

REVIEW ARTICLE

A Study of the Possible Risk Factors of Kidney Stones in Patients in Karbala

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Abstract:

Background

The recurrence and incidence of kidney stones are both high among Iraqi people. Previous studies offers details on the diagnostics, pathophysiology, and epidemiology of kidney stone development, as well as techniques for assessing stone risks in both follow-up and new patients. Recurrence of stones could be avoided with proper management and assessment. The various dangers associated with each form of stone must be considered in the medical and dietary management of kidney stone avoidance. The most effective means of preventing kidney stones from recurring are the identification of such risk factors and the implementation of long-term management methods for dealing with them.

The study aims to determine the most prevalent risk factors that could result in urinary calculi.

Patients and Methods: In Al - Hussain Teaching Hospital in Karbala, 100 patients were diagnosed with renal stones after several investigations, such as urine analysis Ultrasonography, and X-ray for kidneys, ureters, and bladders (K.U.B) participated in a cross-sectional study.

Results: A total of 100 patients [31%] of whom were females, while [69%] were males, age group (36-45 years) made up the majority of the participant age which was about 30%. This study found a significant association between gender and smoking, over eating meat, potatoes, sugar or sodium, if the patient taking antacids, vitamin C, aspirin, or diuretics, if any relatives suffer from stones, and body mass index (BMI) values association $P < 0.05$.

Conclusions: There is an association between dietary habits of high sodium intake, eating animal protein, age, gender, occupation, and family history with the occurrence of renal stone

Keywords: Calculi, Recurrence, Incidence, Gender, Occupation, Age, Residency, Marital Status, Daily habits, Healthy diet.

Introduction:

Because of its recurrence, prevalence, and serious effects, renal stone disease is a serious issue (Brener et al,2011). Most kidney stones are made up of calcium phosphate and calcium oxalate, while infection-related and uric acid stones occur only in 10% and 8% of cases, respectively (Litza et al,2010). The primary etiological factor associated with the development of urolithiasis was urinary schistosomiasis. It has been found that urinary stone disease occurrence is related to obesity, diabetes, atherosclerosis, dyslipidemia, hypertension, and other disease states (Bagga et al, 2013). Organic matrices like matrix A and acid mucopolysaccharide, as well as a few crystalline compounds including oxalic acid, calcium, cysteine, and uric acid, abnormally accumulate in the kidney and result in kidney calculi. Renal calculi can develop in the ureters, kidneys, or bladder, damaging the kidneys by obstructing urine flow, impairing kidney function in eliminating body waste, and ultimately resulting in renal failure (Rivera et al,2012). Numerous articles and research have noted that there is no single cause of urinary calculi, but rather a variety of genetic body responses to different metabolic and chemical situations as

well as lifestyle hazards that contribute to the development of renal calculi (Pak et al, 2003). According to estimates, urinary tract stone disease affects at least 10% of people in the developed world. Kidney stones are more common now than they were ten years ago, they impact 12% of the world population at some point in their lives (Smith-Bindman et al,2014). It affects people of all sexes, ages, and races, yet is more common in males than women between the ages of 20 and 49 (Pietrow et al,2006). Throughout the 20th century, kidney stones have become more common throughout stone. Up to 15% of Americans are affected, according to statistics. The frequency of new recurrences and cases may increase. Reduced renal function, ureteral scarring and stenosis, urinary fistula development, extravasation, ureteral perforation, renal failure, and urosepsis are among the problems that are brought on by renal calculi. Throughout pregnancy, acute nephrolithiasis is linked to a special set of problems (Semins & Matlaga,2013). Eating patterns, drinking too little water, and smoking are risk factors for kidney stone formation. Gender, age, race, the use of diuretics, low urine volume, and low fluid intake are a few more factors. Regular tea consumption, mental activity, and



history of urolithiasis are risk factors for kidney calculi. Crystal aggregation, nucleation, and development of insoluble particles are caused by the process of stone formation in the urinary tract. Through the transit of the stones in the urinary tract system, the symptoms of the stones could include obstruction, pain, hemorrhage, and infection (Wanget al,2013).

Treatment and management of renal stones rely on surgical techniques, such as extracorporeal shock wave lithotripsy, transurethral lithotripsy, and percutaneous lithotripsy. These surgeries are complex, costly, and do not affect the recurrence of stones. Various medicines, such as thiazide as a diuretic and alkali-citrate, are applied to prevent the frequency of hypercalciuria and hyperoxaluria, which cause calculi formation but they are not promising enough due to their limited effectiveness and low tolerability (Singh et al,2007). Because of the disadvantage of surgical techniques and limited choice in pharmacotherapy, exploring new pharmacological therapies for the management of kidney stones is worthwhile. Various medicinal plants with antispasmodic, diuretic, and antioxidant activities exert inhibitory effects on the crystallization, nucleation, and aggregation of crystals, making them useful for the treatment of urolithiasis (Rathod et al, 2012).

The current study aims to assess the risk factor of renal stones in patients in Karbala and the association between renal calculi and age, gender, residency, daily habits, and dietary intake.

Material and Method

Study Design and Setting

A cross-sectional analysis was done on 100 patients who were identified as having kidney stones, following multiple studies, including ultrasonography, urine analysis, and X-rays of the ureters, kidneys, and bladder. The patients were selected from Al - Hussain Teaching Hospital in Karbala. The research was conducted between September 2019 and February 2020.

The Inclusion and Exclusion Criteria of Participants

A total of (100) patients (69 males and 31 females) were selected depending on the inclusion criteria including Iraqi people who visited the urology consultant of the hospital and were diagnosed with kidney stones. The patients' ages were between 16 and 75 years.

The exclusion criteria included patients who had other urologic diseases or conditions

The Ethical Considerations

Before the start of the project, the hospital administration was informed by Karbala University in the College of Medicine about the aim of the study to obtain the appropriate cooperation to conduct the study. The name was not recorded on the research documents and the purpose of this study was explained to the subjects.

The Sampling Techniques and Data Collection

To complete the questionnaires and collect data, an interview was utilized. All the renal stone patients in the hospital consented to participate in the research, and this was done in order to determine which risk factors were specific to the development of urinary calculi. 100 subjects with kidney stones were chosen according to their sex, age, marital status, place of residence, and degree of education. Following a review of the relevant disease, a questionnaire was created to cover the following issues:

1. The general information included sociodemographic information such as sex, age, degree of education, marital status, and place of residence.

2. The items that are associated with factors regarding the patients' medical history

3. The items that are associated with risk factors regarding drugs and diet.

In order to determine whether the patients had elevations in uric acid, the files of the patients were also reviewed for urine analysis.

The Statistical Analysis:

All data were analysed using the Statistical Package for Social Science (SPSS Program version-22).

The Results:

The Baseline Characteristics:

A total of 100 people (69 males and 31 females), were divided into 6 age groups. (Tables 1& 2). The age group between 36 and 45 years was the highest percent about 30%, who were suffering from kidney stones. The patients had been asked many questions about socioeconomic features, symptoms, and risk factors of kidney stones. Most of the patients were 69% males, 68% lived in urban areas, 88% were married and 41% had monthly incomes ranging between 300 and 600 per month. (Table 1, 2, 3, 4).

Table 1: The distribution of gender among people in Al-Hussain Teaching Hospital.

Gender	Number
Male	69
female	31
Total	100

Table 2: The distribution of age groups among people with kidney stones.

Age groups	Percent
16-25	9%
26-35	22%
36-45	30%
46-55	23%
56-65	13%
66-75	3%

Table 3: The distribution of residency among infected people.

Residency	Percent
Urban area	68%
Rural area	32%
Total	100%

Table 4: The distribution of marital status among infected people.

marital status	Percent
Single	11%
Married	88%
Divorced	1%
Total	100%

The Statistical Tests:

For assessing the relation between gender and symptoms of kidney stones, the cross-tabulation revealed a significant association between gender and each (pain during urination, uremia, sharp abdominal pain, and nausea) $P < 0.05$.

So, pain during urination, uremia, sharp abdominal pain, and nausea were considered the most prevalent symptoms of kidney stones among people in Al- Hussain Teaching Hospital.

No significant association had been found between gender and vomiting (P>0.05). All these findings are summarized in (Table 5).

Table 5: The Relationship between Gender and Symptoms of Kidney Stones Like Nausea, Vomiting, Pain During Urination, Lower Abdominal Pain, and Uraemia.

Items		Group				Statistical test	P value
		Male		Female			
		n=69		n=31			
		n	%	n	%		
Pain during urination	Yes	35	50.7	25	80.6	Fisher's Test =8.493	0.00
	No	21	30.4	5	16.1		
	Sometime	13	18.8	1	3.2		
uraemia	Yes	19	27.5	15	48.4	Fisher's Test 3.989=	0.00
	No	41	59.4	13	41.9		
	Sometime	9	13	3	9.7		
sharp pain / lower abdomen	Yes	27	39.1	8	25.8	Fisher's Test 2.274=	0.00
	No	31	44.9	19	61.3		
	Sometime	11	15.9	4	12.9		
nausea	Yes	31	44.9	21	67.7	Fisher's Test 4.794=	0.00
	No	25	36.2	8	25.8		
	Sometime	13	18.8	2	6.5		
vomiting	Yes	16	23.2	9	29	X2=0.950	0.622
	No	39	56.5	18	58.1		
	Sometime	14	20.3	4	12.9		

Concerning assessing the relation between gender and risk factors of kidney stones, the cross-tabulation revealed a significant association between gender and each (smoking, overeating meats, overeating potatoes, overeating sugar or sodium, if taking antacids, vitamin C, aspirin, diuretics, if any relatives suffer from stones and BMI values) P<0.05.

All of the above mentioned are considered the most prevalent risk factors for kidney stones among patients in Al- Hussain Teaching Hospital.

At the same time, no considerable relation was found between gender and how many liters of water the patients drank per day, if eating much tomatoes, green vegetables, indomie, drinking too much milk, had a history of urinary tract infection, had kidney stone before, had a previous catheterization, and if had a dehydration or sweating (P>0.05).

All these findings are summarized in (table 6 and 7)

Table 6:- The Relationship between Gender and Daily Habits of The Kidney Stone

Items		Groups				Statistical test	P value
		Male(n=69)		Female(n=31)			
		n	%	n	%		
How many litres of water do you drink per day?	3L	32	46.4	11	35.5	X2= 1.213	0.545
	2L	26	37.7	13	41.9		
	1L	11	15.9	7	22.6		

Do you smoke?	Yes	28	40.6	3	9.7	Fisher's Test 11.723=	0.00
	No	41	59.4	27	87.1		
	sometime	0	0.0	1	3.2		
Do you eat too much meat?	Yes	29	42.0	6	19.4	X2= 6.58	0.037
	No	16	23.2	14	45.2		
	Sometime	24	34.8	11	35.5		
Do you eat too much potatoes?	Yes	42	60.9	10	32.3	X2=7.15	0.028
	No	9	13.0	8	25.8		
	Sometime	18	26.1	13	41.9		
Do you eat too much tomatoes?	Yes	43	62.3	10	32.2	X2=7.91	0.19
	No	10	14.5	7	22.6		
	Sometime	16	23.2	14	45.2		
Do you eat too much sugar/ sodium?	Yes	45	65.2	8	25.8	13.38=x2	0.001
	No	15	21.7	15	48.4		
	Sometime	9	13.0	8	25.8		
Do you eat too much green vegetables?	Yes	41	59.4	14	45.2	1.77= x2	0.431
	No	12	17.4	7	22.6		
	Sometime	16	23.2	10	32.3		
Do you drink too much milk?	Yes	18	26.1	9	29.0	x2= 0.180	0.914
	No	32	46.4	13	41.9		
	Sometime	19	27.5	9	29.0		
Do you eat indomie?	Yes	23	33.3	9	29.0	x2=2.301	0.310
	No	35	50.7	13	41.9		
	Sometime	11	15.9	9	29.0		

Table 7:- Relationship between Gender and Risk Factors of The Kidney Stone

Items		Groups				Statistical test	P value
		Male(n=69)		Female(n=31)			
		n	%	n	%		
Do you take antacid?	Yes	16	23.2	10	32.3	Fisher's Test 0.985=	0.00
	No	47	68.1	19	61.3		
	sometime	6	8.7	2	6.5		
Do you take vitamin C?	Yes	24	34.8	4	12.9	Fisher's Test 5.353=	0.00
	No	39	56.5	24	77.4		
	sometime	6	8.7	3	9.7		
Do you take aspirin?	Yes	20	29.0	6	19.4	Fisher's Test 1.349=	0.00
	No	45	65.2	24	77.4		
	sometime	4	5.8	1	3.2		
Do you take Diuretics?	Yes	22	31.9	4	12.9	Fisher's Test 4.173=	0.00
	No	42	60.9	24	77.4		
	sometime	5	7.2	3	9.3		
Do you have a history of urinary tract infections?	Yes	41	59.4	19	61.3	x2 =0.031	0.860
	No	28	40.6	12	38.7		
	Yes	45	65.2	16	51.6		
Did you have kidney stones before?	No	24	34.8	15	48.4	x2=1.66	0.197
	Yes	20	29.0	6	19.4		
	Yes	49	71.0	25	80.6		
Do you have a previous catheterization?	No	34	49.3	20	64.5	x2 =2.00	0.157
	Yes	35	50.7	11	35.5		
	Yes	40	58.0	23	74.2		
Do you have relatives who suffer from kidney stones?	No	28	40.6	8	25.8	Fisher's Test 2.586=	0.00
	sometime	1	1.4	0	0.0		
	Normal	16	23.2	5	16.1		
BMI	Overweight	38	55.1	10	32.3	Fisher's Test 9.067=	0.00
	Obese class 1	11	15.9	12	38.7		
	Obese class 2	2	2.9	2	6.5		
	Obese class 3	2	2.9	2	6.5		
	Obese class 3	2	2.9	2	6.5		

The Discussion:

A recent review of epidemiological data from seven countries revealed incidence rates for kidney stones of 114 to 720 per 100,000 individuals and prevalence rates ranged from 1.7 to 14.8%, and in nearly all countries, the rates seem to be rising (Wolf et al,2014).

In this work, people between 36 and 45 years old made up the majority of the participants age in Karbala/ Iraq. So the highest

incidence was recorded in the third and fourth decades. while (Romero et al, 2010) found that the age at which incidence peaked in Iran ranged from 40 to 49 years old. According to the results of the current research, there was a connection between gender and the chance of developing kidney stones; for men (69%) the risk was higher than for women. Regarding the relationship of kidney stones with high BMI and the incidence rising among overweight and obese individuals, the current study revealed statistically a significant conclusion. Cigarette smoking could cause urolithiasis in healthy subjects by decreasing urinary flow and raising serum cadmium levels (Duraket al, 1990; Mortada et al, 2004). Additionally, Scott et al (1982) indicated that elevated serum cadmium levels linked to cigarette smoking could be a risk factor for urinary tract stone development, which is consistent with the present study findings. In the US population, the lifetime prevalence of kidney stones is around 10%. Kidney stones are significantly influenced by diet, especially the consumption of sodium, calcium, water, fructose, and other liquids. Fresh fruits and vegetables are the major dietary sources of ascorbic acid, also known as vitamin C, which is an important nutrient that functions as a cofactor in various enzyme pathways.

Studies by (Scott et al, 1982; López et al, 2010) showed that calcium intakes of 1000 mg/day, as opposed to intakes of less than 600 mg/day, are associated with a decreased risk of kidney stones. Other researchers found that using a lot of cooking salt causes an increase in calcium excretion. These results support the current study which found that a higher sodium consumption enhances the development of kidney stones ($P=0.001$). Eating too much meat raises uric acid levels and can cause renal stone disease, as the current work showed a strong link between stone formation and animal proteins ($P=0.037$). This work also indicated that potatoes have a high oxalate content and can cause kidney stones when combined with calcium ($P=0.028$).

As per the present study, those samples with a family history of renal stones had a greater risk of suffering from renal stones than others.

According to current research, 74.2% of females and 58% of males with renal stones had a positive family history.

Total and supplemental intake of vitamin C was significantly associated with a higher risk of incident kidney stones because vitamin C can increase urinary oxalate excretion (Preminger et al, 2014). This study indicated significantly that Loop diuretics, antacids, and abused analgesics (aspirin) can cause metabolic abnormalities that facilitate the formation of stones. Correction of the metabolic abnormality can eliminate or greatly attenuate stone activity, this goes with the study of Naughton CA which mentioned that if the metabolic anomaly is corrected this could stop or reduce stone activity (Naughton CA, 2008).

The participants who reported incident kidney stones were asked about the associated signs and symptoms such as hematuria, pain, and nausea. The results showed a significant connection (p less than 0.05) between the kidney stones and the outcome this goes with a study by McDonald MM, et al which is consistent with the current study findings (McDonald, et al 2006).

The Conclusion:

In conclusion, there was an association between dietary habits of high sodium intake and eating animal protein and age, gender, occupation, and family history with the occurrence of

renal stones in Karbala City. Renal calculi could be managed by putting a strong emphasis on regular exercise, a healthy diet, and lifestyle changes.

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