

Prevalence of Symptomatic Urinary Calculi in Kerman, Iran

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Introduction: In a cross-sectional study, we evaluated the prevalence of symptomatic urinary calculi in Kerman, Iran.

Materials and Methods: A total of 2431 citizens of Kerman were surveyed from September of 2005 to April 2006. The study population was selected by cluster method from 5 different areas, and 100 houses in each area were randomly approached. Questions on the urinary symptoms consisted of flank pain, urogenital pain, dysuria or any difficulty in urination, and alterations in urine color. Individuals with a suspicion of urinary calculi based on their symptoms were evaluated by physical examination, laboratory investigations, and plain abdominal radiography. Ultrasonography and intravenous urography were done if required to confirm the diagnoses.

Results: Of 2431 individuals, 196 (8.1%) had symptoms in favor of urinary calculus diagnosis, of whom 47 (24.0%) had urinary calculi (prevalence of symptomatic urolithiasis was 1.9%). Of the patients, 35 (74.5%) were underweight. Compared to the other participants, the patients with urinary calculus were younger ($P = .001$) and a larger proportion of them had a positive family history of urinary calculi (14.9% versus 6.5%; $P = .02$) and were rug weavers and office employees. Dependency on opium and its derivative was significantly more frequent in patients with urinary calculi (25.5% versus 0.2%; $P = .001$).

Conclusion: This study showed that the prevalence of symptomatic urinary calculi in this hot and dry area is relatively high. According to our findings, the other factors including specific occupations, malnutrition, and substance use may also have influence on the rate of urinary calculus formation. Therefore, to prevention and early treatment of urinary calculi, evaluation of potential predisposing conditions should be considered with special attention to regional factors.

Keywords: urinary calculi, Iran, epidemiology, occupations, substance-related disorders, genetics

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INTRODUCTION

Prevalence of urinary calculi is estimated to be 1% to 5% worldwide, 2% to 13% in developed countries (with a great variation among them), and 0.5% to 1% in developing countries.⁽¹⁻⁴⁾ One study showed that about 20% of patients with recurrent calculi who underwent surgical operation for

obstruction or infection went on developing mild renal insufficiency.⁽¹⁾ Moreover, urinary calculus is one of the most costly diseases in the world. For instance, in the United States alone 0.9% of hospitalized patients suffering urinary calculi, and in 1993, the yearly cost of this disease was reported to be US \$ 1.83 million.⁽⁵⁾ These facts

necessitate the emphasis on prevention measures, and as a result, on understanding the predisposing factors of urinary calculi.

It has been reported that urinary calculi have different prevalence rates among different races and ethnicities.^(3,4) Based on the environmental conditions and the individual characteristics of the patient, urinary calculi tend to develop, recur, and increase morbidities. Geographical characteristics may be indirect predictors of calculus formation, through their effect on temperature and humidity. Also, the temperature of the environment has been reported to affect the incidence of urinary calculus disease.⁽⁶⁾ Finally, nutrition and body weight are of other associated factors that can be related to the socioeconomic and cultural characteristics of an area.⁽⁷⁻¹⁰⁾ Overall, evaluation and understanding the contributors to urinary calculus formation in different geographical areas is the primary step for prevention and treatment of patients suffering this problem. We, however, lack enough nationwide information of urinary calculus disease in Iran. In this study, we designed the primary research in Kerman (a city in the vicinity of Iran's deserts) on the prevalence and associated factors of urinary calculi.

MATERIALS AND METHODS

This cross sectional study on the prevalence of urinary calculi was carried out in Kerman, Iran, from September of 2005 to April 2006. Kerman is a city in the southwest of Iran, in the vicinity of Loot and Dasht-e-Kavir deserts. The environmental characteristics of the city make the citizens prone to urinary calculus formation. The population is relatively homogenous and some specific occupations such as rug waiving are the prominent activities of the people. We considered these characteristics in our epidemiologic evaluation of urinary calculi. In addition, Kerman is on the transport way of drug trafficking from Afghanistan; consequently, substance use is a challenge in the healthcare system of the city, which was addressed in this study. The study was approved by the ethics committee of Kerman University of Medical Sciences.

In order to investigate the prevalence of urinary calculi, we calculated a sample size of 2000 people

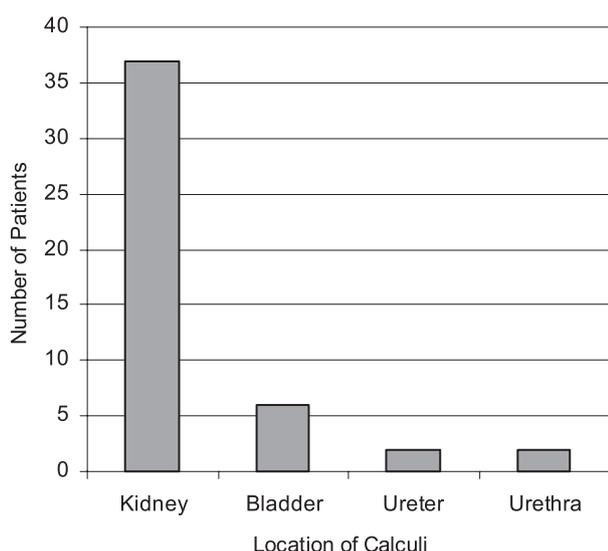
considering the worldwide prevalence of 5% ($\alpha = 5\%$ and $d = 1\%$),⁽¹⁻⁴⁾ but for more confident results, we considered 2500 individuals. The population samples were selected by cluster method from 5 different areas, and 100 houses in each area were randomly approached. Finally, 2431 individuals consented and participated in this study.

The national healthcare personnel interviewed the families by door-to-door visits. They filled in a questionnaire on demographic information, urinary calculus symptoms, individual and family history of urinary calculus formation, and the use of opium and its derivatives (evaluated via semistructured interview based on the Diagnostic and Statistical Manual-IV criteria for opioid dependence).⁽¹¹⁾ Questions on the urinary symptoms consisted of flank pain, urogenital pain, dysuria or any difficulty in urination, and alterations in urine color. Individuals with a suspicion of urinary calculi based on their symptoms were referred to the urology clinic. They were evaluated by physical examination, laboratory investigations, and plain abdominal radiography. Ultrasonography and intravenous urography were done if required to confirm the diagnoses. Patients with urinary calculi were identified and compared with those without urinary symptoms.

The collected data were analyzed using the SPSS software (Statistical Package for the Social Sciences, version 13.0, SPSS Inc, Chicago, Ill, USA). Either the *t* test or the chi-square test was used for comparisons between the two groups of the study, where appropriate. Dichotomous variables were demonstrated as percentages and the absolute values, and the continuous variables as mean \pm standard deviation. A *P* value less than .05 was considered significant.

RESULTS

Of 2431 individuals, 196 (8.1%) had symptoms in favor of urinary calculus diagnosis. Ultimately, 47 of 196 individuals (24.0%) had urinary calculi, and the prevalence of symptomatic urolithiasis was 1.9% (95% confidence interval, 1.4% to 2.5%). Most of the detected calculi (78.7%) were located in the kidneys (Figure). Of note, 21 patients



Location of the calculi in 47 patients with urinary calculi.

(44.7%) with urinary calculi did not have any classic clinical symptoms and diagnosis was made based on nonspecific manifestations in primary evaluation, confirmed by further laboratory and imaging tests. The patients' body mass index was calculated and it was found that 35 (74.5%) were underweight.

Compared to the other participants, the mean age of the patients with urinary calculus was significantly lower ($P = .001$), but sex distribution was not different between the two groups (Table). Family history of urinary calculi was more frequent in patients with urinary calculi than in participants without urinary symptoms (14.9%

versus 6.5%; $P = .02$). Furthermore, among the patients with urinary calculi, significantly larger proportions were rug weavers and office employees, while a small percentage of them were housewives (Table). Finally, dependency on opium and its derivative was significantly more frequent in patients with urinary calculi (25.5% versus 0.2%; $P = .001$).

DISCUSSION

In the present study, we found that the prevalence of symptomatic urinary calculi in Kerman was 1.9%. This rate is relatively high, especially when compared to the prevalence rates in developing countries.⁽¹⁻⁴⁾ Given that our detected urinary calculi did not include asymptomatic ones, it can be speculated that the overall prevalence of urinary calculi in Kerman is even higher. It seems that a potential factor in calculus formation in this area is the special geographic condition of Kerman province that is surrounded by 2 deserts of Iran (Dasht-e-Kavir and Kavir-e-Loot). Like other hot and dry geographic "stone belts", such as the southeastern United States, climate of Kerman may affect urinary calculus formation in our population. In the stone belt of the southeast of the United States, 19.2 per 10 000 hospital admissions are due to urinary calculi.⁽¹²⁾ Thus, this special geographical condition (dry and hot climate) might have some influence on the prevalence of urinary calculus formation in our region. However, the causative relation of the

Characteristics of Patients With Urinary Calculi Compared With Individuals Without Urinary Symptoms in Kerman*

Characteristic	Patients With Calculi	Other Participants	<i>P</i>
Number of Individuals	47	2384	...
Sex			
Male	26 (55.3)	1212 (50.8)	
Female	21 (44.7)	1172 (49.2)	.54
Mean age, y	25.8 ± 5.1	43.6 ± 7.8	.001
Family history of urinary calculi	7 (14.9)	155 (6.5)	.02
BMI, kg/m ²	17.0 ± 1.5	25.0 ± 2.0	.001
Opium dependency	12 (25.5)	4 (0.2)	< .001
Job			
Rug weaver	21 (44.7)	417 (17.5)	< .001
Office employee	16 (34.0)	604 (25.3)	.18
Farmer	3 (6.4)	110 (4.6)	.47
House wife	2 (4.3)	698 (29.3)	< .001
Others	5 (10.6)	555 (23.3)	< .001
Work experience	32.0 ± 8.5	22.0 ± 2.5	< .001

*Values in parentheses are percents. Continuous variables are demonstrated as mean ± standard deviation. BMI indicates body mass index.

temperature of the environment has not been elucidated yet, and some have disputed this issue.^(13,14) Curhan and colleagues performed a large cohort study in the United States and suggested that the magnitude of the “stone belt” effect was modest compared with previous estimates.⁽¹⁴⁾

As we showed in the present study, some other factors that have direct or indirect relation with the environmental parameters may play a role in calculus formation. For instance, urinary calculi were more frequent among rug weavers (a most common occupation in this area). These workers have the physical activity, sitting for a long time while weaving, and may very little amount of liquid intake. Atan and colleagues, proposed a higher risk of calculus formation in hot occupational environments,⁽⁶⁾ a factor which might explain, at least partly, the high incidence in our study population. Another interesting factor in our study was substance abuse. Urinary calculi were more frequent opium-addicted people. There is a lack of knowledge on the relation of substance use and calculus formation that warrants further evaluations in our region. We speculate that other than the probable direct effects of opioids on the urinary tract, this finding can be explained by the associated factors such as the nutritional and socioeconomic status of substance-dependent people.

Fifteen percent of the sufferers from urinary calculi in our study had a positive family history of calculus formation. Therefore, the inheritance and family factors cannot be ruled out. Earlier, Ahmadi Asr Badr and colleagues reported a high frequency of positive family history among the patients with calculi in Iran.⁽¹⁵⁾ Nonetheless, multivariate analyses are required to confirm the strength of family history as an independent predictor of urinary calculus, because family members have other characteristics in common than genetic resemblances, too.

Unlike the reports of some researchers that overweight predisposes to urinary calculus formation,⁽¹⁶⁾ our group of urinary calculus formers were mainly among underweight (mean body mass index, $17.0 \pm 1.5 \text{ kg/m}^2$). We think that people suffering a poor nutrition do not

receive sufficient minerals and vitamins necessary for prevention of calculus production, since it is believed that a corrected diet can reduce calculus formation.⁽¹⁷⁾ However, to determine exact relations of this factor with urinary calculi, it is recommended to further researches by multi-variable studies as case-control, cohort studies.

CONCLUSION

Urinary calculus is the third most common problem in urology clinics after urinary tract infections and prostate diseases. Also, it is the most costly disease worldwide that needs a good management and prevention. Our nationwide information on the prevalence and characteristics of urinary calculi is not complete yet. However, we can portrait the disease and its specific feature in our province by the findings of this study. Although a definite conclusion still remains to be made, we know that special attention to the occupation and substance use may help us to diagnose and prevent urinary lithiasis in Kerman. The regional effects such as the so-called “stone belt” should be also considered in our future investigations.

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CONFLICT OF INTEREST

None declared.

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