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ORIGINAL ARTICLE

Awareness of Preventive Measures for Urinary Calculi Formation Among Adult Egyptians

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ABSTRACT

Background: Urinary calculi formation is a common worldwide health problem. Six verities of renal calculi are known. The prevalence of urinary calculi and awareness of risk factors among the public in adult Egyptians are not addressed enough nowadays, so this study aims to assess the awareness of preventive measures of urinary stones among adult Egyptians.

Methods: Our study is a cross-sectional observational survey. This survey was elaborated through a link shared on social media. It was conducted for one month. The Egyptian adults who use social media and decided to join in the survey were incorporated using convenience and snowball samples (380 adults). A set of questions about urinary calculi and preventive measures were included in the survey to be answered. Statistical analysis was done using the Statistical Package for the Social Sciences (SPSS V20.0).

Results: Overall, 380 respondents participated in our survey. The prevalence of urinary calculi was 57 out of 380 (15%) of respondents. Multivariate analysis showed that family history of stone formation and hypertension was significantly associated with the incidence of urinary calculi. The overall knowledge about preventive factors was poor in both groups stone former and other public groups with no statistical difference between the two groups regarding their awareness of preventive measures for urinary stone formation.

Conclusions: There was no statistical significance difference between participants with stone disease and those without stones regarding the awareness of preventive measures against stone formation. Both groups had little knowledge about disease prevention.

Keywords: Urinary calculi, Egyptians, Preventive measures, Awareness

INTRODUCTION

Kidney diseases affect about 200 million people worldwide on behalf of the World Health Organization (WHO). The number of diseased people continues to grow each year [1].

Nephrolithiasis is a common disease. It is believed to be formed by crystal aggregation of minerals inside the urine, which acts as the nidus for more crystallization and the formation of a kidney stone [2].

Urinary calculi are found in the kidneys, ureters, urinary bladder, and urethra. Six varieties of renal calculi were detected by biochemical analysis, of which 90% are calcium oxalate and phosphate, struvite, cysteine, and mixed matrix, while the remaining 10% are formed of uric acid and xanthine calculi [3].

The prevalence of urinary stones varies in different regions of the world. As its causes are influenced by many factors such as race, diet, and fluid intake [4]. The prevalence of urinary calculi among Egyptians working in Saudi Arabia was 29.5% [5]. prevalence of urinary calculi and awareness of risk factors among the public in adult Egyptians is not addressed enough nowadays, so this study assesses the awareness of preventive measures of urinary stones among adult Egyptians.

METHODS

Study Design and Setting

Our study is a cross-sectional observational survey to assess the awareness of preventive measures for urinary stone formation by using an anonymous online questionnaire. This survey was elaborated through a link shared on social media. It was conducted for one month.

Study population & Type of sample

The Egyptian adults who use social media, fulfilled the inclusion criteria, and decided to join in the survey were incorporated using convenience and snowball samples.

Inclusion criteria

Egyptians aged 18 years or older, read and understand Arabic, use social media, and willing to participate in our study after agreeing to informed consent were included in our survey.

Sampling

Using an online sample size calculator (www.openepi.com), keeping anticipated frequency of 29.5% as reported by the prevalence of urinary calculi in adult Egyptians working in Saudi Arabia was 29.5% [5]. The sample size was calculated, where $Z\alpha/2 = 1.96$, confidence level was 95% and Margin of error 5%, the sample size was equal to 377 participants, it was extended to be 380.

Data collection

A semi-structured questionnaire (Appendix) consisted of two parts:

1) Socio-demographic characteristics:

It included age, gender, residence, level of education, employment status, marital status, smoking, and the presence of any chronic diseases.

2) Questions to survey the presence of urinary calculi, site of stones, method of treatment, and consequences of treatment.

3) Questions to assess the awareness of participants to preventive measures as the minimal amount of fluid intake to decrease the opportunity of urinary tract stone development, food components that provoke stone formation, and whether calcium intake should be diminished to decrease urinary stone formation. All items are previously reliable by other study [2].

The questionnaire items were translated into Arabic. It was back translated into English by two bilingual consultants, and then both translators did necessary modifications, then two experts validated the questionnaire with no significant modifications. A pilot study was conducted on 50 participants to assess the reliability of the questionnaire, with acceptable Cronbach's α of 0.71.

Google forms including an informed consent were used to gather the data. An online semi-structured questionnaire was used. The connection to the questionnaire was delivered through WhatsApp groups, and Facebook groups. On viewing and clicking the link the participants were guided to study information and informed consent. After they agreed to join the survey, they answered questions about demographic data, then a set of questions about urinary calculi and preventive measures.

Ethical consideration

The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. The ethical Committee of Faculty of Medicine, Suez Canal University approved this research #4684. The online self-reported consent was included in the questionnaire and was obtained from all participants in the study. No monetary rewards were given for completing the questionnaire.

STATISTICAL ANALYSIS

Statistical analysis was done using the Statistical Package for the Social Sciences (SPSS V20.0). Frequencies and percentages are calculated and presented in tables and figures. (%). A chi-square test was employed to assess if there was a significant association between categorical variables. Multivariate analysis was done to assess if there is a difference between independent and dependent variables.

RESULTS

Overall, 380 respondents participated in our survey. Most participants were women 73.7%. The prevalence of urinary calculi was 57 of 380 (15%) of respondents. The mean age was 33.26 years, 30.66 years in urinary stone respondents, no urinary stone respondents, respectively (P<0.05). Most respondents have urinary stone was married 11% (P<0.05). Approximately 62% of respondents have a family history of stone formation (Table 1).

The kidney was the most affected urinary site 52.6%, then the ureteric stone was 22.8%. The mode of treatment was medical treatment, endoscopy, ESWL, and open surgery, 82.5%,19.3%, 15.8%, and 10.5%, respectively. Complete clearance of stone after treatment was achieved in 49.1%, partial clearance was in 24.6%, and failed treatment was in 26.3% (Table 2).

Multivariate analysis showed that family history of stone formation and hypertension was significantly associated with the incidence of urinary calculi (Table3). There were no statistical difference regarding the residence, government either upper Egypt or lower Egypt, nor occupation or type of work.

The respondents whose daily water intake was 2 L or more (correct answer) were 28 respondents 49.1% among whose have stone compared to 146 respondents (45.2%) among no stone respondents (P>0.05) (Figure 1). Most respondents reported that salty diets can increase the stone formation; 61.4% in the stone group, and 64.7% in the non-stone group (P >0.05) (Figure 2).

Regarding the question about whether decrease calcium intake can lead to decreased stone formation, 36.8% in the stone group answered NO (correct answer), while 42.1% in the non-stone group (P>0.05) (Figure 3).

Most respondents in both groups agreed that holding urine in the bladder for a long time increases the incidence of stone formation (P>0.05) (Figure 4).

Table 1: Sociodemographic data

	Have urinary stone N=57		No urinary stone N=323		P
Age Mean (SD)	33.26	(7.4)	30.66	(8.3)	0.0274[T]
BMI Mean (SD)	27.9	(5.3)	28.1	(6.5)	0.8262[T]
SEX	N	%	N	%	
FEMALE	39	10%	241	63%	0.327[C]
MALE	18	5%	82	22%	
RESIDENCE					
RURAL	9	2%	71	19%	0.290[C]
URBAN	48	13%	252	66%	
MARRITAL STATUS					
SINGLE	11	3%	120	32%	0.0277[F]
MARRIED	42	11%	189	50%	
DIVORCED	4	1%	13	3%	
WIDOW	0	0%	1	0%	
EDUCATIONAL LEVEL					
POSTGRADUATE STUDY	16	4%	57	15%	0.1451[F]
UNIVERSITY	36	9%	246	65%	

SECONDARY	5	1%	18	5%	
PRIMARY OR BELOW	0	0%	2	1%	
SMOKING					
NONSMOKER	51	13%	300	79%	0.3719[C]
SMOKER	6	2%	23	6%	
HYPERTENSION					
YES	8	2%	21	6%	0.0482[C]
NO	49	13%	302	79%	
DM					
YES	2	1%	10	3%	0.869[C]
NO	55	14%	313	82%	
Family history of stone formation					
Yes	42	11%	194	51%	0.0506[C]
No	15	4%	129	34%	

[T] T test, [C] Chi square test, [F] Fisher's exact test

Table 2: Stone site, mode of treatment, and treatment results

	N (57)	**%**
Site of stone		
Do not remember	12	21.1
Right kidney	8	14.0
Left kidney	11	19.3
Both kidneys	11	19.3
Right ureter	8	14.0
Left ureter	3	5.3
Both ureters	2	3.5
Urinary bladder	2	3.5
Mode of treatment		
Medical treatment	47	82.5
Endoscopy	11	19.3
ESWL	9	15.8
OPEN surgery	6	10.5
I forgot/hard to tell	5	8.8
Results of treatment		
Uncertain or failed results	15	26.3
Partial clearance of stone	14	24.6
Complete clearance of stone	28	49.1

Table 3: Multivariate analysis of urinary stones risk factors

Independent variables	**Coefficient**	**Std. Error**	**T**	**P**
(Constant)	0.02363			
Age	0.001592	0.002814	0.566	0.5719
BMI	-0.003319	0.003034	-1.094	0.2748
Educational_level	-0.04039	0.03637	-1.110	0.2676
Family history of stone formation	0.08909	0.03807	2.340	0.0198
HTN	0.1437	0.07097	2.025	0.0436

Marrital_status	0.07217	0.04045	1.784	0.0752
Occupation	-0.001400	0.01877	-0.0746	0.9406
Residence	0.05918	0.04492	1.317	0.1885
Sex	0.04643	0.04641	1.000	0.3178
Smoking	0.04443	0.07330	0.606	0.5448

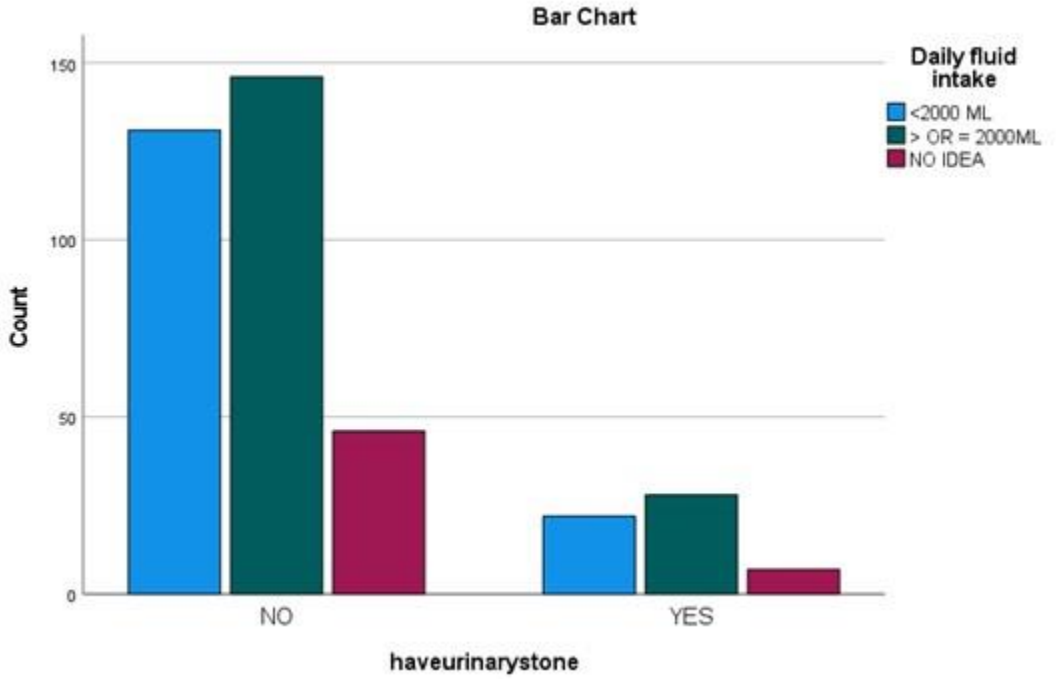

Figure 1: Daily fluid intake.

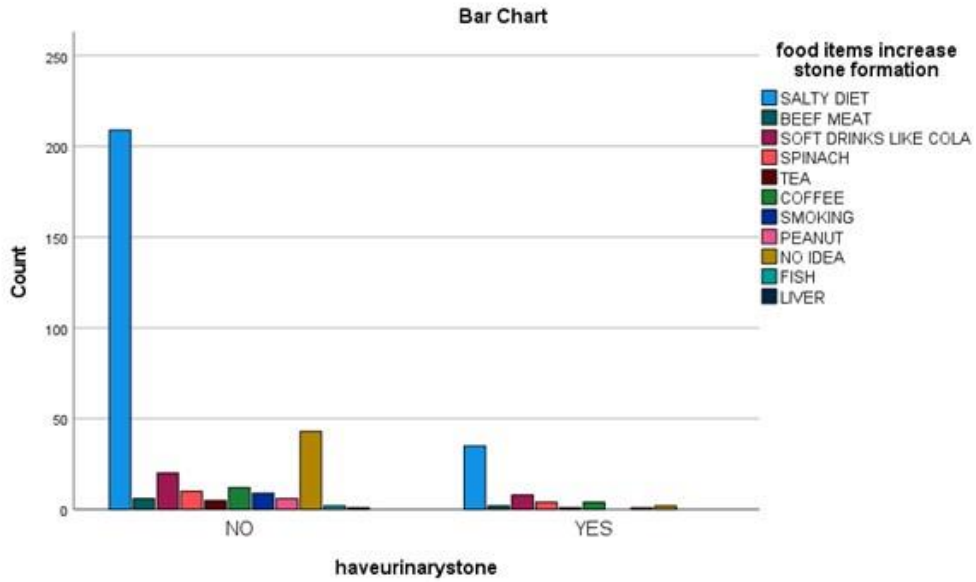

Figure 2: Food items increase stone formation.

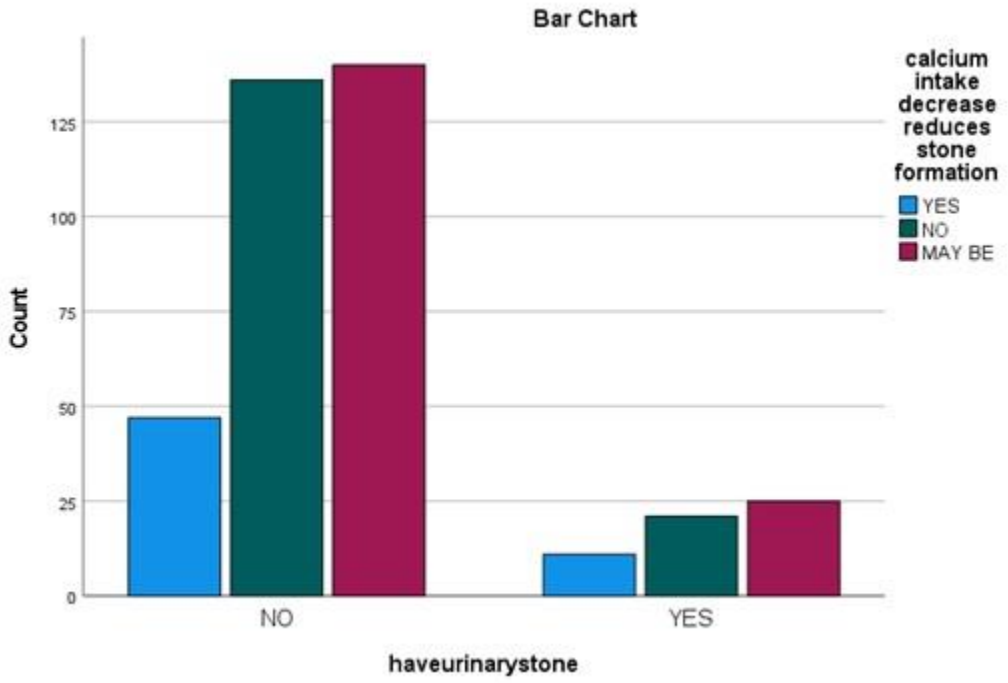

Figure 3: Calcium intake decrease reduces stone formation.

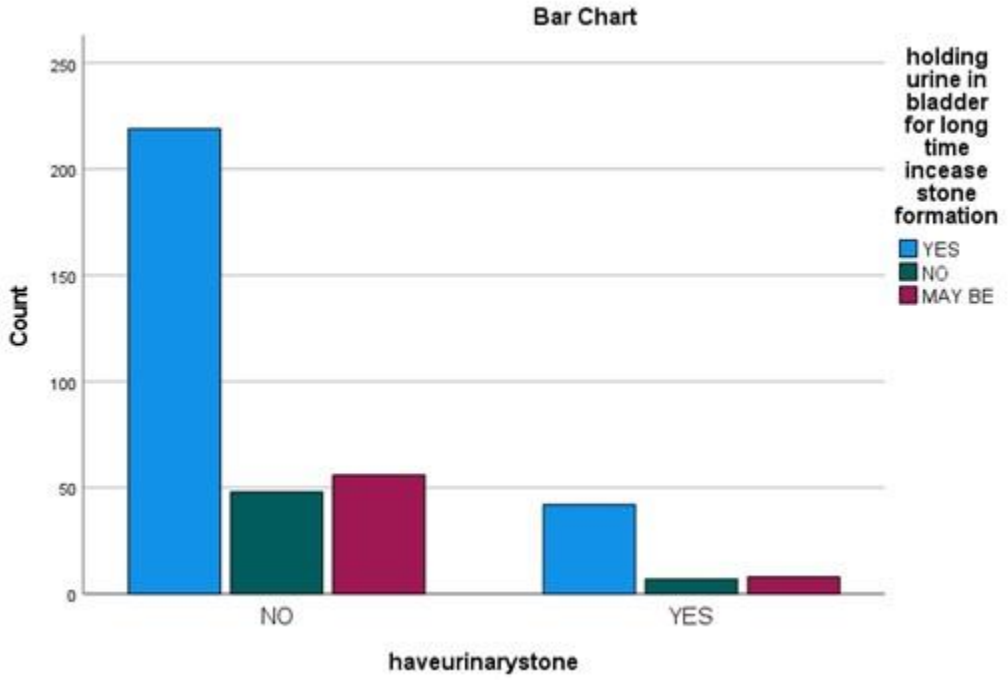

Figure 4: Holding urine in bladder for long time increase stone formation.

DISCUSSION

The worldwide prevalence of urinary calculi has increased in the last decade, ranging from 1%-5% in Asia, 5%-9% in Europe, and 7%–13% in North America [6]. The prevalence of urinary calculi among our studied sample was 15%, The kidney was the most affected urinary site 52.6%, the ureteric stone was 22.8%. These results differ from results obtained by Ahmed et al. [5] that the prevalence of urinary calculi among Egyptians was 29.5%. This difference because their study was conducted on the Egyptians working in Saudi Arabia based on ultrasound detection of stones so asymptomatic urinary calculi patients were included.

The prevalence of urinary stones in Saudi Arabia was 19.1% [5]. Our finding is close to the prevalence of Saudi Arabia and differs from Asia and Europe, and it is because climate, dietetic habits, and lifestyle look similar in middle east countries and different from Europe, Asia, and North America.

The incidence of urinary calculi was higher in males than in females as 18 out of 100 (18%) males had urinary calculi for 39 of 280 (13.9%) females. These findings agreed with other reports that the incidence of urolithiasis is higher in men than in women [7].

Our study found a positive association between family history of stone formation, hypertension, and incidence of urolithiasis. This is congruent with another study that a family history of urinary calculi has a two-fold increased risk of kidney stone formation [8]. In agreement with a study that detailed that there is a positive association between urinary calculi and hypertension [9].

In our study, there was no association between BMI, DM, and incidence of urolithiasis, which was contrary to other reports, which showed a positive relationship [10,11]. This difference could be because of differences in groups being studied regarding age groups and race.

In our study, there was no statistical significance difference between participants with stone disease and those without stones regarding the awareness of fluid requirements, food items increase stone formation, reduction of calcium in food decreases stone formation, and holding of urine for a long time increases stone formation. The overall knowledge about preventive factors was poor in both groups stone former and other public groups, which were consistent with other studies, which concluded that both the public and stone participants had little idea about the urinary stone disease and its prevention [2].

Diet and fluid intake regimen could influence the concentration of various minerals in urine and therefore the chance of urinary calculi formation [12,13]. Some reports showed that with increasing awareness and adjusting the fluid and dietary consumption, the incidence of urinary calculi can be decreased [14-16].

Decrease fluid intake reduces diuresis, resulting in concentrated urine and supersaturation of minerals donating to the formation of urinary stones [17]. After ingesting food high in oxalate increases its concentration in urine. The mixture of lipid and calcium in the small intestine, forming insoluble compounds, can also restrain the absorption of calcium, followed by enhancing oxalate absorption [18]. Hyperuricemia due to excessive ingestion of meat is the essential risk factor for uric acid stone formation [19]. High meat consumption can also cause urine acidification [20], which can lead to calcium oxalate stone formation.

The sodium concentration influences the urea level and raises the concertation of other minerals in the urine like calcium phosphate, calcium oxalate, and uric acid crystals [21].

If there are low dietary levels of calcium, more calcium will be released into the blood from calcium storage structures like the bone. The small intestine absorbs more calcium, and little is absorbed in the nephrons, increasing concentrations of calcium in the urine [22]. With high calcium levels in the urine, there is an increased probability that these ions will compound other minerals to cause kidney stones [23].

CONCLUSIONS

The prevalence of urinary stones among adult Egyptians is about 15%, there was no statistical

significance difference between participants with stone disease and those without stones regarding the awareness of preventive measures against urinary stone formation. Both groups had little knowledge about disease prevention.

List of abbreviations:

ESWL: Extracorporeal shock wave lithotripsy
BMI: Body Mass Index
DM: Diabetes mellitus

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