

## TREATMENT OF URINARY TRACT INFECTIONS: STUDY ON PATIENTS' BELIEFS AND ATTITUDES

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### Abstract

The present study investigated patients' opinions and attitudes regarding the use of antibiotics and plant-based products in the treatment of urinary tract infections (UTIs). The research was conducted as a cross-sectional study, using a validated questionnaire for data collection. The results indicate that the majority of respondents considered antibiotics (74.3%) and plant-based products (87.9%) to be effective in treating UTIs, while approximately half of the participants evaluated plant-based products as being more effective than antibiotics. Additionally, over 50% of respondents believed that plant-based products could be administered concomitantly with other medications. Regarding the treatments used, patients who exhibited UTI symptoms were treated with antibiotics in 63.9% of cases, while 78.6% also used plant-based products. Data analysis revealed that patients who perceived plant-based products as more effective than antibiotics were 40.4% less likely to use antibiotics and 138.2% more likely to opt for plant-based products. Furthermore, positive beliefs regarding the efficacy, safety, and compatibility of concomitant administration with other medications, along with access to adequate information, significantly increased the use of plant-based products.

### Rezumat

Studiul de față a investigat opiniile și poziția pacienților referitor la utilizarea antibioticelor și a produselor pe bază de plante în tratamentul infecțiilor tractului urinar (ITU). Cercetarea a fost realizată sub forma unui studiu transversal, utilizând un chestionar validat pentru colectarea datelor. Rezultatele indică faptul că majoritatea respondenților au considerat că antibioticele (74,3%) și produsele din plante (87,9%) sunt eficiente în tratamentul ITU, în timp ce aproximativ jumătate dintre participanți au evaluat produsele din plante ca fiind mai eficiente decât antibioticele. De asemenea, peste 50% dintre respondenți au fost de părere că produsele din plante pot fi administrate concomitent cu alte medicamente. În ceea ce privește tratamentele utilizate, pacienții care au prezentat simptome de ITU au fost tratați cu antibiotice în proporție de 63,9%, iar 78,6% dintre aceștia au utilizat și produse din plante. Analiza datelor a evidențiat că pacienții care percep produsele din plante ca fiind mai eficiente decât antibioticele au avut o probabilitate cu 40,4% mai mică de a utiliza antibiotice și cu 138,2% mai mare de a opta pentru produse pe bază de plante. În plus, convingerile pozitive legate de eficacitatea, siguranța și compatibilitatea administrării concomitente cu alte medicamente, alături de accesul la informații adecvate, au determinat o creștere semnificativă a utilizării produselor din plante.

**Keywords:** urinary tract infection, antibiotic, herbal product, attitude

### Introduction

The treatment of urinary tract infections (UTIs) is based on antibiotics, the choice of which depends on the type of infection. Their use is recommended in all patients with symptomatic UTIs since there is evidence of clinical efficacy of antibiotics compared to placebo. However, in most cases, the choice of therapy is made empirically by a doctor [1-3].

Antibiotics are recommended for prophylaxis of recurrent UTIs because they reduce the probability of symptomatic UTIs by as much as 85% [4]. On the other hand, their irrational use increases the risk of

antimicrobial resistance [5], lack of efficacy, and increased treatment costs [6, 7]. Recently, increasing resistance of uropathogens to antibiotics has been developing, and Serbia occupies a high place in antibiotic resistance [8, 9].

Many UTIs are self-limiting. Therefore, antibiotic consumption could be reduced [10]. At the same time, the use of herbal products (HPs) for the treatment and prevention of UTIs is becoming more and more popular [1, 11, 12]. Various herbal products (herbal drugs and herbal drug preparations) in different pharmaceutical forms are used for the treatment of uncomplicated UTIs, most often in self-medication

[13-15]. Some of the most commonly used herbal remedies are bearberry leaf (*Uvae ursi folium*) and cranberry fruit (*Vaccinii macrocarpi fructus*), as well as drugs with a diuretic effect [16].

Adequate administration of antibiotics is necessary for the effectiveness of therapy [17]. Patient's behaviour in taking medications is influenced by numerous factors, including their beliefs [18], which are stronger predictors of adherence than clinical and socio-demographic factors [19-21]. Also, beliefs about medications, such as general beliefs about their intrinsic nature, the necessity of taking them, and beliefs about their potential harms, influence health behaviour and the degree of adherence [22]. However, patients' final decision about their health behaviour is influenced by their assessment of risks and benefits [23, 24].

The use of HPs is often associated with negative beliefs about medicines [19, 25], beliefs that HPs are natural and safe, and beliefs about the nature and severity of disease. The use of HPs is also associated with good past experiences, family traditions, and dissatisfaction with conventional treatments [26].

The formation of patients' attitudes and beliefs about medicines is influenced by sociodemographic and clinical variables such as gender, age, level of education, cultural background, media and social networks, and the patient's personal experience with medicines [25, 27-29]. Patients' attitudes and beliefs may change over time, and interventions can be implemented that will result in the desired change in the patient's behaviour [30, 31]. Specific interventions can be implemented to improve health behaviour [32]. Patients with UTIs often do not adhere to the correct use of antibiotics and resort to complementary or alternative forms of treatment. Therefore, to better understand them, it is necessary to study patients' beliefs and attitudes about UTIs [33-36]. In addition, it is also essential to understand the cultural differences in patients' attitudes and beliefs, which is a prerequisite for developing effective further educational interventions [34, 37-39].

This study aims to examine patients' and citizens' beliefs and attitudes toward antibiotics and herbal products used to treat urinary tract infections in populations with or without symptoms of urinary tract infection.

#### *Ethical approval*

The Ethics Committee for Biomedical Research of the Faculty of Pharmacy, University of Belgrade approved the study. After collection, the data were kept anonymous and confidential, without data that could reveal the identity of the respondents.

## **Materials and Methods**

### *Study design*

Quantitative, non-experimental research was carried out in the Republic of Serbia during 2021 and 2022.

An online questionnaire was employed and distributed by the snowball technique.

### *Instrument*

At the time of the study, there were no similar questionnaires about patients' attitudes toward urinary tract infections. This required the creation of a questionnaire. The questionnaire was developed based on a systematic literature review and then tested and validated using the focus group method. The developed questionnaire contains 29 questions divided into six domains. Following the objectives of this work, only responses to questions on basic information, attitudes toward antibiotics, and the use of HPs for urinary tract infections were analysed. Basic information included questions on age, sex, place of residence, education level, employment, economic status, and health characteristics. Attitudes toward antibiotics included three statements about efficacy, safety, and use. Attitudes toward HPs included five statements about their effectiveness, safety, and information on their packaging. Attitude items were answered on a Likert scale ranging from 1 (very low agreement) to 5 (very high agreement).

### *Respondents*

The representative sample size of 385 was calculated based on the number of all inhabitants of the Republic of Serbia (approx. 7 million inhabitants) with a confidence level of 95% and a margin of error of 5% (Survey-Monkey). The inclusion criteria were voluntary participation in the study, residence in the Republic of Serbia, and knowledge of the Serbian language. The criteria for excluding respondents' data in the analysis were filling out the questionnaire multiple times with the same respondents and incomplete responses.

The respondents were divided into two groups regarding the presence of symptoms of urinary infections. Respondents who currently have symptoms of urinary infections or have had these symptoms in the previous year are classified as patients "with UTI" group. The group – citizens "without UTI" consisted of respondents who had no symptoms of urinary infections during the previous year. In both groups, a representative sample had to be ensured.

### *Data collection*

The snowball technique was used for questionnaire distribution by email and social networks. Data were analysed according to the presence of UTI symptoms in respondents. The inclusion criterion for respondents in the "with UTI" group was the presence of the following symptoms in the previous year: frequent and painful urination, burning sensation during urination, or the feeling of not being able to empty the bladder. All other respondents were included in the group "without UTI".

### *Data analysis*

The IBM SPSS Statistics ver. 20 was used to analyse the gathered data. Socio-demographics, health characteristics, and attitudes of respondents were analysed using descriptive statistical tests (frequencies

and percentages for categorical variables, mean values with standard deviation (SD), and rank for numerical data). Inferential statistics methods were used to analyse the differences between the two groups of respondents and to determine the influence of certain variables on attitudes and their correlation. To analyse the results, we transformed the five-point Likert scale for assessing the degree of agreement with a specific statement into a three-point scale. The standard probability plot and the Kolmogorov-Smirnov test with the Lilliefors significance level were used to check the data distribution. The Chi-square test was used to compare the distribution of categorical data between groups. In contrast, the Mann-Whitney U test was used for numerical data that did not follow a normal distribution. The correlation between attitudes and certain variables was assessed by binary logistic regression. Only variables shown to have a statistically significant effect on the data distribution were included in the further analysis. All variables were transformed into a two-point scale as follows: Age - young ( $\geq 27$  years) and old ( $< 27$  years); Residency - rural (including suburban) and urban; Education level - low (primary, secondary, and high school) and high (university and postgraduate); Monthly income - low ( $< 680$  EUR) and high ( $> 680$  EUR); degree of agreement - low and

high (including medium). The standard categories were young, male, rural, low education level, unemployed, low monthly income, without comorbidities, and low degree of agreement. The significance level was set at  $p < 0.05$  in all cases.

**Results and Discussion**

*Sample*

The questionnaires were completed by 945 respondents, ten of whom were excluded according to the exclusion criteria (five respondents did not give their consent to participate in the research, and five others filled out the questionnaire twice in the same way). Final data processing included data from 935 respondents, 393 of whom had symptoms of UTI during the previous year and 542 did not.

*Demographics and medical history data*

Most respondents were women who lived in an urban environment, had a high school or university education, were employed, and received an average or slightly above-average salary. Almost one in five respondents had another medical condition, with cardiovascular disease and hypothyroidism being the most common (Table I). Patients with UTI symptoms were treated with antibiotics (63.9%) and herbal products (78.6%).

**Table I**  
The basic respondents' characteristics

All respondents (N)	Whole sample (935)	Patients (393)	Citizens (542)	P-value
<b>Age, Median, Range</b>	27, 10 – 81	29, 10 – 81	26, 15 – 81	$< 0.05^*$
<b>Gender, n (%)</b>				
<b>Male</b>	171 (18.3)	32 (8.1)	139 (25.6)	$< 0.001^{**}$
<b>Female</b>	764 (81.7)	361 (91.9)	403 (74.4)	
<b>Residency, n (%)</b>				
<b>Urban</b>	681 (72.8)	287 (73.0)	394 (72.7)	$> 0.05^{**}$
<b>Suburban</b>	60 (6.4)	22 (5.6)	38 (7.0)	
<b>Rural</b>	194 (20.7)	84 (21.4)	110 (20.3)	
<b>Education level, n (%)</b>				
<b>Primary school</b>	9 (1.0)	5 (1.3)	4 (0.7)	$> 0.05^{**}$
<b>Secondary school</b>	294 (31.4)	113 (28.8)	181 (33.4)	
<b>High school</b>	59 (6.3)	25 (6.4)	34 (6.3)	
<b>University</b>	387 (41.4)	175 (44.5)	212 (39.1)	
<b>Postgraduate</b>	186 (19.9)	75 (19.1)	111 (20.5)	
<b>Employment status, n (%)</b>				
<b>Employed</b>	475 (50.8)	198 (50.4)	277 (51.1)	$> 0.05^{**}$
<b>Unemployed</b>	460 (49.2)	195 (49.6)	265 (48.9)	
<b>Monthly income (EUR), n (%)</b>				
<b>&lt; 170</b>	42 (4.5)	24 (6.1)	18 (3.3)	$> 0.05^{**}$
<b>170 - 340</b>	118 (12.6)	52 (13.2)	66 (12.2)	
<b>340 - 680</b>	300 (32.1)	123 (31.3)	177 (32.7)	
<b>680 - 1270</b>	302 (32.3)	129 (32.8)	173 (31.9)	
<b>&gt; 1270</b>	173 (18.5)	65 (16.5)	108 (19.9)	
<b>Comorbidities, n (%)</b>				
<b>Yes</b>	170 (18.2)	96 (24.4)	74 (13.7)	$< 0.001^{**}$
<b>No</b>	765 (81.8)	297 (75.6)	468 (86.3)	

\* Mann-Whitney U test, \*\* Chi-squared test

Statistically significant differences were observed between the respondents' groups in terms of age, gender, employment status, and existing comorbidities. Respondents with symptoms of UTI had a slightly higher average age and were predominantly women. There was also a high proportion of unemployed and retired individuals in the group of respondents with UTI symptoms.

*Attitudes toward the use of antibiotics*

The majority of all respondents believe that antibiotics can help treat UTIs. Half of them believe that antibiotics are not completely safe medicines. The majority believe that antibiotics should be used only after prior consultation with a doctor/pharmacist,

with a significant difference found between patients and citizens (Table II). However, it was found that these attitudes have a statistically significant impact on the use of antibiotics or herbal products in patients who had UTI symptoms.

*Attitudes toward the application of herbal products*

The majority of respondents believe that HPs can contribute to UTI treatment. However, half of them believe HPs are more effective than antibiotics. In addition, half of the respondents believe HPs have fewer adverse effects than antibiotics. One-third of respondents believe that HPs can be combined with other medicines. One-third of respondents believe they have enough information about the use of HPs (Table III).

**Table II**

Attitudes toward the use of antibiotics in the treatment of UTIs

Statement	Degree of agreement	n (%)	Whole sample (935)	Patients (393)	Citizens (542)	Pearson Chi-square (p-value)
Antibiotics can help treat a urinary tract infection.	Low	n (%)	240 (25.7)	114 (29.0)	126 (23.2)	3.987 (> 0.05)
	Medium		119 (12.7)	47 (12.0)	72 (13.3)	
	High		576 (61.6)	232 (59.0)	344 (63.5)	
Antibiotics are completely safe.	Low		467 (49.9)	197 (50.1)	270 (49.8)	0.186 (> 0.05)
	Medium		332 (35.6)	137 (34.9)	195 (36.0)	
	High		136 (14.5)	59 (15.0)	77 (14.2)	
Antibiotics can be administered without prior consultation with a doctor/pharmacist.	Low		858 (91.8)	349 (88.8)	509 (93.9)	7.914 (< 0.05)
	Medium		57 (6.1)	33 (8.4)	24 (4.4)	
	High		20 (2.1)	11 (2.8)	9 (1.7)	

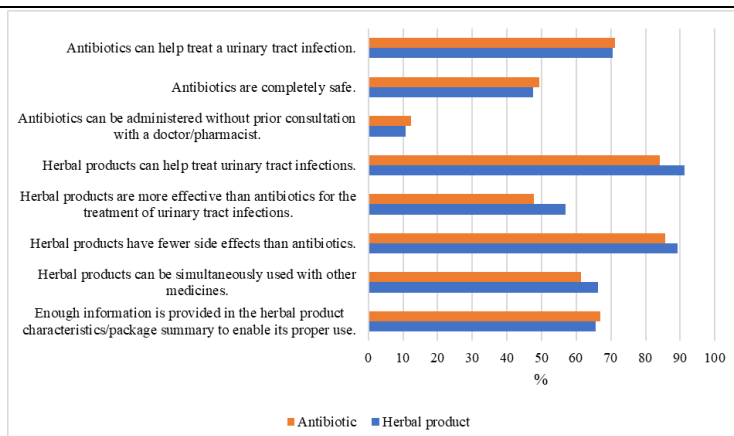
**Table III**

Summary of respondents' responses to attitudes toward herbal products

Statement	Degree of agreement	n (%)	Whole sample (935)	Patients (393)	Citizens (542)	Pearson Chi-square (p-value)
Herbal products can help treat urinary tract infections.	Low	n (%)	113 (12.1)	54 (13.7)	59 (10.9)	2.296 (> 0.05)
	Medium		291 (31.1)	115 (29.3)	176 (32.5)	
	High		531 (56.8)	224 (57.0)	307 (56.6)	
Herbal products are more effective than antibiotics for the treatment of urinary tract infections.	Low		450 (48.1)	187 (47.6)	263 (48.5)	0.579 (> 0.05)
	Medium		333 (35.6)	145 (36.9)	188 (34.7)	
	High		152 (16.2)	31 (15.5)	91 (16.8)	
Herbal products have fewer side effects than antibiotics.	Low		134 (14.3)	51 (13.0)	83 (15.3)	3.486 (> 0.05)
	Medium		210 (22.5)	80 (20.4)	130 (24.0)	
	High		591 (63.2)	262 (66.7)	329 (60.7)	
Herbal products can be simultaneously used with other medicines.	Low	411 (44.0)	147 (37.4)	264 (48.7)	12.309 (< 0.01)	
	Medium	247 (26.4)	112 (28.5)	135 (24.9)		
	High	277 (29.6)	134 (34.1)	143 (26.4)		
Enough information is provided in the herbal product characteristics/package summary to enable its proper use.	Low	338 (36.1)	135 (34.4)	203 (37.5)	2.094 (> 0.05)	
	Medium	281 (30.1)	115 (29.3)	166 (30.6)		
	High	316 (33.8)	143 (36.4)	173 (31.9)		

These attitudes did not differ significantly between groups, except for the attitude toward combining HPs with medicines (Table II). The difference between attitudes in the group of patients who had UTI symptoms depending on the type of treatment is shown in Figure 1. Binary logistic regression analysis found that patients who had symptoms of UTI and who believe that HPs are more effective than antibiotics

for the treatment of UTI are 40.4% less likely to use an antibiotic and 138.2% more likely to use HPs. Patients who believe that HPs can help treat UTIs, that HPs have fewer side effects than antibiotics, that HPs can be simultaneously used with other medicines, and that they have enough information about the use of HPs are more likely to use HPs (394.7%, 128.1%, 106.1% and 92.3% respectively).



**Figure 1.**

Attitudes of patients who used antibiotic and herbal products in the treatment of UTI

### *Prediction factors*

The largest number of variables influenced attitudes toward antibiotic efficacy. Age greater than 27 years was negatively correlated with this attitude. Female respondents living in the city, having a high level of education, and having a high income were positive predictors of this attitude (Table IV).

Surprisingly, high education was associated with a higher chance of having the attitude that antibiotics are completely safe. No statistically significant predictor was found for the attitude that antibiotics can be administered without prior consultation with a doctor/pharmacist (Table IV).

Age greater than 27 years was positively correlated with the attitude that herbal products are more effective than antibiotics. However, many other factors (female, living in the city, high level of education, and high monthly income) were negatively correlated with this attitude. The influence of variables on attitudes toward herbal products is shown in Table IV.

The statistically significant gender difference found among respondents was expected because UTIs are more common in women [3, 40]. Also, the difference in terms of comorbidity was expected, given that some diseases, such as diabetes, carry a high risk for UTIs [3, 41]. A high percentage of highly educated respondents was observed in the study. However, similar observations were made in other studies [42]. The majority of our respondents believe that antibiotics can help treat symptoms of UTIs. Macfarlane *et al.* [43] found that 87% of respondents believe that antibiotics will help treat lower acute respiratory tract symptoms. This study was conducted 25 years ago when antimicrobial resistance rates were low [44]. The slightly more negative attitudes about antibiotics for UTI treatment found in our study may be due to recurrent UTIs that are difficult to treat with antibiotics [45]. In our study, it was found that those who live in the city, have a high level of education, and have a high income are more

than twice as likely to believe that antibiotics are effective.

Half of our respondents believed that antibiotics are safe medicines, which can be worrying. Similar results were obtained in the study by Vanden Eng *et al.*, which found that 58% of respondents were not aware of the health risks of antibiotics [46].

It is encouraging that the vast majority of respondents in this study believe that antibiotics should not be used without prior consultation with a healthcare professional. However, previous studies have shown that although almost all respondents believe that antibiotic treatment should be started after visiting a doctor and receiving a prescription, only slightly more than half received antibiotics on a doctor's prescription during the last infection [47]. The attitude towards antibiotic use without prior consultation with a healthcare professional is statistically significantly different in respondents with symptoms of UTIs than those without UTI symptoms. UTIs can often be recurrent, and patients may self-administer antibiotics based on previous experience, which indicates that they are more likely to use antibiotics independently [48].

A large percentage of respondents believe that in addition to antibiotics, HPs can also help treat UTIs. Similar observations have been noticed in other studies examining the use of non-specific HPs [49]. The percentage of patients from this study who believe that HPs are effective for the treatment of UTI is higher than the general views on the effectiveness of non-specific HPs [42]. However, half of the respondents from our study believe HPs are more effective for UTI treatment than antibiotics. Although our study did not determine the influence of attitudes about antibiotics on their use, negative attitudes toward antibiotics may cause frustration among respondents, and failure to receive treatment may cause feelings of resentment [36] and affect respondents' resorting to HPs. On the other hand, positive attitudes towards HPs may be associated

with their use and motivation to continue using them [26]. Therefore, understanding patients' health problems and personal views regarding the treatment

and making shared therapy decisions on UTI treatment could be very important.

**Table IV**

Factors predicting attitudes toward antibiotics and herbal products

Whole sample (935)	Antibiotics can help treat a urinary tract infection.	Antibiotics are completely safe.	Herbal products can help treat urinary tract infections.	Herbal products are more effective than antibiotics for the treatment of urinary tract infections.	Herbal products have fewer side effects than antibiotics.	Herbal products can be simultaneously used with other medicines.	Enough information is provided in the herbal product characteristics/package to enable its proper use.
Variable (reference category)							
Age ( $\geq 27$ )	0.53 (0.40 - 0.69)		0.77 (0.59 - 0.98)	1.50 (1.05 - 2.13)	0.65 (0.50 - 0.84)		
Gender (Male)	1.62 (1.16 - 2.26)			0.61 (0.41 - 0.93)			
Residency (Rural)	2.26 (1.69 - 3.04)			0.46 (0.32 - 0.65)	1.67 (1.24 - 2.24)		
Education level (Low)	2.54 (1.93 - 3.34)	1.56 (1.05 - 2.30)		0.49 (0.35 - 0.70)		0.75 (0.56 - 0.99)	0.54 (0.41 - 0.72)
Employment status (Unemployed)							
Monthly income (Low)	2.06 (1.57 - 2.69)			0.38 (0.27 - 0.56)		0.71 (0.54 - 0.94)	0.66 (0.50 - 0.87)
Urinary tract infection (No)						1.44 (1.09-1.92)	
Comorbidities (No)					0.65 (0.46 - 0.91)		

Research conducted in Serbia, it was found that 38.5% of respondents thought that combining HPs with conventional medicines was safe [50]. A significantly high percentage of respondents with UTI believed that HP could be combined with other medicines. This issue may be of concern, and pharmacists should educate patients, especially those with a low level of education and low income. A significant number of respondents believe that there needs to be more information about the use of HPs, and pharmacists should advise patients in detail about their use.

Respondents with a high level of education are two and a half times more likely to believe that antibiotics can help treat UTIs. As expected, respondents with a high level of education are less likely to believe that HPs are more effective than antibiotics. In addition, other predictive factors were identified, suggesting that educational programs need to be adapted to specific groups of patients [39].

#### *Study strengths and weaknesses*

This is the first study to examine respondents' specific attitudes about antibiotics and HPs for the treatment of UTIs. The strength of this study is that it analyses the attitudes of two groups of respondents (with and without current symptoms of UTIs). Both groups had enough respondents to ensure the representativeness of the results. The weak spot of the study is that only Internet users could participate in the research, which ensured a large percentage of younger and more educated respondents. Also, both groups of respondent objects differed statistically in terms of gender and comorbidities.

#### *Further research*

Future research should investigate the influence of attitudes on the behaviour of respondents with symptoms of UTIs. There is also a need to examine the attitudes and practices of pharmacists and doctors regarding treating UTIs, particularly about the use of HPs. Consideration of these findings would contribute significantly to understanding the

treatment of UTIs and enable the development of new strategies for their appropriate treatment.

### Conclusions

Patients should be aware of the safety of taking antibiotics and the importance of their rational use. In addition to pharmacists, society should be involved in this campaign, and other organisations, such as the Ministry of Health, should also support it. The use of HPs for the treatment of UTIs should be discussed openly with patients. Healthcare professionals should not take a repulsive attitude toward the use of HPs, as this may negatively affect patients' confidence in the treatment and even in the entire healthcare system. Pharmacists should provide detailed instructions on the use of these products when dispensing them and verify that patients have understood the information. Additional efforts by pharmacists to educate these patients could result in greater efficacy and safety and, thus, greater patient satisfaction.

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### Conflict of interest

The authors declare no conflict of interest.

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