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A Cross-Sectional Study on Hospital-Based Knowledge Regarding Prevention of Recurrent Urolithiasis

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Background: Urolithiasis which is a prevalent disease that can be prevented. Additionally, the rate of recurrence has been increasing. Prevention of the recurrence plays a vital role in limiting complications. One of the best ways to achieve this is by enhancing patients' knowledge about preventing urolithiasis. However, there are few studies conducted on this issue in Vietnam.

Objective: To explore the level of knowledge regarding the prevention of urolithiasis recurrence and identify predicted factors.

Methods: A cross-sectional design was used in the study. The respondents were over 18 years, used to diagnose urolithiasis, and attended the Department of Medical Examination and General Surgery Ward of C Da Nang Hospital. Ethical approval was obtained from the university and the hospital. Frequency and descriptive tests were applied to describe variables. Binominal logistic regression was used for detecting factors predicting knowledge regarding the prevention of urolithiasis recurrence.

Results: There were 254 patients participating in the study, and 68.9% of participants had good knowledge toward prevention of urolithiasis recurrence. The study revealed that occupation, duration of urolithiasis, number of hospitalizations, and source of information were significantly predictable factors ($P < .05$). Age, gender, residence, educational level, and treatment methods did not affect this knowledge.

Conclusions: Improving knowledge regarding the prevention of recurrent urolithiasis in patients was important, especially in general knowledge and diet including fluid intake. The development should be through the source of obtained information. It is necessary to emphasize the role of healthcare workers in providing the appropriate information.

Keywords: Urolithiasis, Recurrent, Prevention, Knowledge

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Introduction

Urolithiasis is a common condition that effects all ages around the world.[1] Globally, about 12% of the population had urolithiasis.[2] However, the prevalence and incidence of urolithiasis vary by regions and countries. In North America, the prevalence ranged from 7% to 13%, while in Europe, it ranged from 5% to 9%.[3] The rate of the Asian population suffering from urolithiasis was from 1% to 19.1%.[1] Vietnam is located in the "urinary stone belt" of the world. The percentage of Vietnamese people with urolithiasis accounted for 1% to 3% of total population, making it the most prevalent urological disease, accounting for 60% of urinary disease in general.[4]

Approximately 50% of urolithiasis cases were symptomatic.[5] Some kinds of urolithiasis, especially nephrolithiasis, were the risk factor for end-stage renal disease.[6] In addition, the rate of readmission due to urolithiasis and its recurrence has significantly increased.[5] Recurrence rates have been reported to be between 30% and 50% over a period of 10 years.[5] Early diagnosis, effective treatment, and adherence to prevention methods can reduce both the complications from urolithiasis and its recurrence.[2]

In order to prevent recurrent urolithiasis, not only the treatment and nursing care from physicians and nurses but also self-care by patients, including compliance with diet, fluid intake, exercise, regular follow-ups, and check-ups.[7] One of the reasons for recurrent urolithiasis was the lack of knowledge on prevention, leading patients to not knowing how to properly self-care. A study in Saudi Arabia showed that 64.1% patients had poor knowledge toward urinary stone.[8] Another study revealed limited knowledge about preventing recurrence of urolithiasis.[9]

Furthermore, knowledge regarding the prevention of recurrent urolithiasis was poorly reported in Vietnam. Additionally, to our knowledge, there were limited studies that investigated risk factors related to knowledge regarding prevention of recurrent urolithiasis worldwide. Most researches focused on the epidemiology of urolithiasis such as the prevalence, incidence, and the risk factors associated with urolithiasis.[3, 8, 10, 11] Other studies have demonstrated the risk factors of urolithiasis.[11, 12] Therefore, this study was conducted with the objectives to describe knowledge regarding prevention of recurrent urolithiasis and explore the related risk factors. The results would provide valuable data on the level of knowledge about prevention of recurrent urolithiasis and related factors. This information could serve as the basis for planning intervention programs for patients, contributing to lowering the proportion of recurrent urolithiasis and reducing the complications of the disease.

Methods

Participants and Setting

The study was designed as a cross-sectional study. Participants aged 18 years and over who were diagnosed with urolithiasis according to medical records and hospital admission forms. Exclusions were patients in the emergency settings and/or had cognitive impairment based on 6 cognitive impairment tests (score > 8).

The sample size was calculated by the following formula as: $n = Z^2_{(1-\alpha/2)}[p(1-p)/d^2]$, with n: the minimum sample size; $Z_{\alpha/2}$: the Z value obtained from the Z table corresponding to the α value. In the study, α was 0.05 and Z was 1.96; *p*: based on the study of Huong,[13] 60.8% participants got the good knowledge regarding the prevention of recurrent urolithiasis. Therefore, the *P* value was .6108; *d*: the allowable error of 0.06. From the formula, the sample size was 254.

Instruments

The questionnaire consisted of 2 parts. Part A consisted of 9 questions about personal characteristics such as age, gender, residence, occupation, educational level,

duration of urolithiasis, treatment methods, number of hospitalizations, and sources of information.

Part B was developed by Huong[13] and colleagues for assessing patients' knowledge regarding the prevention of urolithiasis recurrence. The questionnaire included 16 items that divided into 4 components. Component 1 with 5 items evaluated the general knowledge about urolithiasis. Seven items of the component 2 were used for assessing knowledge about diet. Component 3 was about frequency of doing exercises. Component 4 included 3 questions gauging about monitoring and reexamination. There were 8 items that had only 1 correct answer, while the other items had more 1 correct answer. Each correct answer got score of 1, while the wrong one was 0. The total score was from 0 to 16. Participants with good knowledge had 8 points and over, whereas ones who got under 8 scores were classified as having poor knowledge. The Cronbach's alpha of the investigators was 0.81. The reliability in this study measured by the Kuder-Richardson Formula 20 index was 0.92.

Data Collection

After receiving the approvals, the convenience sampling method was used to collect data. Data collection was carried out from February to August 2023 in the Department of Medical Examination and General Surgery Ward of C Da Nang Hospital. The C Da Nang Hospital is in the first line under the Ministry of Health. The hospital is responsible for taking care of people in the Central Highlands region of Vietnam.

Researchers directly met each patient who got inclusive standards and conducted face-to-face interviews. Patients would fill in the informed consent if they agreed to join the study. All participants were specifically explained the aims and content of the study before proceeding. Data were used for research only. All information of participants was kept confidential, encrypted during process, and ensured no disclosure.

Data Analysis

Data were analyzed and interpreted by SPSS version 20.0 (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp; 2013). Qualitative variables were described by frequency and percentage. Quantitative data were explained by mean and standard deviation (SD). Binominal logistic regression was applied to test the prediction of independent variables on knowledge regarding the prevention of urolithiasis recurrence. The significant threshold was P value less than .05 ($P < .05$).

Results

There were 254 participants who enrolled in the study (mean [SD] age, 63.11 [10.9]; range, 29 - 82 years). More than a half was male. Most of them lived in urban areas. Exactly a half were retirees, and 46.1% of participants had graduated from diploma, university, or over. The duration of urolithiasis ranged from 1 to 48 months (mean [SD], 7.11 [7.37] months). Nearly a third of participants used to experience lithotripsy to treat urinary stones, whereas a small minority (11.4%) has not yet treated. The majority of patients (67.7%) had hospitalized in the first time. Ninety-nine out of 254 participants got information from books, magazines, newspaper, or social media.

Over two-thirds (68.9%) of participants fulfilled good knowledge regarding the prevention of urolithiasis recurrence. According to general knowledge, a significant proportion of patients knew signs and symptoms of urolithiasis, and treatment methods (74.4% and 71.7% respectively). With regards to knowledge about diet, the large number of patients who understood to increase vegetables with fruits, and fluid intake accounted for 82.7% and 97.2% respectively, whereas there were only 12.6% of them recognized certain kinds of fluid intake that was good for their health. There were 39% grasped the need of salt restriction and the participants aware protein restriction in 35.8%. Most patients (96.5%) identified

the usefulness of doing exercise for urolithiasis, and 64.2% participants answered correctly with the knowledge of herbs that prevented the urolithiasis recurrence. One-third realized signs and symptoms of complications that require reexamination (Table 1).

A binomial logistic regression was performed to assess the effects of independent variables on knowledge regarding the prevention of urolithiasis recurrence. The logistic regression model was statistically significant ($P < .001$). The model explained 28.3% (Nagelkerke R^2) of the variance in knowledge level and correctly classified 76.8% of cases. Occupation, duration of urolithiasis, number of hospitalizations, and source of information were significantly predicted knowledge regarding the prevention of urolithiasis recurrence. Retirees were 0.193 times less likely to have knowledge than the people with manual labor. Additionally, increasing duration of urolithiasis and number of hospitalizations was associated with an increased likelihood of knowledge. Participants who got information from book, magazines, newspaper, and social media had increasingly limited knowledge than from the ones who received information from their relatives and friends, health care workers, and others ($P < .05$). Age, gender, residence, educational level, treatment methods did not predict knowledge regarding to prevention of urolithiasis recurrence (Table 2).

Table 1. Description of Knowledge Regarding to Prevent Urolithiasis Recurrence

Content	Correct Answer, No. (%) (N = 254)
General knowledge	
Suspected factors	52 (20.5)
Risk factors	49 (19.3)
Signs and symptoms	189 (74.4)
Complications	85 (33.5)
Treatment methods	182 (71.7)
Diet	
Increase vegetable and fruit intake	210 (82.7)
Calcium restriction	133 (52.4)
Salt restriction	99 (39.0)
Protein restriction	91 (35.8)
Increase fluid intake	247 (97.2)
Coffee and tea restriction	214 (84.3)
Kind of fluid intake	32 (12.6)
Frequency of doing exercise	245 (96.5)
Monitoring and reexamination	
Herbs for helping prevent the recurrence	163 (64.2)
Signs and symptoms for reexamination	85 (33.5)
Time of reexamination	110 (43.3)

Table 2. Factors Predicted Knowledge Regarding to the Prevention of Urolithiasis Recurrence

Factor	OR (95% CI)	*P* Value*
Age	1.017 (0.97 - 1.07)	.505
Female gender	0.881 (0.47 - 1.66)	.696
Rural residence	1.670 (0.62 - 4.50)	.311
Occupation	-	.026
Intellectual labor	0.347 (0.09 - 1.22)	.098
Retirement	0.193 (0.06 - 0.064)	.007
Educational level	-	.780
High school	1.281 (0.51 - 3.20)	.596
Diploma, university, and over	1.402 (0.54 - 3.67)	.491

Table 2. Factors Predicted Knowledge Regarding to the Prevention of Urolithiasis Recurrence (Continued)

Factor	OR (95% CI)	*P* Value*
Duration of urolithiasis	1.105 (1.02 - 1.19)	.010
Treatment methods	-	.051
Lithotripsy	0.477 (0.20 - 1.12)	.089
Operation	1.344 (0.58 - 3.13)	.494
Not yet treated	1.856 (0.57 - 6.04)	.305
Hospitalization ≥ 2 times	3.258 (1.42 - 7.49)	.005
Source of information	-	.001
Relatives and friends	0.189 (0.08 - 0.44)	< .001
Health care workers	0.282 (0.11 - 0.73)	.009
Others**	0.038 (0.00 - 0.51)	.013
Constant	1.087	.958

Abbreviations: CI, confidence interval; OR, odds ratio.

* The statistical significance was determined at $P < .05$.

** Books, newspapers, social media, or conferences.

Discussion

The finding of the study revealed that the proportion of people with good knowledge regarding the prevention of urolithiasis recurrence was reasonably high (68.9%). This finding was more likely than the result from Huong[13] and Moussa et al.[14] Moussa et al[14] found that patients' knowledge about preventing urolithiasis recurrence was low (26%), even though 71% of them were interested in learning about the preventive methods. One of the main reasons for the limited knowledge was lack of guidance from health care specialist.

According to general knowledge, in Vietnam, some suspected factors causing urolithiasis included genetics, urinary tract infection, and inappropriate diet.[4] Less than one-fifth of participants in the study understood these suspected factors. The majority of respondents (80.7%) incorrectly answered about risk factors for urolithiasis. These results were consistent with the study of Huong.[13] Patients who lied down for long periods, worked in hot condition, or experienced urine retention were at a higher risk of developing urinary stones.[5] In addition, poor hygiene has been identified as an indirect factor for urolithiasis and its recurrence.[5]

Symptoms of urolithiasis often have few manifestations.[5] Patients typically recognized this disease when the stone has moved and caused obstruction or complications. Therefore, recognizing the signs and symptoms of the disease was crucial for detection and appropriate treatment while the stone is still small. In the study, many patients (77.4%) had knowledge about signs and symptoms of urolithiasis; the rate that was higher than studies conducted in the United Arab Emirates[15] and Saudi Arabia.[8] However, if stones were not detected and treated early, dangerous complications could occur, such as urinary tract infection, kidney failure, fluid retention, pus retention, and urinary tract obstruction.[2] Knowledge about the complications of urolithiasis was insufficient among participants, indicating that they did not fully understand the seriousness of the disease's complications.

A suitable diet significantly contribute to the protection against urolithiasis recurrence and reduce the need for invasive surgical procedures.[16] This diet typically include restriction on foods high in salt, calcium, protein, and beverages such as coffee, tea, as well as ensuring adequate water intake.[15] A combination of low calcium and sodium intake could notably decrease urinary calcium excretion.[16] More than half of the participants acknowledged the need for calcium limitation in the diet, a rate slightly higher than studies in the United Arab Emirates[15] and Spain.[17] However, only 39% of patients recognized the necessity of salt restriction. The percentage of patients who understood the need to limit high-protein foods was comparable to the finding of Thuy' study,[4] conducted in the public hospital in Northern Vietnam. Moreover, a diet high in fiber and fruits could help prevent the risk of urinary stones.[16]

There was substantial evidence that adequate fluid intake plays a vital role in preventing urolithiasis recurrence.[18] In the study, the majority of participants were aware of the need to increase of fluid intake and restrict coffee and tea, while 12.6% of them identified specific types of consumed fluid. These results were consistent with previous studies.[19, 20] A systematic review synthesized the relationship between higher fluid intake and increased urine output.[21] Low fluid intake causes decrease diuresis, resulting in concentrated urine, which could lead to the formation of urinary stones.[21] If urine output is approximately 1.6 L per day, the risk of urinary stone recurrence would be lower.[5] Citrus fruit juices, such as orange juice and lemonade, were excellent choices as it contains citrate, which could protect against stone formation.[22] Additionally, some boiled herbal water such as corn silk was also a good option because it has a diuretic effect, anti-stone impact, inexpensive, and easy to find.[23]

Frequent exercises help in increasing metabolism, excretion, and elimination of waste from the body through increased sweating, thereby reducing the deposition of minerals in the kidney. Consequently, it helps decreasing the risk of stone formation.[8, 12] A high percentage of participants (96.5%) recognized the importance of frequent exercise to prevent urolithiasis recurrence. The result was comparable to the study from Thuy.[4]

Herb plants help in preventing urolithiasis recurrence. Some types of herbs such as galangal bud, plantain flower, and pyrethrum can be easily collected in Vietnam. Most participants (64.2%) were aware of this. This aligns with Vietnamese belief and culture, where traditional medicine was trusted as a treatment option.[24] In contrast, one-third of patients recognized abnormal signs and symptoms of complications requiring reexamination, such as fever, pain in the waist, dysuria, hematuria, urinary retention, and hypertension.

Occupation significantly predicted the level of knowledge regarding the prevention of urolithiasis recurrence. Manual labors had better urolithiasis-related knowledge than the retirees. The finding was consistent with 2 previous studies.[4, 9] In addition, evidence on the occupation factor for urolithiasis recurrence was limited. People working in hot environment had a higher risk of urolithiasis.[1, 25] Duration of urolithiasis was one of the factors affecting knowledge about preventing recurrent urinary stones in the study. This result was similar to the comprehensive meta-analysis by Wang et al.[12] People who had previously suffered from urinary stones were more knowledgeable because they accumulated awareness and experiences from the previous occurrences.

A statistically significant predictable factor was the number of hospitalizations, which affected patients' knowledge. This result aligned with the finding of Aldaher et al[15] in the United Arab Emirates. Patients hospitalized for treating urinary stones had better knowledge of prevention about recurrence because they were likely provided information about the disease by healthcare workers. Additionally, source of information was related to knowledge. Specifically, counseling on the prevention

of recurrent urolithiasis was an important responsibility for healthcare workers.[26]

Our study was limited as it was carried out in a single hospital, which affected the generalizability of population. The authors suggested conducting similar studies in multiple institutions to implement intervention methods that enhance knowledge about recurrent urolithiasis.

Conclusions

The study revealed a relatively high level of knowledge regarding the prevention of recurrent urolithiasis. However, it was necessary to improve patients' knowledge about the general knowledge, particularly diet and fluid intake. In addition, there was an association between occupation, duration, position of stones, number of hospitalizations, and source of information and knowledge of prevention about urinary stone recurrence. Increasing patient awareness by providing information on these related issues through channels such as medical workers, handouts, leaflets, and workshops for both patients and their relatives and caregivers was essential. Furthermore, it was necessary to clarify the role of medical staffs in providing appropriate information.

Article Information

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Ethics Approval

The study was approved by the Ethics Council in Biomedical Research of Da Nang University of Medical Technology and Pharmacy (No. 45/CT-HDDD dated January 12, 2023) and the Scientific Ethics Board of the Hospital (No. 170 dated February 10, 2023).

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Conflict of Interest

The authors declare no conflict of interest.

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