ORIGINAL PAPER

UROLITHIASIS

Patient perception and barriers with fluid hydration: a prospective face-to-face interview and counselling from a university hospital stone clinic

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Introduction Kidney stone disease (KSD) has a lifetime prevalence of up to 14% in the United Kingdom. Primary and secondary prevention of KSD via dietary intervention is a low-cost public health intervention and remains the best preventative strategy against urolithiasis.

Material and methods This prospective study was conducted on kidney stone patients attending a stone clinic at our tertiary endourology centre. Patients were taken through a questionnaire, which was completed in the clinic by a trained specialist endourology nurse.

Results A total of 259 patients completed the questionnaire. 141 (54.4%) had an active stone during the clinic visit with the remaining 118 (45.6%) with a history of stone treatment. Regarding barriers to fluid intake, 43 (16.6%) patients did not have a habit of drinking water or felt too bloated, 36 (13.9%) did not like the taste, 17 (6.6%) were not thirsty, 10 (3.9%) of patients were too busy. Of those who answered, 108 (46.8%) patients did not believe there was a link between fluid intake and stone formation. A belief of a link between fluid intake and stone formation significantly predicted fluid intake (p = 0.024) with people who did believe in this drinking less water.

Conclusions There are numerous perceived barriers to adequate fluid intake, with almost half of all patients not believing that there is a link between fluid intake and stone formation. This misunderstanding may predict a lower fluid intake. More attention should therefore be focussed on patient education and primary prevention aspects to avoid kidney stone recurrence.

Key Words: fluid intake ‹› hydration ‹› stone ‹› patient perception ‹› urolithiasis

INTRODUCTION

Kidney stone disease has been increasing in prevalence in the United Kingdom over recent decades, with a lifetime prevalence of up to 14% in the United Kingdom [1], with a significant fiscal impact on the wider population [2]. As KSD is also associated with high recurrence rates, with more than 50% of patients having a recurrent episode within ten years [3], it is important that modifiable risk-factors are targeted for stone prevention. Increasing fluid intake has been identified as a key strategy to reduce kidney stone formation, with a linear dose-response relationship [4, 5, 6]. Illustrating the importance of adequate fluid intake, a prospective cohort study demonstrated that individuals who drank over 2.3 litres of fluid had a 50% reduced risk of developing kidney stones when compared to individuals who drank less than 1.2 litres [4]. This is reflected in international guidelines, which recommend that patients with KSD have a fluid intake of 2.5–3 litres/day [7].

However, these recommendations are not always adhered to by patients, with subjectively reported compliance rates of approximately 65% for keeping daily

fluid consumption above 2 litres [8]. In an objective study of adherence using 24-hour urine volume, the adherence rates were 47.5% at 18 months, with older patients and males being more likely to be compliant [9]. Barriers to increasing fluid intake amongst stone formers have previously been identified and these include lack of awareness, dislike for the taste of water, lack of thirst, and disruption of work [10]. As with other lifestyle advice, these barriers should be addressed at an individual level. A previous study has demonstrated that patients who were unsuccessful with increasing fluid intake were less likely to be counselled by a urologist and less aware of future stone risk [11]. The aim of the present study is to investigate the perception of patients with known kidney stones and barriers to fluid hydration perceived by them.

MATERIAL AND METHODS

Patient population

All patients with either active kidney stone disease or previous treatment for kidney stones were included in this prospective study. A face-to-face interview to understand their perception of fluid intake and the barriers to drinking fluids was undertaken at our university hospital kidney stone clinic. Patients were then counselled about the risk of stone recurrence and the importance of compliance with fluid hydration. The study was carried out from Jan. 2017 to Dec. 2019 and was registered with the hospital audit system (audit number 7505) with all patients consenting to being included in the study.

Data was collected on patient demographics, occupation, history of previous stone episode and treatment including shockwave lithotripsy (SWL), ureteroscopy (URS), percutaneous nephrolithotomy (PCNL), spontaneous stone passage (SSP), or surveillance. Data was also recorded on whether they currently had kidney stones. The type and quantity of fluid beverage was also recorded. While the type of beverage included water, tea, coffee, decaffeinated tea or coffee, fruit juices, fizzy drinks, alcohol and milk, the quantity was as mentioned by the patients and recoded for each beverage type (mL) and the total fluid intake (mL) for the day. The patients were asked whether they thought there was a link between fluid intake and kidney stone disease. Finally, the patients were asked for the reason why they were not drinking more water.

Despite being a face-to-face interview and counselling, not all patients answered all the questions, with some choosing to withhold the answers. In this scenario, these answers were not recorded. All interviews and counselling were done by two dedicated and trained kidney stone nurse specialists (MA, TD).

Statistical analysis

All responses were tabulated in an Excel spreadsheet (Microsoft, USA). For each recorded item, descriptive statistics were reported. Due to the heterogeneity in the numbers of patients answering each category, individual one-way ANOVAs were performed to assess factors associated with fluid intake volume. Statistical significance was set at $p < 0.05$. All statistical analyses were conducted using IBM SPSS for Mac version 28.0.0.0 (190).

RESULTS

Patient characteristics and beliefs

A total of 259 patients were included from this face-to-face interview (Table 1). Regarding employment, 25 (9.6%) patients were unemployed (full time parents, retired, students or unemployed), 43 (16.6%) patients had active jobs (healthcare workers, manual labour, police, security, and retail), 52 (20%) patients had sedentary jobs (transport, office workers), with the professional status not known for the rest. For treatment of previous stones, 75 (28.9%) patients were under surveillance but had never received any active treatment for urinary stones, 50 (19.3%) patients had undergone shockwave lithotripsy (SWL), 62 (23.9%) patients had undergone flexible ureteroscopy with lithotripsy (FURS), 12 (4.6%) undergone percutaneous nephrolithotomy (PCNL), and 57 (22%) patients passed their stones spontaneously.

Regarding fluid hydration and barriers to it, 43 (16.6%) patients did not drink more out of habit or felt bloated, 36 (13.9%) patients did not like the taste of water, 17 (6.6%) patients did not feel thirsty, 11 (4.2%) maintained the same level of fluid intake, 10 (3.9%) patients felt too busy, 3 (1.1%) patients believed the water contained calcium, 1 patient did not drink more due to their stoma issues, and 43 (16.6%) believed they had increased the amount they drank. Regarding the link between increased fluid intake and decreased stone formation, of those who answered, 123 (53.2%) patients believed there was a link, and 108 (46.8%) patients did not believe there was a link.

Fluid intake

Total fluid intake was reported by all 259 patients, with a mean volume of 2516 mL (SD: 922; IQR: 1065).

239 patients reported drinking water (mean vol. 1379 mL; SD: 905; IQR 1150), 128 patients reported drinking tea (mean vol. 863 mL; SD: 557; IQR: 713), 108 patients reported drinking coffee (mean vol. 650 mL; SD: 534; IQR: 500), 38 patients reported drinking decaffeinated coffee/tea (mean vol. 981 mL; SD: 594; IQR: 750), 48 patients reported drinking fruit juice (mean vol. 450 mL; SD: 401; IQR: 250), 11 patients reported drinking energy drinks (mean vol. 425 mL; SD: 256; IQR: 260), 56 patients reported drinking carbonated drinks (mean vol. 421 mL; SD: 420; IQR: 360), 74 patients reported drinking alcoholic drinks (mean vol. 330 mL; SD: 454; IQR: 260), and 11 patients reported drinking milk (mean vol. 528 mL; SD: 506; IQR: 250). Fluid intake is summarised in Table 2.

Table 1. *Patient demographics of the study*

Characteristic	N (%)
Occupation	
Unemployed	25 (9.7)
Active	43 (16.6)
Sedentary	52 (20.1)
Not answered	120 (46.3)
Stone status	
Active stone	141 (54.4)
No active stone	114 (44.0)
Not answered	4 (1.5)
Previous treatment	
No previous treatment*	75 (29.0)
SWL	50 (19.3)
FURS	62 (23.9)
PCNL	12 (4.6)
Spontaneous passage	57 (22.0)
Not answered	3 (1.2)
Link	
Believes link	123 (47.5)
Does not believe link	108 (41.7)
Not answered	28 (10.8)
Barriers to fluid intake	
Habit/bloated	43 (16.6)
Taste	36 (13.9)
Not thirsty	17 (6.6)
Maintained input	11 (4.2)
Too busy	10 (3.9)
Calcium	3 (1.2)
Have increased amount	43 (16.6)
Stoma	1 (0.4)
Not answered	95 (36.7)
*Had active stone with no prior treatment	

SWL – shockwave lithotripsy; FURS – flexible ureteroscopy with lithotripsy; PCNL – percutaneous nephrolithotomy; N – number of patients

Predictive analysis

A one-way ANOVA was performed to test if employment status significantly predicted total fluid intake. The one-way ANOVA revealed that there was no statistically significant difference in fluid intake between at least two groups ($F[2, 117] = 1.065$, $p = 0.348$).

A one-way ANOVA was performed to test if the presence of an active stone significantly predicted total fluid intake. The one-way ANOVA revealed that there was no statistically significant difference in fluid intake between at least two groups ($F[1, 253] = 3.052$, $p = 0.082$).

A one-way ANOVA was performed to test if the type of prior management for stones significantly predicted total fluid intake. The one-way ANOVA revealed that there was no statistically significant difference in fluid intake between at least two groups ($F[4, 251] = 0.809$, $p = 0.521$).

A one-way ANOVA was performed to test if the belief of a link between increased fluid intake and decreased stone formation significantly predicted total fluid intake. The one-way ANOVA revealed that there was a statistically significant difference in fluid intake ($F[1, 229] = 5.189$, $p = 0.024$). Patients who believed the link between fluid intake and stone formation drank significantly more water than those who did not (mean difference = 278.45; SE = 122.24; $p = 0.024$). Descriptive graphs including 95% confidence intervals are displayed in Figure 1.

Table 2. *Fluid intake detailed by the patients*

Intake	N (%)	Mean volume (mL) (SD; IQR)
Water	239 (92.3)	1379 (905; 1150)
Tea	128 (49.4)	863 (557; 713)
Coffee	108 (41.7)	650 (534; 500)
Decaffeinated tea/coffee	38 (14.7)	981 (594; 750)
Fruit juice	48 (18.5)	450 (401; 250)
Energy drink	11 (4.2)	425 (256; 260)
Carbonated drink	56 (21.6)	421 (420; 360)
Alcoholic drink	74 (28.6)	330 (454; 260)
Milk	11 (4.2)	528 (506; 250)
Total fluid intake	259 (100)	2516 (922; 1065)

N – number of patients

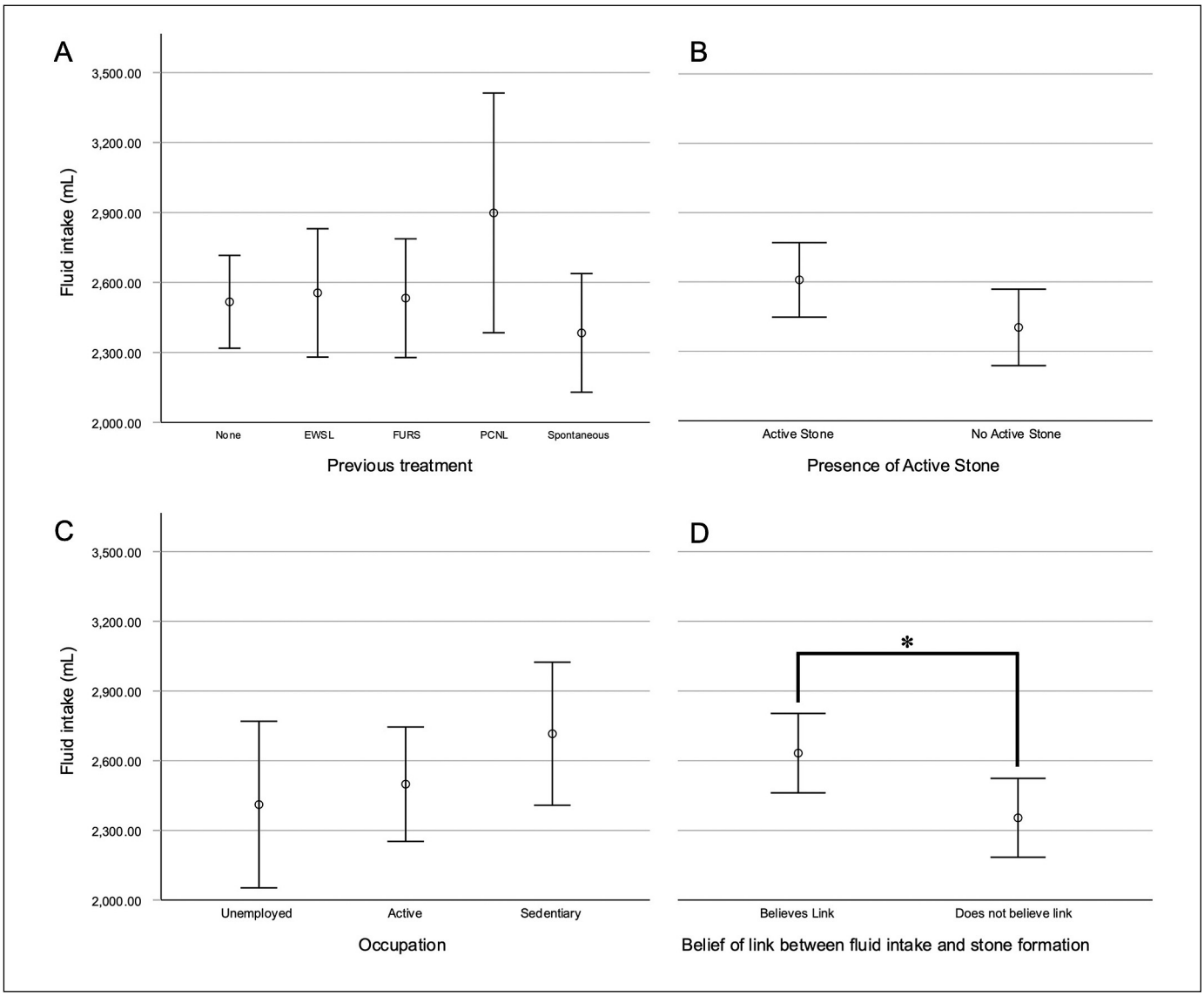

Figure 1. *The impact of previous treatment on fluid intake* **(A)**, *the impact of having an active stone on fluid intake* **(B)**, *the impact of occupation type on fluid intake* **(C)**, *the impact of believing there is a link between fluid intake and stone formation on fluid intake* **(D)**.

DISCUSSION

It is well established that increasing fluid intake protects against the formation of urinary stones [4, 5, 6], and therefore aiming for an intake of greater than 2.5 litres should be offered as conservative management advice to patients with urinary stones [7]. However, patients do not always adhere to this advice and several predictors and barriers to adequate fluid intake have been identified. In our study, we report fluid intake and perceived barriers to fluid intake from patients attending our tertiary stone service clinic. The reported mean total fluid intake amongst patients was 2516 mL, with water being the most consumed beverage. The most common barriers to fluid intake were not having a habit or feeling bloated when drinking, not liking the taste of water, and patients not feeling thirsty. The belief of a link between increased fluid intake and decreased stone formation predicted fluid intake.

McCauley et al. used a qualitative methodology to explore patients' perceptions and barriers to fluid intake, breaking down barriers into primary (lack of knowledge and not remembering to drink), secondary (water availability, lack of thirst, dislike taste), and tertiary (voiding frequency and issues at work) that patients passed through as they successfully increased their fluid intake volume [10].

Patients in the present study described similar barriers, with most barriers being perceived within the primary or secondary levels. For secondary barriers, the most common barriers were a lack of thirst and a dislike of the taste of water. Clinicians may suggest the use of fruit cordials or the use of decaffeinated beverages to increase the appeal of drinks as a strategy to address these barriers. For primary barriers, ~42% of patients did not believe a link between fluid intake and stone formation and these patients drank significantly less fluid. This presents a key target for behaviour modification approaches.

As previously identified, counselling from the urologist about the benefits of increasing fluid intake is of key importance. Communication strategies, such as motivational interviewing, have been successfully employed to address and reduce smoking [12] and substance use [13] among patients; these strategies may provide a framework for clinicians to discuss fluid intake with patients to help them understand the link and motivate them to increase intake. Simple psychological tools such action planning ('when, where, and how') or implementation intentions ('if–then') could potentially be used to address the goal-behaviour gap and may help patients increase their fluid intake behaviours [14–18]. These could be particularly helpful to patients who identified a lack of habit as a barrier.

The main strength of the present study is that the data is from patients presenting to a tertiary stone service. One weakness of the present study is the heterogeneity of data from patients – for example, almost half of patients did not report their occupation. A further limitation is the lack of a validated questionnaire to evaluate barriers to fluid intake. Future research should investigate the strategies to improve the understanding of the importance of fluid intake [19, 20].

CONCLUSIONS

One of the principal barriers to adequate fluid intake was patients' understanding of the association of fluid intake with kidney stones. A lack of understanding predicted lower fluid intake and almost half of patients not believing there was a link between fluid intake and stone formation. For patient-reported barriers to fluid intake, hydration habit and taste of water mattered to them. Neither occupation, the presence of an active stone, nor previous treatment significantly predicted fluid intake. This highlights the importance of addressing patients understanding and counselling them of the link between increased fluid intake and decreased stone formation.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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