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INVESTIGATING THE COMPOSITION OF URINARY STONES IN PATIENTS VISITING JAHROM TREATMENT CENTERS: A DESCRIPTIVE CROSS- SECTIONAL STUDY

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ABSTRACT

Introduction: findings of this study have proven that the causes of formation of the urinary tract stone are multi-factor affected by environmental, metabolic and genetic factors. Different epidemiologic factors have been introduced as the underlying factors in the formation of urinary stones. The objective of this study is the epidemiological and demographic examination of the patients with urinary stones and the composition of urinary stones in patients visiting Jahrom treatment centers. Materials and Methods: This descriptive cross-sectional study was conducted on 728 patients with urinary stones visiting Jahrom treatment centers. After collecting the required urinary stones, the composition of urinary stone of the patients was examined. Finally, by the use of SPSS software and chi square test the data was analyzed. Results: the analysis of data indicated that the combination of calcium oxalate and uric acid were the most common urine stone followed by pure calcium oxalate, and men are more prone to urinary stones than women (72.5% to 24.8%). masculinity, tropical regions, previous history of stone, family history, low education, taking hypertensire drugs, back ground diseases and age are considered as risk factors for urinary stones. Conclusion: This study proved that epidemiological and demographic factors are associated with the formation of urinary stones and increase its risk. Thus, by identifying these factors it is possible to decrease the burden of this disease over society and individuals.

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Introduction

Urinary stone is one of the most commonly reported diseases of the patients visiting urological clinics. Stones can be formed in kidney, ureters, bladder, prostate and urethra [1, 2]. Recent studies in the United States, Europe, and Japan indicated a progressing growth of prevalence of urinary stones in the last half century [3, 4]. Urinary stones have a considerable effect on the quality of patients' life of and impose a high cost on them [5]. The two main causes of the formation of the stones are: the keeping urination and excessive saturation of urine with crystalloids that are not well soluble. Whenever the amount of drinking decreases or the amount of soluble material in the solution increases, the concentration of soluble substances in the solution increases, and this concentration leads to deposition of the crystals like of calcium, uric acid and phosphate [6]. PH of the urine also affects the solubility of certain crystals, some of which deposit very fast in acid urine and some others in alkaline urine. Abnormal PHs occurs in conditions such as tubular kidney acidosis, carbonic anhydrase inhibitors, and the presence of urea dividing bacteria into smaller particles, and chronic diarrhea (which causes severe abnormal PHS) [6]. The presence of sedimentary in the urine (Such as protein matrix, bacteria, and inflammatory elements) cannot be ignored. It seems that inhibitors such as citrate and magnesium prevent the accumulation of crystals and the formation of compounds,

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and absence of inhibitors increases the risk of stone formation [6]. Not only the absence of inhibitors makes a person vulnerable to the formation of stones, but also, the presence of anti-inhibitors in the urine (such as aluminum, iron, and silicon) paves the ground for the formation of stones. Certain medications contribute to the formation of stones (Such as acetazolamide, absorbable alkalins of calcium carbonate and sodium bicarbonate, and aluminum hydroxide). Excessive doses of vitamin C also increases oxalate levels in urine. In the southern United States, known as "rock belt", is more prone to the risk of stone formation than other parts of the country. In men aged 30 to 50 years, the risk of stone formation is three times higher [6]. The prevalence of stone formation in a study conducted in Taiwan was as follows: calcium oxalate + calcium phosphate 52.3%, calcium oxalate 27.8%, calcium phosphate 9.3%, uric acid 7.6%, strurite 3%, cysteine 0.1 %[1]. The prevalence of urinary tract stones in Iran is 11.4% (7.8%), such that, in the study conducted in Ardabil, the prevalence of urinary stones is as follows: calcium oxalate, 82.2%, uric acid 16.2%, calcium phosphate 4.8% 2, infectious stone 0.4, cysteine 0.6, other stones 0.3 % [7]. different studies have been conducted on the prevalence of urinary stones in different countries, which indicates different outbreaks of urinary stones [8-12]. Stone formation is more common among European and Asian peoples. After the first time of stone formation in a patient, the risk of formation of other stones increases [6]. The possibility of formation of stones in Iran from 9 to 15 years old is 0.9% and the growing of 8.2 % for ages 70 and above [13]. In adult males, the prevalence of urinary stone is higher [1, 2]. It seems that, due to the climatic effects, the prevalence of this disease is higher in tropical regions. Urinary stones have considerable effects on the life quality of patients and impose a lot of costs over their shoulders [5]. This study was conducted to identify the composition of urinary stones and their relationship with age and sex of patients. Existence of Urinary tract stones is one of the main reasons for the presence and visit of patients to the urological clinics, and over time the rate of this illness increases. Drinking liquids and increased urine volume and dilution of it are preventing factors of the formation of stones. On the other hand, excessive consumption of some foods increases the risk of stone formation. The composition of urinary stones is also one of the important issues and it may vary from one region to another. The percentage of urinary tract stones is different in different countries as well as different parts of Iran. Due to the absence of statistics on the prevalence of urinary stones in the city of Jahrom and the surrounding areas and the composition of these rocks, especially its relationship with demographic factors and lifestyle of people and drinking water or food, etc, it was required to design and conduct this study in this city and its surrounding areas.

Methodology

This is a descriptive cross-sectional study. The population of this study was all patients visiting the urological department of Jahrom hospitals. The participants of this study were 728 patients visiting the urological department of Jahrom who were selected by the available sampling methods. Entry and exit criteria of this study are: Entry criteria: All patients with kidney stones visiting Jahrom treatment centers who are willing to cooperate and whose stones are accessible. Exit criteria: Patients who stop continuing the study and are not willing to continue cooperation or patients whose stones are inaccessible. In this study, urinary stones of patients visiting Jahrom treatment centers are collected by self-sustained methods, extracorporeal crusher or cutaneous crusher (PCNL) methods by the experts in the operating rooms, and put in special bags with labels and forms of the pre-designed questionnaire, and are sent to the University's Research Laboratory for the analysis of the stone (Co company Kate). After removing the stone, it is rinsed to remove any remaining tissue samples or blood from the stone. In the next step, the stone must be powdered in Chinese bowl. While powdering, it must be noticed that the rocks have different compositions, for example, some rocks act as core of another stone, and then, during subsequent processes, other compounds are deposited on it and it forms a large stone, so we have tried to powder the stone well to obtain all the rock components. In the next step, using a special kit, the analysis of urinary calculi, (Kaveh treatment company), we will analyze it. This kit contains brochures and special solutions for testing and analytical solutions. The stone is dissolves using sulfuric acid. First, a certain amount of powdered stones is picked with a spatula spoon and dissolved in a proportional amount of sulfuric acid. Then we add 50 cc distilled water to it, and then mix it. We use this collection as Stoke. In the next steps, we add special solutions to identify the presence of substances such as calcium, oxalate, phosphorus, aluminum, magnesium, uric acid and cysteine. Based on the colors created and special tables, type and percentage of compounds are determined. Patients are divided into age groups (less than 19 years of age, 20-39 years, and 40- 59 years of age and over 60 years of age) and males and females. And we categorize the types of urinary stones into classes of 1-4 including: Class 1 calcium oxalate stones and calcium phosphate with 80% of purity, 2nd class, infectious stones like struvite, 3rd class of stones, uric acid stones and 4th class, cysteine stones. Rare germs like xanthine and triamteren are not excluded.
After analyzing the rocks, the results were entered into a questionnaire and the obtained data were analyzed by SPSS software at descriptive statistics level and analyzed using Chi-square and Fisher test.

Results

The present study was conducted on 728 rock samples obtained from Urological sections of Jahrom. The mean age of the participants in this study was 47.43±15.36, the oldest participant was 90 years old and the youngest participant was 12 years old.

Table 1. Frequency of underlying factors in patients

Background factors	Number	Percentage
diarrhea	4	0.5
gout	13	1.8
Diabetes	56	7.6
Kidney Failure	50	6.8
Urinary tract infections	64	8.7

Table 2. Demographic features of patients with urinary stones

Variable		Frequency	Percentage
Gender	Male	543	72.5
	Female	178	24.8
education	University	32	4.8
	High school	191	9.9
	Primary school	242	33.3
	No education	252	34.6
The amount of drinking water	More than 6-8 glasses	307	41.8
	Less than 6-8 glasses	412	56.1
weather	Cold	115	15.6
	warm	608	82.7
Family history	Positive	358	48.7
	Negative	337	45.9
Drug use	diuretic	37	5
	Blood Pressure Drug	106	14.4
	Gastric Medicine	57	7.8
History of having stone	first time	305	41.5
	Second time	415	56.5

As shown in Table 2, men more likely develop urinary stones than women (72.5% to 24.8%). In terms of education, the majority of the visitors to the clinics were those with primary and secondary education, and the higher the level of education, the lower the number of visits to clinics, so that the number of visits with university was 32 people, which is much lower than the rest of the educational levels.

The next factor that was studied in this study was the amount of drinking water. As shown in Table 2, the amount of drinking water is also associated with the development of urinary stones.

Living in cold climate reduces the rate of urinary stone more than that in living in hot climates such that, the ration of suffering from urinary stone in hot areas to cold areas is 82.6 to 15.6.

According to the results of Table 2, it seems that the use of blood pressure medications is more related to urinary stones than other drugs. Regarding the results of Table 2, it can also be said that previous history of urinary stones increases the risk of urinary stones. Finally, more than 20% stone composition is considered significant.

Table 3. Prevalence of urinary stones obtained from patients

Stone Type	Frequency	Percentage
Calcium oxalate	702	95.5
Uric acid	509	69.3
Cysteine	130	17.7
Calcium Phosphate	22	3
Infectious (strurite)	49	6.7

As it was shown in Table 3, calcium oxalate has been observed in 95.5% of the patients (It should be noted that due to the fact that some people had more than one type of urolithiasis, the total of percentages is higher than 100 per cent) and then were uric acid, cysteine, strurite and calcium phosphate, respectively.

Table 4. composition of patient's urinary stones based on previous history

Stone composition	Previous history on stone		Total	Mote Cario sig (2-sided)
	First time	Second time		
Calcium oxalate	93	121	214	0.002
Calcium oxalate + uric acid	146	186	332	
Calcium oxalate + uric acid + calcium phosphate	11	4	15	
Calcium oxalate + uric acid + cysteine	17	55	72	
Calcium oxalate + uric acid + infectious	21	17	38	
Uric acid + cysteine	1	6	7	

Calcium oxalate + calcium phosphate	0	2	2	
Cysteine	0	4	4	
Uric acid + cysteine	11	9	20	
Calcium oxalate + uric acid + infectious + cysteine	2	3	5	
Calcium oxalate + uric acid + infectious + cysteine + calcium phosphate	0	1	1	
Uric acid + infectious + cysteine	0	3	3	
Uric acid	1	0	1	
Total	303	411	714	

Table 5. Patients' urinary stones according to background diseases

Stone type	Diarrhea	Gout	Diabetes	Kidney failure	Urinary infection	Total	Monte Carlo sig (2 -sided)
Calcium oxalate	0	3	14	24	18	49	
Calcium oxalate + uric acid	4	8	26	23	22		
Calcium oxalate + uric acid + calcium phosphate	0	0	1	0	2	3	
Calcium oxalate + uric acid + cysteine	0	2	7	5	6	20	
Calcium oxalate + uric acid + infectious	0	0	5	6	10	21	
Yoric acid + cysteine	0	0	1	0	0	1	0.68
Calcium oxalate + calcium phosphate	0	0	0	1	0	1	
Cysteine	0	0	2	0	5	7	
Uric acid + cysteine	0	0	0	1	0	1	
Calcium oxalate + uric acid + infectious + cysteine	0	0	0	0	1	1	
Calcium oxalate + uric acid + infectious + cysteine + calcium phosphate	0	0	0	0	0	0	
Uric acid + infectious + cysteine	0	0	0	0	0	0	
Uric Acid	0	0	0	0	0	0	
Total	4	13	56	50	64	187	

Discussion

There are three main stages in the formation of kidney stones. These three stages include: core formation, crystal formation, and crystal growth. During the formation of the nucleus, over saturation of soluble and insoluble materials inside the kidney tubules leads to formation of nucleus, and the formed nucleus is a primary step to the formation of the crystal which eventually leads to the formation of rock layers. These layers (core, middle layer, shell) are the result of gradual accumulation and crystallization of insoluble material [14]. Analysis of this compounds and layers and of the renal stone crystals provides valuable information about the major pathogenesis of stone formation and contributes to further evaluation of the patients. Also, finding out about the composition of the stones helps adjust the diet, treatment, reduce the risk of getting severe and help the signs and symptoms of the patients [15]. In this study, stones obtained from individuals with self-sustained surgical disposal, were analyzed after obtaining the patients consent. Calcium oxalate was the most common stone with a prevalence of 95.5% and uric acid stones were the second stone most common (69.3%), followed by cysteine, infectious and calcium phosphate rocks respectively. However, due to the fact that the stones in patients suffering from urinary stones are compounds, the analysis was performed on the basis of the individuals, which means, the content of kidney stones was studied in each individual and the results indicated that the combination of calcium oxalate and uric acid were the most common urinary stone and then pure Calcium oxalate and after that other stones were the most prevalent ones. According to the results of the study, as the people get on age, prevalence of urinary stones increases as well. The results are relatively consistent with the previous results of urinary stones in age range of less than 20 years, and a higher prevalence of urinary stones at the age of 40 to 60 years [16]. The second finding of this study indicated that the prevalence of urinary stones in men is higher than that in women. This finding is consistent with the findings of previous studies. Campbell et al revealed that urinary stones are more common in male's adult than females [16]. In a study by Shirazi and colleagues, the proportion of suffering men was higher than that of women [17]. All accounts of patients suffering from stones suggest that the proportion of stones in men to women is higher than 1. According to some experimental data, it is probably possible to address to the cause of more urinary tract stones in men due to the effect of sex hormones or some risk factors of stone formation. It seems that Androgen increases urinary excretion of urine oxalate and its sedimentation in the kidney and estrogen reduces its urinary output [18]. The third finding of this study showed that the higher the level of education, the lower the prevalence of urinary stones. The following result can be explained by the fact that, increasing level of education leads to the improvement of eating habits and consequently public health.

In a study conducted by Shirazi et al in 2010, most people suffered urinary stone had than lower school diploma. In a study conducted by Tafkoly in Turkey in 2005, most patients suffering from stones were high school graduate students [19]. In a

study by Craiger and colleagues it was indicated that higher education is associated with a reduction in the risk of stones. The likely cause of reduction OF stone risk which increases of educational levels may be due to dietary differences and behavioral habits with an increased awareness of high education individuals that reduce the risk of stones [20]. Other findings of this study showed that people living in cold regions have a lower prevalence of stones than tropical regions. People who live in hot climates are prone to dehydration. Diarrhea leads to an increase in urinary stones, particularly, uric acid stones. Although increase of heat leads to increased fluid intake, heat-induced water loss reduces urine output. In hot climates, people are more exposed to ultraviolet radiation. Ultraviolet rays increase the synthesis of vitamin D3. The greater the exposure to sunlight, the more the calcium and oxalate disposed. The effect is greater on white people [21]. In a study in their 2004, Athens and colleagues showed that people working in a warm environment had less urine volume, secreted less citrate in the urine, and there was an increase in the cases of stones. Also, the amount of sweating is higher among workers who work in warm environments [22].

In the present study, it was shown that a previous experience of stone would increase the probability of future stone formation in the future. Other finding of this study indicated that the prevalence of urinary stones is higher in people with family history of urinary stones. The existence of positive history of urinary stones is consistent with an increase in the prevalence of kidney stones. The probability of a stone in a person with the experience of stone in family is twice of that in a person who does not have such an experience (30% compared to 15%). In those with a positive family history, the prevalence of different stones and early premature stone formation is higher. The prevalence of urinary stones in spouses of patients with calcium oxalate stones is higher. This is probably due to the same environmental and dietary factors [23]. Researches have shown that family history has a 2-fold increase in the risk of stones (quoted from Shirazi). In a study conducted by Anatoly and colleagues in 2003, the history of stones in relatives of the first degree patient was reported to be more [24]. The findings of this study revealed that urinary stones are related to the type of drug used, so that the use of blood pressure medications compared to other drugs is associated with a higher probability of urinary stone, followed by gastric drugs, followed by diuretic drugs, respectively. Gathering a complete history of consumable medications may provide valuable insights into the cause of stone formation. Antihypertensive drug of triamterene is used in combination with several drugs, such as thiazide. The use of this drug is associated with an increase in urinary stones. Long-term use of silica antiacids is associated with the increase in silicate stones. Carbonic anhydrase inhibitors may increase urinary stones with 10 to 20 percent of frequency. The long-term effect of drugs containing sodium and calcium on stone formation is still unclear. The use of protease inhibitors in patients with immunodeficiency is associated with the formation of non-complex stones [15]. This study indicated that, as the water intake increases, the probability of urinary stones decreases. In order to specify this finding, it should be said that the dissolved material in water form rocks when they reach saturation. Thus, despite the intake of materials containing stones, if the consumption of liquids and water is abundant, dilution of the urine prevents the formation of urinary stones. In the study, it was found out that the amount of water received is more important than the compounds in the water, because the amount of received water is effective in diluting the urine and preventing the process of stone formation [25].

Conclusion

Epidemiologic and demographic factors are associated with the formation of urinary stones and increase their risk. Although various epidemiological and demographic factors have been observed in this study, it is suggested that other factors, such as food types, should also be examined. Longitudinal studies on rock formation also help to clarify some uncertain factors in stone formation. In this study most of stones were complex of calcium oxalate and uric acid than pure calcium oxalate.

References

1. Chou YH, Li CC, Wu WJ et al. Urinary stone analysis of 1000 patients in southern Taiwan: Kaohsiung J Med Sci 2007; 23:63-6
2. Stamatelou kk. francis me. jonse ca.et al. time trends in reported prevalence of kidney stone in United States: 1976-1994 kidney int 2003. 63-1817-23
3. Yushida o andgeographical study. urol int.1990 45:104-11okada y. epidmiology of urolithiasis in japan: a chronological
4. Thomas knoll. anne b. schubert. dirk fahlenkampt ET all: urolithiasis through the ages: data are more than 200000 urinary stone analyses: The Journal of Urology April 2011. Vol.185, 1304-1311
5. Lotan Y, Cadeddu JA, Roerhborn CG et al. Cost effectiveness of medical management strategies for nephrolithiasis. J Urol 2004:172:2275
6. Bayati S. Kidney stones recognition. http://www.ansarnews.com/news/ 1000
7. Shokouhi B, Gasemi K, Norizadeh E et al. Chemical composition and Epidmiologcal Risk Factors of Urolithiasis in Ardabil Iran: Reserch Journal of Biological Sciences 2008 3(6) 620-626
8. Ljunghall S, Hedstrand H Incidence of upper urinary tract stones. Miner Electrolyte Metab1987: 13:220–227

9. Yoshida O, Okada Y Epidemiology of urolithiasis in Japan: a chronological and geographical study. Urol in, 1990. 45:104–111
10. Vahlensieck EW, Bach D, Hesse an Incidence, prevalence and mortality of urolithiasis in the German Federal Republic. Urol Res, 1982, 10:161–164
11. Akinci M, Esen T, Tellaloglu S Urinary stone disease in Turkey: an updated epidemiological study. Eur Urol 1991, 20:200–203
12. Hesse A, Brandle E, Wilbert D, Kohrmann KU, Alken P. Study on the prevalence and incidence of urolithiasis in Germany.2003
13. Safarinejad MR. Adult urolithiasis in a population-based study in Iran: prevalence, incidence, and associated risk factor: Urol Res (2007) 35:73–82
14. Grases F, costa-A, Prieto RM. renal LithiaSIS and nutrition. nutr j.2006; 5; 23
15. Daudon M. Epidemiologie actuelle la lithiase renal en france.ann urol.2005; 39(6); 209-31
16. Campell- Walsh.urology .9th ed. Sunderselsevier, 2007
17. Shirazi, Shah Pirian F, Khachian A, Hosseini Aghaf, Heydari Sh. Relationship between epidemiologic and demographic factors and urinary stones. Journal of Faculty of Nursing and Midwifery, Iran University of Medical Sciences, 2010, 33 (66), 80-
18. Ramello A, Vitale C, Margella M. Epidemiology of nephrolithiasis. J Nephrol, 2000; 13(3): 65-70
19. Tefekli A, Tok A, Altunrende F, Barut M, Berberoglu Y, Muslumanoglu AY. Life style and nutritional habits in cases with urinary stone disease. Turk Uroloji Dergisi, 2005; 31(1):113-118
20. Krieger JN, Kronmal RA, Coxon V, Wortley P, Thompson L, Sherrard DJ. Dietary and behavioral risk factors for urolithiasis: potential implications for prevention. Ame J kidney diseas, 1996; 28 (2): 195-201
21. MacAninch J, Lue TF. Smith and Tanagho's General Urology, Eighteenth Edition (Smith's General Urology).2012
22. Atan L, Anderson C, Ortiz V, Koga Silva E, Pitta R, Atan F, Srougi. High kidney stone risk in men working in steel industry at hot temperatures. Urology, 2005; 65 (5): 858-861
23. Krieger JN, Ronal RA, Coxon V, Wortley P, Thompson L, Sherrard DJ. Dietary and behavioral risk factors for urolithiasis: potential implications for prevention. Ame J kidney diseas, 1996; 28 (2): 195-201
24. Anatol T, Pinto Pereira L, Simeon D, Sawh L. Risk factors for urinary tract calculi in Trinidad. Tropical Med Int Health, 2003; 8(4) 348–353
25. Zareem, Aminpour, Mirzadeh, Azar, Tazkari, Zahrabi, Kalantari. Comparison of the effect of two types of drinking water with varying degrees of difficulty on urinary elements in males with and without calcium stones. Iranian Journal of Nutrition and Food Technology. 1 (3), 1385, 1-7.