Original Research Article

Epidemiological profile of urinary infection in women medical students

ABSTRACT

Introduction: Urinary tract infection is an infection that occurs due to the ascension of bacteria from the perianal region to the urinary tract. The most affected population is female, due to anatomical factors and lifestyle habits that may predispose individuals to this infection.

Aim: The study aims to outline the epidemiological profile of urinary infections in female medical students.

Methodology: Urinary cultures were performed on 41 urine samples from medical students, who responded to a questionnaire addressing lifestyle habits that could promote urinary infections.

Results: All cultures performed yielded negative results. However, 70.7% of the samples exhibited microbial contamination with the growth of more than one bacterial species. Descriptive analysis of the questionnaire revealed that medical students engage in lifestyle habits that help prevent urinary tract infections, such as frequent bladder emptying, adequate water intake, cleaning the perianal area after sexual intercourse, and avoiding the indiscriminate use of antibiotics. Consequently, no classic signs of infection were observed on the day of sample collection.

Conclusion: It is hypothesized that, due to the advanced level of education among medical students, they possess a greater understanding of lifestyle habits that can mitigate the risk of urinary infections, thereby preventing the proliferation of uropathogenic bacteria. However, a significant rate of contamination was observed in the urine samples submitted for culture.

Keywords: Cystitis; Urinary infection; sexual intercourse, bladder

1. INTRODUCTION

Urinary tract infection (UTI) is a condition that begins with the uncontrolled proliferation of microorganisms from the urogenital microbiota, which ascend to the urinary tract—primarily the bladder—causing local and, in more severe cases, systemic infection when they migrate to the kidneys [1].

The population most affected by UTIs is female, due to anatomical factors and lifestyle habits. In women, the perianal region is narrower than in men, which facilitates the migration of bacteria from the anus to the vulvar and vaginal regions. Additionally, behaviors such as bladder retention and insufficient daily water intake are factors that contribute to the occurrence of these infections [2].

Escherichia coli, a gram-negative bacterium from the Enterobacteriaceae family, is responsible for approximately 80% of

UTI cases [3]. Although E. coli is typically harmless to the human body, the indiscriminate use of antimicrobial agents has led to bacterial resistance.This phenomenon occurs when microorganisms continue to proliferate despite the presence of drugs designed to inhibit this growth. One of the mechanisms bacteria use to circumvent the action of antibiotics is the production and release of extended-spectrum beta-lactamases [2, 3].

Despite advancements in medicine and research aimed at improving public health, harmful habits and the overuse of medications contribute to the prevalence of preventable diseases. Therefore, conducting cross-sectional epidemiological studies like this one is essential, as they highlight the prevalence of pathologies that have become public health problems and result in high costs to government resources [4].

Thus, the aim of this study is to outline the epidemiological profile of urinary tract infections among female medical students.

2. METHODOLOGY

The present study was approved by CEP/UNIRG under CAAE number: 69635523.3.0000.5518 on 05/29/2023. Urine samples were collected from medical students at the University of Gurupi UNIRG in the year 2023. The samples were subjected to urine culture analysis at the University's Microbiology Laboratory. The participants completed a questionnaire regarding lifestyle habits that may predispose them to urinary tract infections.

The women were instructed regarding adequate urine collection. The urine samples were received in the morning at the Microbiology Laboratory of the UNIRG University for subsequent laboratory processing.

Urine was inoculated onto CLED agar (Cystine Lactose Electrolyte Deficient Agar) and incubated at 36°C for 24h. Colonies grown on CLED agar were counted and multiplied by the relative volume of the platinum loop, thus obtaining the number of colonies/mL of urine. Samples with a colony count greater than 10^5 CFU/mL (Colony Forming Units) of urine were considered indicative of infection.

3. RESULTS AND DISCUSSION

Forty-one urine samples were collected and analyzed. None exhibited a colony count greater than 10^5 CFU/mL of urine; therefore, no medical student presented a urinary tract infection on the day of collection. Twelve urine samples showed no bacterial growth on CLED Agar (29.3%). Although the students were instructed on the proper collection method, following these steps: local hygiene, initiating urination, discarding the first stream of urine without interrupting the flow, collecting the midstream, and delivering the sample to the laboratory on the same day [5], more than 70% of the samples showed a colony count of up to 10^4 CFU/mL, with the presence of two or three different types of bacteria, indicating contamination during sample collection. Among the phases in laboratory testing, it is recognized that the pre-analytical phase is responsible for approximately 46% to 70% of errors. This phase begins from the test request, patient preparation, collection, handling, transportation, and storage of the sample, up to the delivery of the collected material to the laboratory for analysis [6]. The urine sample is the sample where we most identify this pre-analytical error, since the vagina and perianal region have local microbiota. If the patient, at the time of collection, does not perform good prior hygiene with soap and water in this region, these microorganisms will be transferred to the sample, demonstrating contamination in the CLED agar reading.

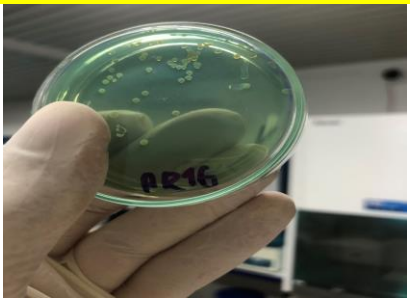

Figure 1: Bacterial growth on CLED Agar.

Table 1. Epidemiological characteristics of the women investigated.

VARIABLES		*n*	*%*
	17 – 20 years	17	41,4%

Age	21 – 25 years old	18	43,9%
	26 – 30 years	2	4,8%
	31 – 34 years old	4	9,7%
Course period	Basic cycle	36	87,8%
	Clinical cycle	5	12,2%
Daily water consumption	Up to 1 liter	6	14,6%
	2 liters	19	46,3%
	3 liters	12	29,2%
Bladder retention	4 liters	4	9,7%
	Yes	12	29,2%

		2	70,7%
	9		
	No		
	Up to 3 times		
Emptying frequency/day		2	4,8%
	4 to 6 times		
	7		
			41,4%
			53,6%
	More than 6	2 times	2

Avoid drinking liquids during classes			
	Yes	12	29,2%
	No	29	70,7%

In Table 1, we observed that the majority of the medical students were young adult women (43.9%), and the majority (87.8%) were enrolled in the basic medical cycle. A large proportion (46.3%) reported consuming an average of 2 liters of water daily, which contributes to a healthy fluid intake. Additionally, 70.7% of the students indicated that they do not retain urine, a behavior that promotes the elimination of bacteria from the urinary system, and stated that they empty their bladder up to six times a day. Furthermore, 70.7% of students also reported that they do not avoid drinking liquids during class time.

Table 2. Hygiene habits that may predispose to UTIs.

VARIABLES		*n*	*%*
Hygiene after defecation	Yes	24	58,5%
	No	17	41,5%

	Use of vaginal douche	Yes	12	29,2%
		No	29	70,3%
	Use of toilet paper	Yes	37	90,2%
		No	4	9,7%
	Cleaning after sexual intercourse	Yes	34	83%
		No	7	17%
	Urine after sexual intercourse	Yes	36	87,8%
		No	5	12,2%
	Perform anal sex followed by vaginal sex	Yes	2	4,9%
		No	39	95,1%

Among the variables analyzed, 58.5% reported cleaning their genitals after defecation, 87.8% urinated after sexual intercourse, and 95.1% reported not engaging in anal sex followed by vaginal sex. Although there is no strong evidence, the European Society of Urology recommends hygiene after defecation, post-coital urination, and avoiding anal sex followed by vaginal sex. Thus, behavioral strategies may help reduce the prevalence of urinary tract infections in women [7].Regarding urinary tract infections (UTI), results indicated that sexual activity is associated with an increased risk of urinary tract infections in women. This is due to female anatomy, where the urethra is located near the anus and vagina, allowing the entry of pathogenic bacteria during sexual intercourse. Additionally, friction and movement during sexual activity can cause microtrauma to the urethra, facilitating the entry of microorganisms and increasing the likelihood of infection [8].

Of those interviewed, 29.2% reported using a vaginal douche. In a cross-sectional study by Marconi et al. it was observed that vaginal douching is associated with a depletion of the vaginal microbiome, particularly a reduction in the presence of *Lactobacillus* sp., making the region more vulnerable to various infections, including urinary tract infections [9].

In this study, 90.2% of the students say they use toilet paper after urinating. Recurrent incorrect use of this product may be one of the risk factors for the occurrence of urinary tract infections. Araújo *et al.*, observed in a literature review that the best way to clean the vulva using toilet paper is in the anteroposterior direction, or, even better, with soap and water. This makes it difficult for uropathogenic bacteria to migrate to the vulvar region. In addition, Araújo *et al.*, also observed that excessive cleaning of this region can become harmful, leading to urinary infections, given that, in excess, cleaning changes the pH and makes the region susceptible to bacterial invasion [10].

Table 3. Clinical characteristics that may predispose to UTIs.

VARIABLES		*n*	*%*
Has pathology in the urinary system	Yes	2	4,9%
	No	39	95,1%
Was taking antibiotics	Yes	1	97,6%

	No	40	2,4%
Recurrent infection	Yes	19	46,3%
	No	22	53,7%
Dysuria in the last 12 months	Yes	7	17%
	No	34	83%
Polaciúria in the last 12 months	Yes	11	26,8%
	No	30	73,2%
Urgent urination in the last 12 months	Yes	10	24,4%
	No	31	75,6%

Terminal hematuria in the last 12 months	Yes	1	2,4%
	No	40	97,6%
Abdominal pain in the last 12 months	Yes	26	63,4%
	No	15	36,6%

Flank pain in the last 12 months	Yes	9	22%
	No	32	78%

During the application of the questionnaires, the interviewees were asked whether they had any previously diagnosed pathology of the urinary system, to which 95.1% stated that they did not. In a master's thesis by Spínola, the relationship between the incidence of anatomical anomalies of the urinary system and complicated and recurrent infections was observed, identifying these anomalies as a risk factor for urinary tract infections [11].

Of the total number of students questioned, 97.6% responded that they were not using any type of antibiotic, whether prescribed or non-prescribed. Fonseca et al. published a study in which the relationship between antibiotic resistance and the vaginal microbiota was observed in women who had had a urinary tract infection at least once in their lives. During the research, it was found that 31% of women are sensitive to the first-choice medication, which, according to the Brazilian Federation of Gynecology and Obstetrics (FEBRASGO), is nitrofurantoin. In contrast, rarely prescribed medications, such as ertapenem, showed 96% sensitivity in the samples analyzed. Worryingly, 17% of the samples showed the release of extended-spectrum beta-lactamases in phenotypic tests, thus exposing the presence of uropathogenic bacteria with antimicrobial resistance, especially modified E. coli [12, 13].

Concerning recurrent infections, 46.3% responded that they have or have had a urinary tract infection more than once. According to a study by Nunes, the incidence of recurrent urinary tract infections, which may be caused by genetic factors that predispose individuals to the condition, or by inappropriate habits that increase the incidence of the disease, is evident [14].

Regarding the classic symptoms of urinary tract infections in women, which include dysuria (painful urination), increased urinary frequency (pollakiuria), hematuria (presence of blood in the urine), sensation of incomplete bladder emptying (vesical tenesmus), urinary retention, and incontinence [15], the medical students reported that, for the most part, they do not experience these symptoms on a recurrent basis. However, 63.4% of the medical students reported experiencing abdominal pain in the last 12 months, which can be attributed to dysmenorrhea, as this is a population of childbearing age. According to a study by Zanella et al., 40% to 90% of women of reproductive age are affected by this condition [16].

4. Conclusion

In conclusion, based on the results, medical students, who belong to a highly educated group, are more knowledgeable about habits that can help prevent urinary infections, such as adequate daily water intake, regular bladder emptying, and

proper and consistent cleaning of the perianal region, all of which help prevent the proliferation of uropathogenic bacteria. However, despite their high level of education, there was a lack of knowledge regarding urine collection, as a high contamination rate was observed in the analyzed urine cultures. Therefore, clinicians' guidance is essential when instructing patients on how to properly collect a urine sample for culture.

Ethical Approval:

The present study was approved by CEP/UNIRG under CAAE number: 69635523.3.0000.5518 on 05/29/2023. Urine samples were collected from medical students at the University of Gurupi UNIRG in the year 2023.

Consent

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

Disclaimer (Artificial intelligence)

The authors declare that generative AI technologies, specifically GPT-4, developed by OpenAI, were used.

Details of the AI usage are provided below:

1 - Translation of certain sections of the article into a more appropriate English for the scientific community.

REFERENCES

1- SAMPAIO, F. J. B. et al. Urinary tract infections in women. Medicine, science and art, Rio de Janeiro. 2022; v. 1, no. 1, p. 70-76.

2- HADDAD, J. M.; FERNANDES, D. A. Urinary tract infection. FEMINA. 2019; v. 47, no. 4, p. 241-244.

3- NUNES, I. Urinary tract infection by Escherichia Coli and its resistance to Ciprofloxacin. Course Completion Work (Graduation in Biomedicine) - Pitágoras. Belo Horizonte: [sn]. 2022.

4- DOS PASSOS, L., C., X. BRITO., M., T., F., M. Occurrence of community urinary tract infection in patients treated in a private laboratory in Belém–PA. RBAC. 2023; v. 55, no. 4, p. 270-275.

5- Cunha, Fernanda Silva Dalcolmo. "Emprego da terapia estrogênica local na prevenção de infecções urinárias recorrentes em mulheres idosas." (2024).

6-Pedrosa, Suzana Carvalho de Sousa, et al. "Condutas que podem interferir na fase pré-analítica do exame sumário de urina." *Cogitare Enfermagem* 26 (2021): e74085.

7- European Association of Urology. The European Association of Urology (EAU) Urological Infections Guidelines. 2020; Arnhem: EAU.

8-STAMM, ANA MARIA NUNES DE FARIA; LUCIANO, LESSANDRO GESSER; PEREIRA, ANDRÉA GISELE. Infecção Urinária na Mulher: Característica e Fatores de Risco. Arquivos Catarinenses de Medicina, p. 106-10, 1997. ISSN:

0004-
2773
9- MARCONI C., et al. Characterization of the Vaginal Microbiome in Women of Reproductive Age From 5 Regions in Brazil. Sex Transm Dis. 2020 Aug;47(8):562-569. doi: 10.1097/OLQ.0000000000001204. PMID: 32520883.

10- ARAÚJO, J. Q. L. de. et al. Risk factors associated with Urinary Tract Infection (UTI) in women: an integrative literature review. Research, Society and Development. 2021; v. 10, n. 12, p. e402101220567.
11- SPÍNOLA, R. J. The impact of the microbiome on urogenital pathologies. Master's work. 2024.

12- FONSECA, from O., L., M.; SOARES, R. W.; VALIATTI, B., T. ANTIMICROBIAL RESISTANCE PROFILE OF Escherichia coli ISOLATED FROM URINARY TRACT INFECTION IN RONDÔNIA. Scientific Interfaces - Health and Environment.

13- Brazilian Federation of Gynecology and Obstetrics Associations (FEBRASGO). Urinary tract infection. Febrasgo Protocols. 2021; n. 49, p. 8.

14- NUNES, I. Urinary tract infection by Escherichia Coli and its resistance to Ciprofloxacin. Course Conclusion Work. 2022.

15- Da Silva, Maysa Oliveira, and Ana Carolina Donda Oliveira. "ABORDAGEM E CUIDADOS DE ENFERMAGEM NA PREVENÇÃO E TRATAMENTO DAS INFECÇÕES DO TRATO URINÁRIO." *Revista Saúde Dos Vales* 11.1 (2024).

16- Zanella. A., K. et al. Menstrual Education as an empowerment tool. UFSM Digital Repository Source. 2024.