

Urolithiasis and water intake in Saudi Arabia, is it a matter of quality or quantity?

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Abstract

Introduction: Urolithiasis is a significant problem with an increasing incidence and prevalence worldwide. Multiple factors such as water intake, climate change, dietary habit, and genetic factors can affect stone formation. Our aim is to clarify the relationship between water intake and urolithiasis in Saudi Arabia as a hot climate area.

Methods: This cross-sectional internet-based survey was conducted in November 2017. Our study was performed using a standard web-based questionnaire using social media open to all internet users. We excluded the incomplete responses. Analysis of the data was then carried out using Chi-square test and SPSS package version 20.

Results: We found a great response to our survey, where 9100 participants responded. Among the participants, 76.6% were females and 23.4% were males. The largest age group was between 18 and 30 years (60.8%). Of the participants, 842 (9.3%) had history of urinary tract stones. About 74.3% of the participants with a history of urinary tract stones were drinking <1 L/day of water in comparison with those who had no history of urinary tract stones who were drinking a minimum of 1.25 L/day in 55.1%. Regarding the type of water intake, there was no significant relationship between the type of water and the incidence of stones formation ($P = 0.096$). The amount of water was significantly correlated with the urolithiasis ($P = 0.000$).

Conclusion: We concluded that the amount of water intake per day significantly correlated with urolithiasis, and according to our study, the minimally accepted intake was ≥ 1.25 L/day. However, the type of water consumed has no statistically significant impact on stone formation.

Keywords: Saudi Arabia, urolithiasis, water

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INTRODUCTION

Urolithiasis is an important problem with increasing prevalence and incidence worldwide, and its tendency for recurrence made it to gain a significant attention.

Stone formation is multifactorial including biochemical, epidemiological, metabolic, and genetic risk factors.^[1]

The prevalence of stone formations depends in many factors and differs worldwide, and it is estimated to be

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about 1%–5% in Asia, 5%–9% in Europe, and 13% in North America.^[2]

Epidemiologically, Middle East, Scandinavian countries, the United States, Central Europe, Mediterranean countries, and the British Isles had higher incidences of urolithiasis. In Asia, Saudi Arabia, Iran, Sudan, the United Arab Emirates, India, Pakistan, Indonesia, Myanmar, Thailand, and the Philippine have been known as a stone-forming belt.^[3] In Saudi Arabia, the prevalence is about 6.8%–19.1%^[4] and the population tends to have 2.5 times higher possibility to develop urolithiasis, especially in hot regions.^[5]

Urolithiasis constitutes a major burden on health care, and therefore, all effort should focus on its prevention. Increased water intake is an important factor to decrease the chances of stone formation and recurrence.^[6] Production of at least 2.5 L of urine per day is recommended in patient with history of urolithiasis.^[7] Urine volume of 1 L/day or less is associated with higher incidence of urolithiasis. Stone recurrence in stone former patients can be prevented by higher urinary volumes over 2–2.5 L/day.^[8] However, a controversy has been suggested that weather stone formation is affected by water quality or not. Limited data are available which tried to determine the relationship between water quality and kidney stone formation.

Hence, our current study performed to clarify the relationship between whether quality or quantity of water intake is significantly correlated with stone formation in Saudi Arabia as a hot climate area.

METHODS

This cross-sectional internet-based survey was conducted on October–December 2017. Information about gender, residence, age, daily amount of water intake, and source of water intake were collected from the study participants through a standard web-based questionnaire using social media open to all internet users. Chemical composition of the three water analysis was compared including pH, hardness, and total dissolved solutes.

Analysis of the data was then carried out using Chi-square test and SPSS package version 20 (Armonk, New York, United States).

RESULTS

In total of 9100 participants completed the survey, 76.6% were females and 23.4% were males [Figure 1], largest age group was between 18 and 30 years (60.8%). About 842 (9.3%) had history of urinary tract stones [Figure 2],

74.3% of them were drinking <1 L/day of water in comparison with those who had no history of urinary tract stones who were drinking a minimum of 1.25 L/day in 55.1%. The compositions of the three water types showed comparable bottled and mineral compositions, however, tap water showed increased pH, total hardness, and total dissolved solutes [Table 1].

There was no significant relationship between the type of water and the incidence of stones formation ($P = 0.096$), however, the amount of water was significantly correlated with the urolithiasis ($P = 0.000$) [Table 2].

DISCUSSION

Urolithiasis is a disease known for its high prevalence and high rate of recurrence, focusing on such disease is important not only for its treatment but also mainly for its prevention and identifying its risk factors. In our data about 9320 participants completed the survey, 220 were excluded because of incomplete answers on all the questions, about 9.3% had history of urolithiasis which is higher than the

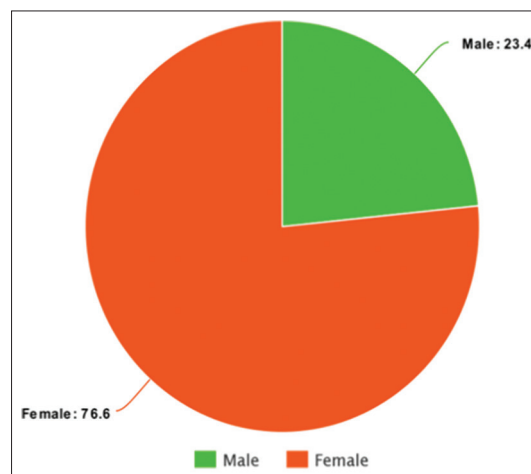


Figure 1: Participant gender

Table 1: Water types and composition

Type of water	Bottled	Mineral	Tap	Average
pH	7.1	7.0	7.6	7.23
Total dissolved solutes (in PPM)	110	90	1077	425.6
Total hardness (in PPM)	65	80	152	99

Table 2: Variant, stone incidence, and P value

	Variant (%)	Stone incidence (%)	Significance (P)
Type of water			
Bottled	5331 (58.6)	517 (9.7)	0.096
Mineral	1740 (19.1)	157 (9.0)	
Tap	2029 (22.3)	167 (8.2)	
Amount of water			
<5 cups	4331 (47.6)	626 (14.4)	0.0001
≥5 cups	4769 (52.4)	216 (4.5)	

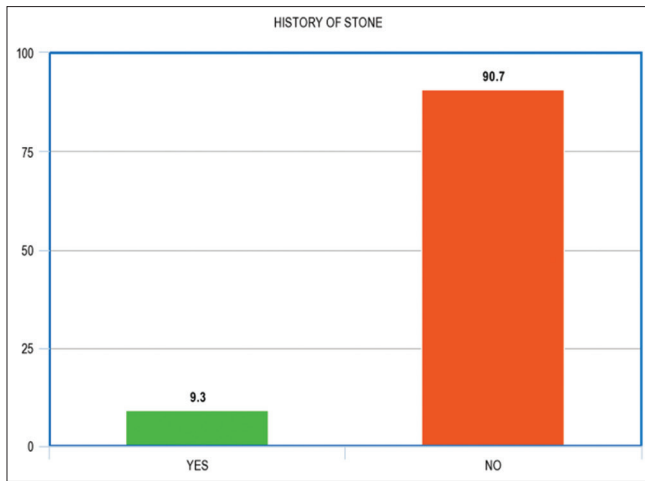


Figure 2: History of urolithiasis

prevalence in Asia (1%–5%) and Europe (5%–9%).^[2] In comparing the type of water consumed by the participants and incidence of urolithiasis, there was no statistically significant correlation, this result was reported before in a similar study conducted in West Bengal, India by Pubali Mitra, in which they found that drinking water in various places in West Bengal was found to be suitable for consumption and no association of water quality with kidney stone occurrence.^[9] Female participants were more in our study in contrast to male 76.6% versus 23.4%, respectively, likely because they are more social media responders.

However, in our study, the amount was statistically significant with regard to the prevalence of urolithiasis.

Controversy remains as to whether type of water consumed affect renal stone formation. The relationship between water hardness and incidence of stone formation was studied by multiple studies, and Basiri *et al.*^[10] found no statistically significant relation as well as a study done by Kohri *et al.*^[11] and Singh and Kiran.^[12]

However, Bellizzi *et al.* reported that the increased water hardness was associated with increased chances of stone formation by increasing urinary calcium concentration by 50%. Therefore, the authors suggested that soft water intake is associated with decreased urinary calcium concentration and incidence of urolithiasis.^[13] Another study done by Coen *et al.* also reported that there is an increase in urinary stone incidence in those who are drinking hard water.^[14]

The limitation of our study was that it was based on electronic questionnaire over a short period of time. Data collection from patients in different places in Saudi Arabia

could have provided a more accurate picture of stone prevalence and relation to water intake.

CONCLUSION

We concluded that the amount of water intake per day significantly correlated with urolithiasis, and according to our study, the minimally accepted intake was ≥ 1.25 L/day. However, the type of water consumed has no statistically significant impact on stone formation

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Conflicts of interest

There are no conflicts of interest.

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