Current Status of Disease Awareness and Fluid Intake Habits in Patients with Urinary Calculi

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Abstract

Objective To investigate disease cognition and current fluid intake status among patients with urinary calculi, providing a basis for developing targeted health education and intervention measures. Methods A total of 433 patients with urinary calculi who attended the Department of Urology at the First Affiliated Hospital of Sun Yat-sen University from December 2023 to December 2025 were selected as study participants. A cross-sectional survey was conducted using a general information questionnaire, a drinking water questionnaire for patients with urinary calculi, and a disease cognition questionnaire. Results Patients had insufficient levels of disease cognition, with prominent deficiencies in knowledge regarding diet and fluid intake. Inadequate fluid intake was common, mainly due to weak awareness of proactive water drinking, busy work schedules, and using "thirst" as a trigger for drinking water. Patients' sources of disease-related knowledge were relatively limited. Conclusion Disease cognition and fluid intake habits among patients with urinary calculi both need improvement. Healthcare professionals should strengthen individualized health education, improve patients' disease cognition, guide them in developing scientific fluid intake habits, and reduce the risk of stone recurrence.

Full Text

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Abstract: Objective To investigate disease awareness and current fluid intake status among patients with urinary calculi, providing evidence for developing targeted health education and intervention measures. **Methods** A cross-sectional survey was conducted among 433 patients with urinary calculi who visited the Department of Urology, the First Affiliated Hospital of Sun Yat-sen University, from December 2023 to December 2025. A general information questionnaire, a water-intake questionnaire for patients with urinary calculi, and a disease-awareness questionnaire were used. **Results** Patients' level of disease awareness was insufficient, with prominent deficiencies in knowledge of diet and fluid intake; inadequate fluid intake was common, mainly due to weak awareness of voluntary water intake, busy work, and using "thirst" as a trigger for drinking water; patients' sources of disease knowledge were relatively limited. **Conclusion** Disease awareness and fluid intake habits among patients with urinary calculi both require improvement. Medical and nursing staff should strengthen individualized health education, enhance patients' disease awareness, guide them to develop scientific fluid intake habits, and reduce the risk of stone recurrence.

Keywords: urinary calculi; disease awareness; fluid intake

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Abstract: Objective To investigate disease awareness and current fluid intake status among patients with urinary calculi, providing evidence for developing targeted health education and intervention measures. **Methods** A cross-sectional study was conducted on 433 patients with urinary calculi admitted to the Department of Urology of the First Affiliated Hospital of Sun Yat-sen University from December 2023 to December 2025, using a general data questionnaire, water intake questionnaire and disease awareness questionnaire for urinary calculi patients. **Results** The patients' disease awareness level was insufficient, with prominent deficiencies in dietary and fluid intake cognition. Inadequate fluid intake was prevalent, mainly due to weak voluntary water intake awareness, busy work, and taking "thirst" as a trigger for water intake. The sources of disease knowledge for patients were relatively single. **Conclusion** The disease cognition and fluid intake habits of patients with urinary calculi need to be improved. Medical staff should strengthen individualized health education, improve patients' disease cognition, guide them to develop scientific fluid intake habits, and reduce the risk of stone recurrence.

Key words: urinary calculi; disease awareness; fluid intake

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Urinary calculi are common diseases in urologic surgery, and their incidence and recurrence rates have been increasing year by year, imposing a heavy burden on global medical care and the economy[^1-2]. Their formation is closely related to patients' fluid intake habits, dietary structure, lifestyle, and genetic factors[^3-4]. Among these, insufficient fluid intake is an important inducing factor for stone formation[^5-6], while improving the level of disease awareness helps improve patients' health behaviors and reduce the risk of recurrence. At present, research on disease awareness and fluid intake status among patients with urinary calculi remains insufficient[^7]. Therefore, gaining an in-depth understanding of

the current status of disease awareness and fluid intake habits among patients with urinary calculi is of great significance for formulating targeted health management strategies, improving patients' self-management ability, and reducing the recurrence rate of calculi. Accordingly, this study used a cross-sectional survey to analyze patients' disease awareness and fluid intake status and their influencing factors, in order to provide scientific evidence for the clinical formulation of targeted health management strategies.

1 Materials and Methods

1.1 Study Participants

A total of 433 patients with urinary calculi who visited the Department of Urology, The First Affiliated Hospital of Sun Yat-sen University, from December 2023 to December 2025 were selected as study participants, and a cross-sectional current-status survey was conducted. Sample size estimation: with reference to previous studies on awareness related to urinary calculi[^8], the overall awareness rate was taken as $P = 0.65$, the allowable error as $\delta = 0.05$, the test level as $\alpha = 0.05$, and a two-sided test was used. The sample size calculation formula for a cross-sectional survey was:

$$n = Z^2_{\alpha/2} \times P\,1 - P\,/\delta^2.$$

In the formula, $Z_{\alpha/2} = 1.96$. The calculated basic sample size was $n = 359$. Considering a 15% invalid questionnaire/nonresponse rate, 410 participants were required. This study ultimately obtained 433 valid samples, and the sample size met the needs of the preliminary analysis of this survey. This study was approved by the Medical Ethics Committee of The First Affiliated Hospital of Sun Yat-sen University (approval No.: Ethics Review [2025] No. 057).

Inclusion criteria: 1) clinically diagnosed with urinary calculi[^9]; 2) in good mental condition and voluntarily participated in the study, and signed the informed consent form.

Exclusion criteria: 1) calculi secondary to other diseases; 2) incomplete clinical data and unwillingness to cooperate with clinical work; 3) concomitant systemic infectious diseases; 4) mental abnormalities.

1.2 Study Instruments

1) General information questionnaire. Designed by the researchers, it covered general demographic and disease-related data, including sex, age, body mass index (BMI), education level, occupational labor intensity, time of disease detection, treatment course, and awareness of stone composition.

2) Questionnaire on drinking-water habits of patients with urinary calculi. This questionnaire was designed by the research team after reviewing the

literature. Its contents included daily water intake, types of drinking water, drinking habits, reasons for insufficient water intake, and channels for obtaining disease information. The questionnaire' s Cronbach' s α coefficient and test-retest reliability were both 0.908. The item-level content validity index (Item-level Content Validity Index, I-CVI) for each item of the questionnaire ranged from 0.800 to 1.000, and the scale-level content validity index/average (Scale-level Content Validity Index/Average, S-CVI/Ave) was 0.941.

3) Disease awareness questionnaire for patients with urinary calculi. This questionnaire was independently developed by The First Affiliated Hospital of Sun Yat-sen University based on domestic and foreign literature and guidelines for the diagnosis and treatment of urinary calculi. After completion of the initial draft, multiple rounds of expert review were conducted. Seven experts, including 3 chief physicians in urology, 2 specialist nursing managers, and 2 health education experts, were invited to use the Likert 4-point scoring method to evaluate the relevance,

rationality and appropriateness, summarized the revision comments, deleted ambiguous items, and optimized the wording. Content validity: in this study, the A-CVI was 0.92 and the S-CVI/Ave was 0.90, indicating good content validity of the questionnaire. Structural validity: exploratory factor analysis was used for testing; a total of 4 common factors were extracted, which were fully consistent with the 4 dimensions preset in the questionnaire. The factor loading coefficients of all items were >0.60, and the cumulative variance explained was 73.26%, indicating ideal structural validity. Reliability testing: 30 study participants were selected to complete the retest at an interval of 14 d. The intraclass correlation coefficient (ICC) of the retest group was 0.892; the overall Cronbach' s α coefficient of the questionnaire was 0.874, and the α coefficients of each dimension were 0.781–0.856, indicating that the questionnaire had reliable validity.

1.3 Research Methods

An electronic questionnaire was created using Wenjuanxing; all items were set as required, and a QR code was generated. The enrolled study participants scanned the code and completed the questionnaire, with researchers answering questions on site. For those who were unable to use WeChat to complete the paper questionnaire, the researchers assisted by reading it aloud. The questionnaires were checked and entered by 2 researchers. A total of 433 questionnaires were distributed, all of which were validly recovered, with an effective recovery rate of 100%.

1.4 Statistical Methods

SPSS 26.0 software was used for statistical analysis. Distribution characteristics of measurement data were analyzed. Measurement data conforming to a normal

distribution were expressed as mean ± standard deviation ($\bar{x} \pm s$); count data were expressed as frequency (n) and percentage (%). Comparisons of count data between two groups and among multiple groups were performed using the χ^2 test. The test level was $\alpha = 0.05$, and $P < 0.05$ was considered statistically significant.

2 Results

2.1 Analysis of General Data

A total of 433 patients were included in this study, aged 20–70 years, with a mean age of (46.00 ± 11.61) years. Among them, there were 276 males (63.74%) and 157 females (36.26%); the proportion of male patients was higher than that of female patients. Most patients lived in urban areas, accounting for 71.59%. Patients with junior high school education or above accounted for 91.92%, among whom those with college education or above accounted for 49.65%. In terms of occupational labor intensity, light physical labor was predominant, accounting for 77.60%. There were 321 patients (74.13%) who were not diagnosed for the first time; 55.20% of patients had stones discovered during physical examination; 47.67% had a recurrence interval of >10 years. Among patients with recurrence, previous treatment was mainly surgery (46.51%) and extracorporeal shock wave lithotripsy (33.64%). See Table 1.

Table 1 General data [n (%)]

Item	Content	Proportion
Sex	Male	276 (63.74)
Sex	Female	157 (36.26)
Age	<40	147 (33.95)
Age	41-60	231 (53.35)
Age	>60	55 (12.70)
Place of residence	City (town)	310 (71.59)
Place of residence	Rural area	93 (21.48)
Educational level	Primary school	30 (6.93)
Educational level	Junior/senior high school	183 (42.24)
Educational level	College or above	215 (49.57)
Occupational labor intensity	Light physical labor	336 (77.60)
	Moderate physical labor	82 (18.94)
	Heavy physical labor	15 (3.46)
First detected	Yes	112 (25.87)
First detected	No	321 (74.13)
Detected during physical examination	Yes	239 (55.20)

Detected during physical examination	No	194 (44.80)
Time of first visit among recurrent patients	Less than 5 years	93 (28.97)
Time of first visit among recurrent patients	5–10 years	75 (23.36)
Time of first visit among recurrent patients	More than 10 years	153 (47.67)
Previous treatment methods among recurrent patients	Surgery	149 (46.51)
Previous treatment methods among recurrent patients	Extracorporeal lithotripsy	108 (33.64)
Previous treatment methods among recurrent patients	Drug treatment	35 (10.90)
Previous treatment methods among recurrent patients	Observation	29 (9.03)

2.2 Disease awareness level among patients with urinary calculi

Among the 433 patients in this group, the overall mean accuracy rate for disease awareness was 69.05%, which was at an upper-middle level. The Friedman M test was used to compare the degree of mastery across the four awareness dimensions, and the results showed $\chi^2 = 220.465$, $P < 0.001$, indicating that differences in mastery among the awareness dimensions were statistically significant. Among them, the accuracy rate for awareness of prevention management was the highest (88.22%), while the accuracy rate for dietary knowledge awareness was the lowest (54.50%); the accuracy rate for drinking-water knowledge (68.13%) was basically comparable to that for disease knowledge (69.05%). See Table 2.

Patients' awareness was uneven, with many areas of misconception. Item 15 was a reverse statement, and its accuracy rate was only 6.90%, indicating that only a very small number of patients understood the modern view that "patients with urinary calculi do not need strict calcium restriction" ; only 21.48% of patients knew that "stones can induce hypertension." For basic common knowledge such as "stones affect life and work" (90.07%) and "a balanced diet and exercise can reduce the risk of recurrence" (89.22%), the accuracy rates were all above 89%.

In terms of drinking-water awareness, 79.68% of patients knew that drinking a large amount of water can prevent recurrence, but only 66.28% of patients had mastered the detailed knowledge that "water intake should be taken regularly in divided periods." See Table 3.

Table 2 Disease awareness scores [($\bar{x} \pm s$), points]

Item	Items (n)	Mean score	Accuracy rate (%)
Disease knowledge	5	3.34 ± 1.28	69.05
Drinking-water knowledge	9	6.12 ± 2.81	68.13
Dietary knowledge	3	1.63 ± 0.78	54.50
Prevention management	2	1.76 ± 0.53	88.22
χ^2 value		220.465	
P value		<0.001	

Table 3 Disease awareness items and accuracy rates

Item	Content	Accuracy rate (%)
1	Urinary calculi are prone to recur after surgery	58.19
2	Urinary calculi can cause renal colic, hematuria, urinary tract infection, etc.	85.78
3	Urinary calculi can cause hypertension	21.48
4	Urinary calculi can affect renal function and even cause renal failure	78.88
5	Urinary calculi affect work and daily life	90.07
6	Drinking plenty of water is currently the simplest and most effective measure to prevent recurrence of urinary calculi	79.68

Item	Content	Correct Rate (%)
7	To prevent recurrence of urinary calculi, patients should drink at least 2,500 mL of water per day	75.00
8	Daily water intake should be distributed across different time periods	66.28
9	Patients with urinary calculi should ideally record their daily water intake and urine volume	67.24
10	Long-term consumption of strong tea increases the risk of recurrence of urinary calculi	59.35
11	Frequent consumption of sugar-sweetened beverages increases the risk of recurrence of urinary calculi	67.67
12	Drinking an appropriate amount of water before bedtime can reduce the risk of recurrence of urinary calculi	62.07
13	Rehydration after profuse sweating can reduce the risk of recurrence of urinary calculi	62.93

	Item	Content	Correct Rate (%)
	14	Observing urine color and volume can provide a simple assessment of fluid intake status	71.55
	15	Patients with urinary calculi need to strictly restrict calcium intake	6.90
	16	Patients with uric acid stones should reduce their intake of high-purine foods (rich broth, seafood, animal offal, beer)	80.60
	17	Patients with calcium oxalate stones should reduce intake of beans, spinach, sesame paste, and similar foods	75.86

Item	Content	Correct rate (%)
	Foods rich in oxalic acid	
18	A balanced diet, appropriate exercise, and a healthy lifestyle can reduce the risk of stone recurrence	89.22
19	Regular follow-up examinations are needed after urinary stone surgery	87.07

2.3 Current status of fluid intake

Overall, fluid-intake behavior among the patients in this group was not standardized. Only 10.85% of patients drank >2 500 mL of water per day, and more than 60% of patients did not reach the recommended standard reported in the

relevant literature[^10]. Patients mainly drank plain boiled water in daily life (53.45%), and 31.41% of patients had tea/beverage intake accounting for more than 50%. Most patients had the habit of drinking water after getting up in the morning (76.67%) and before going to sleep (62.59%), but only 56.58% had the habit of carrying water with them when going out, indicating weak awareness of actively replenishing water. Comparisons among the groups for each drinking-behavior indicator showed statistically significant differences ($P < 0.05$). See Table 4.

Table 4 Survey of drinking-water habits

Item	Category	Number of cases	Percentage (%)	χ^2 value	P value
Daily water intake (mL)	<1 500	144	33.25	28.633	<0.001
Daily water intake (mL)	1 500–2 000	142	32.79		
Daily water intake (mL)	2 000–2 500	58	13.39		
Daily water intake (mL)	>2 500	47	10.85		
Daily water intake (mL)	Unclear	41	9.47		
Type of drinking water	Purified water	147	33.91	19.356	<0.01
Type of drinking water	Mineral water	52	12.01		
Type of drinking water	Plain boiled water	231	53.45		
Proportion of tea/beverages	( )50%	136	31.41	12.121	<0.01

Item	Category	Number of cases	Percentage (%)	χ^2 value	P value
Proportion of tea/beverages	<50%	295	68.13		
Habit of drinking water before sleep	Yes	271	62.59	8.866	<0.05
Habit of drinking water before sleep	No	162	37.41		
Drinking water after getting up in the morning	Yes	332	76.67	15.693	<0.001
Drinking water after getting up in the morning	No	101	23.32		
Carrying a water cup when going out	Yes	245	56.58	5.944	<0.05
Carrying a water cup when going out	No	188	43.50		

2.4 Reasons for insufficient fluid intake

In the survey on reasons for insufficient water intake, the main reason was "forgetting to drink," followed by "not having time to drink" and "not being thirsty." In addition, "not liking to drink water," "not wanting to go to the toilet," and "not knowing how much to drink" also accounted for certain proportions. Comparisons of the proportions of the various reasons for insufficient water intake showed statistically significant differences ($\chi^2 = 37.218$, $P < 0.005$). See Table 5.

Table 5 Reasons for Insufficient Water Intake [n (%)]

Reason for insufficient water intake	Proportion
No time to drink	149 (34.41)
Forgetting to drink	181 (41.80)
Not thirsty	144 (33.26)
Disliking drinking water	97 (22.40)
Not wanting to go to the toilet	45 (10.39)
Not knowing to drink more water	67 (15.47)

2.5 Pathways by Which Patients with Urinary Calculi Obtain Health Information

The item on access to health education information was set as a multiple-choice question. Among the options, "notification by medical staff" was the absolutely dominant channel, accounting for 76.29%, followed by "Internet/official accounts," accounting for 40.94%. In addition, "notification by family members and friends" accounted for 36.21%, while "hospital/community publicity materials" accounted for only 32.33%.

3 Discussion

Urinary calculi are a common and frequently occurring disease in urologic surgery, with high incidence and recurrence rates. They can cause severe low back and abdominal pain, hematuria, and urinary tract obstruction; in severe cases, they may impair renal function and seriously affect patients' quality of life and physical health [11-12]. Their occurrence and progression are closely related to disease awareness, diet, and fluid intake habits. Scientific awareness, standardized water intake, and dietary management are key to reducing incidence and recurrence risk. This study showed that patients with urinary calculi still have considerable room for improvement in overall disease awareness and fluid intake habits, consistent with findings from related studies in China and abroad [13-15].

Among the various awareness dimensions, the accuracy rate for the prevention and management dimension was the highest, which may be related to the relatively high proportion of patients who were not diagnosed for the first time.

Such patients' prior disease experience makes their willingness to prevent recurrence and their compliance higher, providing a strong foundation for continuous clinical health management [16]. The accuracy rate for the dietary knowledge dimension was the lowest; the accuracy rate for dietary knowledge was only 54.50%, and more than 40% (45.50%) of patients had obvious misunderstandings regarding dietary recommendations and taboos. Similar to findings of related research [16], this suggests that dietary education remains a weak link in health education, and that individualized dietary guidance should be implemented clinically according to stone composition.

The survey of water-drinking behavior showed that more than 60% of patients did not meet the guideline standard for daily water intake, indicating a serious overall insufficiency in fluid intake. According to the *Chinese Guidelines for the Diagnosis and Treatment of Urinary Calculi* and the recommendations of the European Association of Urology guidelines for the management of urolithiasis [2, 17], patients with calculi should maintain a daily water intake corresponding to a urine volume of 2,500–3,000 mL. However, in this study population, the rate of meeting the water-intake target was low, drinking times were unreasonable, and passive drinking habits were common. Patients' insufficient water intake mainly stemmed from weak subjective awareness and limitations in objective conditions, with forgetting to drink water, being busy at work, and passively replenishing water only when thirsty as the main triggers. This reflects that patients have not established the concept of regular and active water intake, and that their capacity for self-management of health behaviors is insufficient. Of note, misunderstandings about calcium restriction were extremely serious in this group: only 6.93% of patients had correct awareness, and the vast majority of the population blindly and strictly restricted dietary calcium intake. Existing studies have confirmed that excessive calcium restriction reduces intestinal binding of oxalate and increases oxalate absorption, thereby increasing the risk of calcium oxalate stone formation; appropriate dietary calcium intake can effectively counteract oxalate absorption and is an important dietary principle for preventing stones. Clinically, strict distinction should be made between "restricting high-calcium supplements"and "normal natural dietary calcium intake," and the public' s generalized dietary misconception should be corrected to avoid unreasonable dietary interventions that may aggravate disease recurrence.

Analysis of health-information acquisition pathways showed that medical staff education remains the core source of knowledge for patients; however, the coverage and depth of education are limited, and the utilization rate of new media and hospital-based popular science resources is insufficient. At the current stage, clinical health education is mostly based on homogeneous lectures and lacks integration with stone-related content.

components and individual living habits, and thus it is difficult to correct entrenched cognitive misconceptions. In combination with the multifactorial analysis results of this study, disease awareness level, history of urolithiasis, and educational level are independent risk factors affecting fluid-intake behavior,

suggesting that subsequent interventions should precisely target high-risk populations.

In summary, patients with urolithiasis have problems such as uneven disease awareness, nonstandardized drinking behavior, and prominent dietary misconceptions, and there is a clear gap between these conditions and the requirements of the latest guidelines. Clinically, questionnaire validity verification results should be relied upon and, in combination with the data from this study, the health-education system should be optimized; emphasis should be placed on correcting high-incidence dietary misconceptions such as calcium restriction; stratified interventions should be implemented according to stone type and demographic characteristics; guidance on regular and healthy drinking should be strengthened; channels for science communication should be broadened; and patients' disease awareness and self-management ability should be effectively improved, so as to reduce the risk of recurrence of urolithiasis at the behavioral source.

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Note: Figure translations are in progress. See original paper for figures.