a sociological survey. Even though all patients in the main group had UTI episodes over the past year, many could not accurately indicate whether some of the studied factors had occurred, especially the patients in the control group. Nevertheless, many of the results obtained are consistent with data from other studies, where risk factors are also assessed retrospectively or according to a sociological survey. Our study complements the data on the influence of hygiene habits on the risk of developing urinary tract infections, which were studied in a representative sample. We have not found such studies in the available literature in the regional context.

The questionnaire used in this study underwent expert review for content validity, linguistic adaptation into the two official languages of the Republic of Kazakhstan, and assessment of question clarity by patients (face validity). However, not all stages of comprehensive instrument validation were completed: psychometric evaluation methods such as factor analysis and calculation of Cronbach’s alpha were not performed. This limits the ability to fully assess the reliability and reproducibility of the questionnaire.

Given the identified crude prevalence of recurrent UTI associated with uropathogenic intestinal flora (9.6%), further work is needed to develop and test a more robust questionnaire using construct validity assessment and additional psychometric procedures. This would allow the creation of reliable scales to objectively measure the impact of behavioral risk factors in the population of the Republic of Kazakhstan and inform the development of clear strategies to improve intimate hygiene literacy, particularly at the level of primary health care.

5. Conclusions

In this comparative cross-sectional study, using a questionnaire developed from the literature and reviewed by experts, we examined hygiene habits, sexual behavior, diet, and lifestyle of women with and without recurrent UTIs. The most significant risk factors identified were lack of postcoital urination, improper direction of intimate hygiene, sexual intercourse during menstruation, frequent loose stools, touching the genital area without handwashing, and lack of information about the partner’s hygiene habits. Low awareness of preventive measures and the rarity of receiving recommendations from gynecologists were also noted, underscoring the need for systematic patient education and the integration of simple preventive strategies into routine primary care practice.

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Informed Consent

The informed consent of the patients was obtained during the study. Financing. This study did not receive external funding.

Conflict of Interests

The authors declare that none of the blocks of this article has been published in the open press and is not under consideration by other publishers.

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