

Determinants and prevalence of urinary tract infections among international medical students in Osh, Kyrgyz Republic

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Abstract. The present study was aimed at identifying the factors and prevalence of urinary tract infections (UTIs) among Indian students studying at Osh State University and Osh International Medical University in the Kyrgyz Republic, as well as at assessing their patterns of seeking medical care. In March 2025, a cross-sectional study was conducted using an anonymous online questionnaire completed by 178 medical students with a mean age of 20.9 years, enrolled across five years of study at two medical universities. Data were collected using structured questionnaires that included demographic characteristics, the presence of symptoms, daily water intake, satisfaction with the hygiene of toilet facilities, habits of delayed urination and self-reported history of a UTI diagnosis. Approximately 20.79% of participants reported having previously been diagnosed with a UTI. Students who were dissatisfied with the hygienic conditions of toilet facilities significantly more often reported having an infection. The most common symptoms were burning sensation and pain during urination (33.15%), frequent urges to urinate (31.46%) and passing small amounts of urine (31.46%). Many students managed their symptoms on their own: 54.49% ignored them, and 38.20% resorted to self-medication. Only 2.81% sought medical care in hospitals of the Kyrgyz Republic. The findings showed that, despite the fact that most students were aware of UTI symptoms, their preventive and treatment measures remained unsatisfactory. Poor hygiene of sanitary facilities markedly increased the risk of infection, whereas self-medication and ignoring symptoms could have led to complications. The obtained results were considered potentially useful for the development of targeted prevention

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programmes, the improvement of sanitary and hygienic conditions and the enhancement of the effectiveness of measures for early detection and prevention of urinary tract infections in organised populations

Keywords: risk factors; sanitary hygiene; urinary retention; self-medication; medical students

INTRODUCTION

Urinary tract infections (UTIs) were among the most common bacterial conditions, affecting people of all age groups and exerting a substantial impact on quality of life and the functioning of the urinary system. Their development was determined by a combination of microbiological, behavioural and environmental factors, and the prevalence of the condition remained high both in countries with well-developed healthcare systems and in developing regions. In the context of changing environmental conditions, lifestyle factors and differences in sanitary and hygienic conditions, the investigation of the causes of UTIs, approaches to their prevention and patterns of seeking medical care became particularly relevant, representing a key direction for improving the effectiveness of public health measures [1].

UTI was a common bacterial infection that could occur in any individual; however, women were more susceptible. The study by V.F. Johny *et al.* [2] demonstrated the prevalence of recurrent urinary tract infections and key risk factors among women of reproductive age working in a medical college in Kerala. The authors showed that the high recurrence rate was associated with behavioural and sanitary-hygienic characteristics, which underlined the need for preventive measures in organised groups. The findings of S.D. Advani *et al.* [3] indicated that 40-50% of women and about 5% of men experienced a UTI at least once in their lifetime. In the studies by S. Acharya *et al.* [4] and A. Patjas *et al.* [5], it was shown that women encountered UTIs more frequently, with *Escherichia coli* being the most common causative agent, and that international students were additionally at risk because of unfamiliar bacterial strains and unusual local sanitary and hygienic conditions. In the study by F. Tabasum *et al.* [6], it was demonstrated that around 66% of students who had lived abroad for less than two years were not aware of the basic symptoms and signs of UTIs. This gap in knowledge made students particularly vulnerable during the first years of residence in another country. Even as they adapted, they could continue to remain at risk.

In accordance with the findings of Z.A. Abdirasulova *et al.* [7], differences in sanitary and hygienic conditions, access to safe drinking water and behavioural habits were able substantially to influence the prevalence of UTIs, as evidenced by the higher frequency of recurrent UTIs in India compared with the Kyrgyz Republic. In the study by C. Birimoglu Okuyan *et al.* [8], it was reported that 15.7% of students regularly experienced UTIs, and about 30% had various voiding disorders; their impact on quality of life depended

substantially on the individual characteristics of students and the severity of urological symptoms. Studies [9-11] showed that 20-65% of female medical students had experienced UTI symptoms at least once. The higher frequency of UTIs in this group was explained by various risk factors, including clinical practice, long hours of study, specific toilet habits and the type of toilets used. Earlier, N. Kundu *et al.* [12] showed that 63% of students did not perceive UTI symptoms as a serious health problem. Such an attitude posed a serious danger, as many began to regard mild or recurrent symptoms as 'normal' and postponed seeking medical care. This increased the risk of the infection spreading from the lower to the upper urinary tract, which could lead to more severe chronic conditions. The situation was aggravated by the fact that many students in the Kyrgyz Republic preferred not to consult local doctors when UTI symptoms appeared, opting instead for self-medication or remote consultations. Such behaviour led to delays in correct diagnosis and hindered timely and effective treatment [13].

Against the background of the rapid increase in the number of international students choosing medical education in the Kyrgyz Republic, the state implemented special measures to support their adaptation and to ensure safe sanitary and hygienic learning conditions, which made the study of risk factors and the prevalence of UTIs in this group particularly relevant [14]. However, there were very few data specifically devoted to UTIs among international medical students in the Kyrgyz Republic. Thus, an important scientific and practical gap existed: the extent to which adaptation, living and hygiene conditions and behavioural habits of international students in the Kyrgyz Republic influenced the frequency and characteristics of UTIs had been insufficiently studied. The present study was intended to address this gap by assessing the factors and prevalence of UTIs among Indian students studying at medical universities in the Kyrgyz Republic and by identifying characteristic patterns of seeking medical care.

The aim of the study was to determine the prevalence of UTIs and the associated risk factors among international medical students, and to assess the sanitary and hygienic conditions of their living environment and their behavioural patterns when symptoms occurred.

MATERIALS AND METHODS

Study population. A cross-sectional study was conducted using an anonymous Google Forms questionnaire, in which 178 international medical students from years 1-5 in the city of Osh, Kyrgyz Republic, participated

(140 students from the International Medical Faculty of Osh State University and 38 students from Osh International Medical University). The study was carried out during March 2025 using a voluntary sampling method open to all international students of medical universities in Osh. Information about participation was disseminated through official student groups in messengers and WhatsApp channels. Participation was entirely voluntary and involved no material or academic incentives. Inclusion criteria were: international medical student (years 1-5), age 17-30 years, ability to complete the questionnaire independently in English and provision of consent to participate. Exclusion criteria were: pregnancy, presence of chronic kidney disease, indwelling urethral catheter, current use of systemic antibiotics and diagnosed neurological conditions affecting urination.

The study complied with the principles of the Declaration of Helsinki [15]. Approval was obtained from the local ethics committee of Osh State University (No. 17 dated 03.02.2025). Additional clarifications were provided that a cross-sectional design had been selected to assess the prevalence of UTI symptoms and risk factors at a specific point in time, which corresponded to the research aim. Informed consent was obtained by asking participants to tick a dedicated field before starting the questionnaire. Anonymity and confidentiality of data were fully ensured. Data were stored in a password-protected file accessible only to the research team. The results were presented in aggregated form to guarantee confidentiality and privacy of all participants. A cross-sectional design was chosen because it allowed rapid collection of data from a large group of participants at a single time point.

Data collection. Data were collected using a detailed structured questionnaire. The questionnaire was developed on the basis of an analysis of publications in PubMed and included elements of validated instruments (ICIQ-SF, UTI-SIQ-8) adapted for students.

Before the main data collection, a pilot test of the questionnaire was carried out among 10 international students. Based on the pilot results, the wording of several questions was refined for greater clarity, and additional explanations were added to some items.

The instrument comprised several key sections:

1. Demographic and anthropometric data: age, sex, year of study, height (cm) and body weight (kg);

2. Exposure and risk factors: self-reported daily water intake (litres), satisfaction with the level of hygiene of toilet facilities and the habit of delaying urination for a long time;

3. Symptomatology: presence of complaints such as burning during urination, frequent urges, cloudy or foul-smelling urine, as well as participants' awareness that these signs indicated a UTI;

4. Behaviour in seeking medical care: actions taken when symptoms appeared (ignoring, self-medication, consulting a doctor in India or in the Kyrgyz Republic) and history of a diagnosed UTI.

The questionnaire included items on both self-reported symptoms and the presence of a UTI diagnosis confirmed by a physician, including indication of a urine test performed (general urinalysis and/or urine culture). In this way, subjective symptoms and objectively diagnosed episodes of infection were distinguished.

Statistical analysis. Descriptive, comparative and statistical analyses were performed using STATA SE 12. Descriptive statistics included calculation of means, standard deviations (SD) and absolute and relative frequencies for the characteristics of the study population. Categorical variables were compared using the χ^2 (chi-square) test, and numerical variables were compared using the t-test.

RESULTS AND DISCUSSION

Table 1 presents the results of the initial analysis of the sample, reflecting the socio-demographic characteristics of the study participants.

Table 1. Socio-demographic characteristics of the study population

Variable	N (%)	Mean $\pm$ SD	p-value*
Age (years)		20.9 $\pm$ 2.8	0.45
17–19	43 (24.16)		
20–24	108 (60.67)		
≥ 25	27 (15.17)		
Sex			0.0001
Female	98 (55.06)		
Male	80 (44.94)		
Height (cm)		167.5 $\pm$ 9.5	0.08
Weight (kg)		64.1 $\pm$ 11.2	0.05
Year of study			
1 st –2 nd year (junior)	71 (39.89)		
3 rd –5 th year (senior)	107 (60.11)		

Note: * $p \leq 0.05$ – the association between variables was considered statistically significant

Source: developed by the authors

Data from Table 1 indicated that most of the 178 participants were young adults, with a mean age of 20.9 years, and approximately 60.67% were in the 20-24-year age group. More than half (55.06%) were women, which was important, as the risk of UTIs was considerably higher in females. The mean height of participants was

167.5 cm, and the mean body weight was 64.1 kg. Most students were in years 3-5 of their studies, which implied a longer stay in the local environment and, consequently, a higher likelihood of exposure to risk factors. Table 2 presents the association between selected risk factors and the diagnosis of UTI among the study participants.

Table 2. Analysis of behaviour and environmental factors

Risk factor	With UTI diagnosis N (%)	Without UTI diagnosis N (%)	Total	p-value*
Satisfaction with toilet hygiene (not satisfied)	16 (36.4)	28 (63.6)	44	0.001
Water intake (litre)	6 (13.0)	40 (87.0)	46	0.29
Habit of delaying urination (yes)	7 (5.1)	132 (94.9)	139	0.14

Note: * $p \leq 0.05$ – the association between variables was considered statistically significant

Source: developed by the authors

According to Table 2, among students who reported dissatisfaction with the hygienic condition of toilet facilities, 36.4% had been diagnosed with a UTI, whereas 63.6% had no diagnosis. This association was statistically significant ($p = 0.001$), suggesting that dissatisfaction with sanitary conditions was an important risk factor for the development of UTIs. With regard to daily water consumption, 13.0% of students who reported drinking two litres of water or less per day had been diagnosed with a UTI, compared with 87.0% in whom infection had not been detected. This association was not statistically significant ($p = 0.29$), indicating that low water intake was not a major determinant in this sample. As for the habit of delaying urination, only 5.1% of students who reported such a habit had a UTI diagnosis, whereas 94.9% did not. This relationship was likewise

not statistically significant ($p = 0.14$), suggesting that delayed urination did not exert a substantial influence on the incidence of UTIs in this group. Among students who did not delay urination, the frequency of UTI diagnosis was slightly higher, which was possibly related to the fact that individuals with recurrent UTIs were compelled to void more frequently (Fig. 1). Among the participants, burning during urination was reported by 59 students (33.15%), and 56 (31.46%) indicated frequent urges to urinate. This was followed by passing urine in small amounts, which was also reported by 56 students (31.46%), whereas 7 (3.93%) noted cloudy or foul-smelling urine. These findings reflected the distribution of the most common urological symptoms among the surveyed students. Figure 2 presents data on how participants responded to health problems or the onset of symptoms.

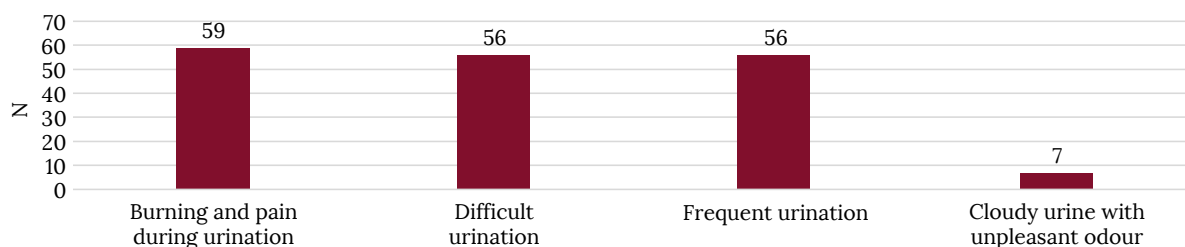


Figure 1. Frequency of UTI symptoms

Source: developed by the authors

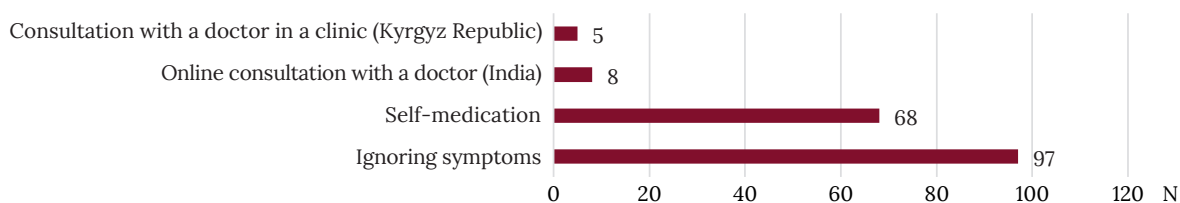


Figure 2. Prevalence of health-seeking behaviours in response to UTI symptoms

Source: developed by the authors

Ignoring symptoms – 97 (54.49%): more than half of respondents preferred not to pay attention to their symptoms, which indicated a rather high level of neglect in seeking medical care. Self-medication – 68

(38.20%): participants preferred to treat themselves without professional advice, which might have reflected such issues as the availability and cost of medical services or the level of trust in the healthcare system.

Online consultation (India) – 8 (4.49%): this proportion of participants resorted to online consultations, which suggested a growing recognition of telemedicine, as well as greater trust in healthcare professionals in their home country than in local doctors. Hospital visit (Kyrgyz Republic) – 5 (2.81%): this percentage of respondents preferred to attend hospital, which showed that a smaller proportion of students still favoured traditional face-to-face medical care. Data on the prevalence of conditions that had previously been diagnosed and treated were presented in Figure 3.

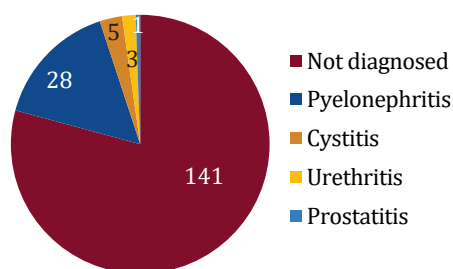


Figure 3. Prevalence of UTIs among participants

Source: developed by the authors

In Figure 3, pyelonephritis, recorded in 28 participants (15.73%), was the predominant diagnosis and occurred markedly more often than other conditions. The presence of urethritis in 3 students (1.69%), prostatitis in 1 (0.56%) and cystitis in 5 (2.81%) indicated a combination of infections of both the upper and lower urinary tract. At the same time, most cases remained undiagnosed and therefore unrecognised, with 141 participants (79.21%) falling into this category. Most of the study participants were young adults aged 20-24 years, with a predominance of women, which in itself increased the likelihood of developing a UTI. Studying abroad was considered an additional risk factor due to stress, environmental change and altered dietary habits, as has been supported by previous research [1].

According to the study by S.B. Alwindy [16], the overall incidence of UTIs was 63.9%, with approximately 68.2% of cases occurring in women, and the most vulnerable group being those aged 20-22 years. In the current study, UTIs were identified in only 20.79% of participants, which was substantially lower than the figures reported by S.B. Alwindy. In the work of M. Mititelu *et al.* [17], it was shown that unhealthy diet, excess body weight, sedentary lifestyle and a tendency towards self-medication significantly increased the frequency and recurrence of UTIs, whereas adherence to a healthy diet and adequate hydration was associated with rare or absent infections. These findings were consistent with the present study: among participants who reported adequate water intake and rational voiding habits, the frequency of diagnosed UTIs was lower, whereas dissatisfaction with sanitary conditions and ignoring symptoms were associated with an increased risk of infection.

In the study by S. Youssef *et al.* [18], 40.2% of female students had significant bacteriuria, with about 33% having previously experienced UTIs; the most frequent complaints in their medical history were urgency (31%) and flank pain (26.6%). The authors also suggested that the UTI rate might be higher in India; however, Indian students in Osh also experienced a high burden of disease, in line with the present findings: among international students in Osh there was a high frequency of UTI symptoms, including burning during urination (33.15%), frequent urges (31.46%) and passing small amounts of urine (31.46%), while a considerable proportion of participants ignored symptoms or resorted to self-medication. This confirmed that the main risk factors were behavioural and environmental rather than unique to this particular sample. Among university students in Nigeria, the prevalence of UTIs was relatively low (4.5%), which, according to J.D. Florence *et al.* [19], was attributed to a relatively high level of knowledge and awareness regarding UTI prevention, whereas among international students in Osh in the present study, the frequency of UTI symptoms was considerably higher.

In study [20] it was noted that the risk factors for UTIs included living conditions in student dormitories, non-compliance with sanitary and hygienic standards and behavioural characteristics of students. These data were consistent with the findings of the present study: dissatisfaction with the hygienic condition of toilet facilities was associated with a higher frequency of diagnosed UTIs, whereas the habit of delaying urination and low water intake did not have a statistically significant effect. The study by O. Olabimtan *et al.* [21] showed that among junior students the prevalence of UTIs reached 48%, with recurrent episodes occurring significantly more often in female students, against a background of low awareness (especially among male students) and very low rates of seeking medical care, which was in line with the findings of the current study. One of the common risks was lack of knowledge of appropriate hygiene practices. Ignoring symptoms and self-medication were also reported in the study by S. Muchukota *et al.* [22]. Many students sought advice on the Internet before visiting a doctor, which led to remote consultations or self-medication instead of obtaining an accurate diagnosis. As 66% of new students were unaware of UTI symptoms, there was an obvious need for structured educational programmes. These conclusions were consistent with the results of similar studies among students after the implementation of educational interventions.

Taking into account the identified risk factors, students' behavioural patterns and the findings of other studies, it appeared necessary to develop a set of practical measures aimed at reducing the prevalence of UTIs among international medical students. The implementation of such measures could substantially

improve sanitary and hygienic living conditions, raise the level of health literacy and reduce the frequency of self-medication, which, according to the present data, remained one of the most common patterns of behaviour when symptoms occurred. In this regard, it was considered appropriate to distinguish the following directions for preventive and organisational work:

- improvement of sanitary and hygienic living conditions – ensuring regular cleaning and disinfection of toilets and showers in student dormitories, as well as monitoring the availability of sufficient sanitary and hygiene supplies;

- increasing students' awareness – organisation of educational seminars on the signs, symptoms and risk factors of UTIs, as well as on appropriate voiding habits and personal hygiene;

- encouraging timely health-seeking – establishment of accessible in-person and online consultation services for international students and provision of information on the risks of self-medication and possible complications associated with delayed medical contact;

- preventive measures – promotion of adequate water intake and regular urination, and implementation of preventive medical check-up programmes for the early detection of UTIs;

- monitoring and further research – conducting periodic surveys and analyses of risk factors among international students, as well as investigating the influence of seasonality, diet and stress on UTI incidence.

Thus, the study findings showed that the prevalence of UTIs among international medical students remained a significant problem directly related to sanitary and hygienic living conditions and behavioural characteristics. The most frequent symptoms were burning during urination, increased urinary frequency and passing small amounts of urine; however, the rate of seeking medical care remained extremely low, which contributed to the widespread practice of self-medication. At the same time, low water intake and the habit of delaying urination did not demonstrate a statistically significant effect, whereas dissatisfaction with the hygiene of toilet facilities showed a clear association with the presence of a diagnosed UTI. The data obtained highlighted the need for a comprehensive approach that would combine improvement of living conditions, educational interventions and the development of accessible medical services for international students.

CONCLUSIONS

In the present study among international students of medical universities in the city of Osh, UTIs were found to represent a noticeably common problem: 20.79% of participants reported a previously diagnosed infection. The most pronounced risk factor was dissatisfaction with the hygienic condition of toilet facilities, with 36.4% of students who expressed dissatisfaction with sanitary conditions having a diagnosed UTI ($p = 0.001$). At the same time, such factors as the habit of delaying urination (5.1% had a diagnosis, $p = 0.14$) and low water intake (13.0%, $p = 0.29$) did not demonstrate a statistically significant effect on the prevalence of UTIs.

UTI symptomatology among students was manifested mainly as burning during urination (33.15%), increased urinary frequency (31.46%) and passing small amounts of urine (31.46%), indicating a high prevalence of typical urological complaints. Analysis of behavioural responses showed that more than half of respondents ignored their symptoms (54.49%), and 38.20% resorted to self-medication, which reflected insufficient awareness and low health-seeking activity. Seeking professional medical care remained extremely rare: only 2.81% of students visited hospitals in the Kyrgyz Republic when symptoms occurred.

The findings highlighted the need to develop targeted preventive programmes aimed at improving sanitary and hygienic conditions in dormitories, increasing students' awareness of UTI risk factors and early symptoms, and fostering a culture of timely consultation with healthcare professionals. Implementation of such measures could substantially reduce UTI morbidity among international students and improve their overall health status. Prospects for further research included expanding the sample by involving students from other regions and universities of the Kyrgyz Republic and conducting longitudinal studies to assess the dynamics of UTIs over time.

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CONFLICT OF INTEREST

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Аннотация. Бул изилдөөнүн максаты – Кыргыз Республикасындагы Ош мамлекеттик университети жана Ош эл аралык медициналык университеттеринде окуган индиялык студенттер арасында заара чыгаруучу жолдордун инфекцияларынын (ЗЧЖИ) таралышын жана аны аныктоочу факторлорду изилдөө, ошондой эле алардын медициналык жардамга кайрылуу жүрүм-турумун баалоо. 2025-жылдын март айында 178 студент (орточо жашы 20,9 жаш) катышкан кесилиштик (cross-sectional) изилдөө жүргүзүлдү. Сурамжылоо эки медициналык университеттин беш окуу жылындагы студенттер арасында онлайн түрүндө анонимдүү анкета аркылуу жүргүзүлдү. Анкетада демографиялык маалыматтар, белгилер (симптомдор), күнүмдүк суу ичүү көлөмү, даараткананын тазалыгына канааттануу деңгээли, заараны кармоо адаты жана өз алдынча билдирилген ЗЧЖИ диагнозу тууралуу суроолор камтылган. Катышуучулардын 20,79 % мурда заара чыгаруучу жолдордун инфекциясына чалдыкканын билдиришкен. Даараткананын тазалыгына нааразы болгон студенттерде инфекцияга чалдыгуу ыктымалдыгы кыйла жогору экени аныкталды. Эң кеңири таралган белгилер – заара кылуу учурунда ачышуусу жана ооруусу (33,15 %), заара кылууга тез-тез муктаж болуу (31,46 %) жана зааранын аз өлчөмдө бөлүнүшү (31,46 %) болду. Көптөгөн студенттер белгилер менен өз алдынча күрөшүшкөн: 54,49 % аларды этибарга алышкан эмес, ал эми 38,20 % өз алдынча дарыланууга аракет кылышкан. Болгону 2,81 % гана Кыргызстандагы ооруканаларга кайрылышкан. Изилдөөнүн жыйынтыгында көпчүлүк студенттер ЗЧЖИ белгилерин билгени менен, аларды алдын алуу жана туура дарылануу иш-чаралары жетишсиз экени аныкталды. Даараткананын начар гигиеналык абалы инфекциянын пайда болуу коркунучун жогорулатат, ал эми өз алдынча дарылануу жана белгилерди көз жаздымда калтыруу терс натыйжаларга алып келиши мүмкүн. Гигиеналык шарттарды жакшыртуу, жетиштүү суу ичүү жана өз убагында дарыгерге кайрылуу боюнча маалымдуулукту арттыруу, ошондой эле өз алдынча дарыланууну азайтуу студенттер арасында инфекциялардын деңгээлин олуттуу түрдө төмөндөтө алат. Алынган жыйынтыктар максаттуу алдын алуу программаларын иштеп чыгуу, санитардык-гигиеналык шарттарды жакшыртуу жана студенттер жамаатынын ичинде заара чыгаруу жолдорунун инфекцияларын эрте аныктоо жана алдын алуу боюнча чаралардын натыйжалуулугун жогорулатуу үчүн колдонулушу мүмкүн.

Негизги сөздөр: коркунуч факторлору; санитардык жайлардын гигиенасы; заараны кармап туруу; өз алдынча дарылануу; медициналык окуу жайлардын студенттери

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Аннотация. Данное исследование было направлено на выявление факторов и распространённости инфекций мочевых путей (ИМП) среди индийских студентов, обучающихся в Ошском государственном университете и Ошском международном медицинском университете в Кыргызской Республике, а также на оценку их особенностей обращения за медицинской помощью. В марте 2025 года было проведено поперечное (кросс-секционное) исследование с использованием анонимной онлайн-анкеты, которую заполнили 178 студентов-медиков в возрасте в среднем 20,9 лет, обучающихся на пяти курсах двух медицинских вузов. Данные собирались с помощью структурированных опросников, включающих демографические сведения, наличие симптомов, объём потребляемой воды в день, удовлетворённость гигиеной туалетных помещений, привычки задержки мочеиспускания и самооценку диагноза ИМП. Около 20,79 % участников сообщили, что им ранее был поставлен диагноз ИМП. Студенты, неудовлетворённые гигиеническим состоянием туалетов, значительно чаще сообщали о наличии инфекции. Наиболее распространёнными симптомами были жжение и боль при мочеиспускании (33,15 %), частые позывы к мочеиспусканию (31,46 %) и выделение небольшого количества мочи (31,46 %). Многие студенты справлялись с симптомами самостоятельно: 54,49 % игнорировали их, а 38,20 % прибегали к самолечению. Лишь 2,81 % обращались за медицинской помощью в больницы Кыргызской Республики. Результаты исследования показали, что, несмотря на осведомлённость большинства студентов о симптомах ИМП, их профилактические и лечебные меры остаются неудовлетворительными. Низкий уровень гигиены санитарных помещений значительно повышает риск инфицирования, а самолечение и игнорирование симптомов могут привести к осложнениям. Полученные результаты могут быть использованы для разработки целевых профилактических программ, совершенствования санитарно-гигиенических условий и повышения эффективности мероприятий по раннему выявлению и профилактике инфекций мочевых путей в организованных коллективах

Ключевые слова: факторы риска; гигиена санитарных помещений; задержка мочеиспускания; самолечение; студенты медицинских вузов