ORIGINAL ARTICLE

Evaluation of adherence to preventive behaviors in patients with a history of renal stones: A cross-sectional study

Behzad Yousefi Yeganeh[1], Golnaz Mahmoudvand[2], Mohammad Mahdi Alborzi[3], Arian Karimi Rouzbahani[2,3]*

[1]Department of Urology, School of Medicine, [2]USERN Office, [3]Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran

Abstract

Background: Urinary stones are among the most common urological diseases. Certain preventive behaviors have been recommended to decrease the recurrence of urinary stones in patients with a prior history. *Aim and Objectives:* To determine the extent of adherence to preventive measures in patients with a history of urinary stones referred to urology clinics of Shahid Rahimi and Shohada-ye Ashayer hospitals in Khorramabad, Iran, in 2021-2022. *Material and Methods:* In this cross-sectional study, 208 subjects with a history of urinary stones were included. Demographic characteristics, lifestyle habits, behaviors to prevent the recurrence of urinary stones, and the overall score of preventive behaviors were collected. *Results:* The mean age of the studied population was 44.72 ± 14.4 years. The majority of patients 120 (57.7%) were male. There was no significant relationship between preventive behaviors with gender, age, occupation, and educational level ($p > 0.05$). However, there was a significant relationship between the overall score of preventive behaviors and the severity of the disease and physical activity ($p < 0.001$). *Conclusion:* Patients who have a history of urinary stones or are at risk of the development of urinary stones should be educated about preventive behaviors to reduce the risk of urinary stones.

Keywords: Renal Stones, Recurrence, Preventative Behaviors

Introduction

Urinary stones constitute the third most common cause of urological disorders [1]. The pathophysiology of urinary stone formation is primarily attributed to the precipitation, enlargement, accumulation, and concretion of different modulators in urine. Moreover, recent evidence points to the key role of cross-talks between crystals and renal tubular epithelial cells in developing stones [2]. With an estimated frequency of 77.5%, calcium oxalate stones are the most important type of urinary stones. Other prominent types include calcium phosphate, infection stone, uric acid stone, and cysteine [3].

Various factors such as genetic predisposition, age, gender, race, geographic location, diet, as well as underlying diseases, contribute to stone formation [4-5]. Some of these factors are unmodifiable. For instance, adult men are traditionally considered to be at the highest risk for developing renal stones [6]. On the other hand, since both medical and surgical therapeutic approaches to renal stones are accompanied by a high rate of recurrence leading to diminished renal function, precise follow-up and adjusting modifiable factors are of significance [7-9]. In various studies, lifestyle changes such as maintaining a suitable Body Mass Index

(BMI), sufficient physical activity, adequate intake of calcium and low salt consumption, low intake of animal proteins, and sufficient fluid intake have been suggested to prevent the formation and recurrence of stones [10-11].

In the Middle East, where Iran is located, the prevalence of urinary stones is estimated to be 20%, which is extremely higher compared to other regions [12]. Given the high incidence of urinary stones in our region and the scarcity of information on the extent of adherence to preventative behaviors in treated patients in this region, this study aimed to determine the extent of performing preventive behaviors for urinary stone recurrence in patients referred to teaching hospitals of Khorramabad, Iran.

Material and Methods

This study was approved by the Research Ethics Committee of Lorestan University of Medical Sciences (IR.LUMS.REC.1400.259). This cross-sectional study was conducted at the urology clinics of Shahid Rahimi and Shohada-ye Ashayer hospitals in Khorramabad, Iran, in 2021-2022. The inclusion criteria were as follows; a prior history of urinary stones, the ability to write and read, and signing the informed consent form to participate in the study. Patients were excluded if they were unable to answer the questionnaire due to severe pain. Based on the results from a similar study [13], and considering α=0.05, d=1, and δ =7.4, the sample size was set at 208.

$$n = \left(\frac{z_{1-\alpha\ 2} \times \delta}{d}\right)^2$$

After obtaining written consent, data were collected using a translated version of the questionnaire suggested by Bos *et al*. [14]. This questionnaire comprised a series of objective questions about the demographic and socio-economic status of the patients, as well as details concerning the patients' lifestyle and preventive behaviors as follows: 1) daily fluid consumption, 2) limitation of calcium intake, 3) limitation of oxalate intake, 4) limitation of salt intake, 5) limitation of sugar intake, 6) limitation of red meat consumption, 7) weekly exercise and physical activity. The answers were graded using the Likert scale (i.e., very low/ low/ moderate/ high/ very high). The collected data were analyzed using IBM SPSS Version 22 (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). The Kolmogorov-Smirnov test was used to determine whether the behavior scores had a normal distribution. The relationship between different variables and behavioral scores was evaluated using Pearson's correlation coefficient at $p < 0.05$ significance level.

Results

In this study, 208 patients who met the inclusion criteria were evaluated. Eighty-eight (42.3%) were female patients and 120 (57.7%) were male patients. Demographic data including age, height, weight, BMI, monthly income, time since diagnosis, and hours of weekly exercise are listed in Table 1. Data on the level of education, the severity of symptoms in patients previously treated, occupation, history of receiving treatment, and composition of stone are shown in Table 2. The overall average score of renal stone preventative behaviors was 21.18 ± 6.59 out of 35. The mean score in patients who had a history of treatment for urinary stones and those who had a family history of stones was 21.12 ± 6.66 and 21.35 ± 6.45, respectively. These scores were evaluated using the Kolmogorov-Smirnov test and showed a normal distribution (p = 0.082). The mean behavioral score

in women and men were 21.39 ± 7.04 and 21.03 ± 6.27 respectively, with no statistically significant relationship between score and gender (p = 0.697). As presented in Table 3, no significant correlation was observed between age, BMI, monthly income, and the time elapsed since the diagnosis with behavioral score (p> 0.05). However, a direct correlation was found between the behavioral scoreswith weekly exercise and the severity of symptoms (p< 0.001).

Table 1: Demographic characteristics of the study population

Variable	Mean ± SD	Minimum	Maximum
Age (years)	44.72 ± 14.4	19	92
Height (cm)	170.06 ± 8.6	151	191
Weight (kg)	80.52 ± 9.46	54	98
BMI (kg/m^2)	27.92 ± 3.39	19.13	27.93
Monthly income (million Tomans)	4.77 ± 3.85	0	15
Time elapsed since diagnosis (years)	8.11 ± 7.41	0.5	40
Weekly exercise (hours)	3.45 ± 2.3	0	9

SD- Standard Deviation

Table 2: The average score of each behavioral pattern in the study population

Behavior	Mean ± SD
Daily fluid consumption	2.73 ± 1.28
Limitation of calcium intake	2.98 ± 0.96
Limitation of oxalate intake	3.15 ± 1.27
Limitation of salt intake	3.29 ± 1.24
Limitation of sugar intake	3.28 ± 1.28
Limitation of red meat consumption	2.88 ± 1.24
Weekly exercise and physical activity	2.88 ± 1.22
Total	21.18 ± 6.59

SD- Standard Deviation

Table 3: Correlation between different variables and behavioral scores

Variable	Correlation (r)	*p*
Age	-0.045	0.516
BMI	0.125	0.072
Monthly income	-0.016	0.817
Time elapsed since diagnosis	0.146	0.076
Weekly exercise and physical activity	0.813	< 0.001
Severity of symptoms	0.561	< 0.001

Discussion

In the present study, no significant relationship was observed between the lifestyle score of urinary stone prevention behaviors with gender, age, BMI, economic status, job, and educational level. However, weekly exercise and severity of symptoms in patients previously treated for calculi had a significant correlation with behavioral scores. This is consistent with the study conducted by Norouzi *et al*. [15] regarding the health-promoting lifestyle factors in 300 patients with urinary stones. A significant relationship was observed between the lifestyle score with a family history of kidney stones and monthly income. However, no significant relationship was observed with age, gender, education, occupation, BMI, and personal history of the disease.

An important factor influencing behavioral scores is the awareness of the patients about lifestyle modifications and behaviors. In the present study, the mean score of lifestyle behaviors to prevent urinary stones was 21.18 out of 35. In a study conducted by Morowatisharifabad *et al*. [13] on 210 people with a history of kidney stones, the mean preventive behavior was relatively similar to that in our study population (38.75 out of 70), while the mean awareness score was 9.49 out of 25 points. Abdelwahab *et al*. [16] in a study on 70 Egyptian patients with kidney stones showed that there was a very positive correlation between knowledge and behavioral pattern in the intervention group.

Nephrolithiasis is caused by a combination of multiple genetic, environmental, and lifestyle factors. Besides medical prophylaxis of stones, behavioral factors can be considered a simple, low-cost approach to reduce the risk of recurrence [5, 17]. Health specialists have recommended multiple non-medical strategies to reduce the risk of urinary stone formation and recurrence. Dietary advice is centered on the intake reduction of lithogenic risk factors, such as calcium, oxalate, salt, and phosphate [10, 18]. It is noted that increased calcium and salt intake, results in increased renal secretion of calcium, potentially contributing to stone formation. Another dietary factor is the consumption of red meat, which alongside

increased calcium excretion is also seen to reduce citrate excretion and lower urine pH [18]. Additionally, sugar is also seen as a potential lithogenic factor, with studies showing an increased risk of stones in patients who consume high amounts of fructose. Other behavioral factors such as increased daily fluid intake (more than 3 liters daily) and physical activity are also noted to be strong preventatives of nephrolithiasis [10, 19]. Hence, owing to the promising effects of lifestyle behaviors and the positive correlation observed between knowledge and performing behavioral advice, patients at high risk for the formation of renal stones should be adequately taught about using evidence-based guidelines to ensure greater adherence to the preventative lifestyle patterns to reduce the risk of nephrolithiasis or its recurrence [17, 20]. In this study, potential factors influencing preventative behaviors was evaluated, with a positive correlation only being seen in physical activity and severity of urinary stone symptoms. However, this study did not establish a relationship between these behaviors with the formation or recurrence of stones. Future studies are recommended to evaluate the effect of lifestyle education on renal stones recurrence.

Conclusion

Patients who have a history of urinary stones or are at risk of the development of urinary stones due to the presence of family history should be educated about preventive behaviors to reduce the risk of urinary stones.

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Author for Correspondence:
Dr. Arian Karimi Rouzbahani, USERN Office, Lorestan University of Medical Sciences, Khorramabad, Iran
Email:ariankarimi1998@gmail.com
Phone: 00989306757977

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