

## Original paper

# Risk Factors in Patients Having Renal Stones in Al-Sader Teaching Hospital in Misan Province

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## Abstract

**B** **ackground:** Renal stone is one of the commonest renal conditions in Iraq and number of the patients who are suffering from this condition is one of the largest attendance to the In / Outpatient clinics.

**Aim:** There are many risk factors leading to this condition and in this study trying to recognize the most common risk factors and compare with other studies.

**Patients and method:** 67 cases were been chosen for this prospective study collected from admitted cases and Outpatient clinic in the main hospital in the province and the data were collected directly from the patients themselves and their medical records to identify the main risk factors causing their problems.

**Results:** In this study many tables were getting for the main risk factors but try to concentrate about the commonest risk factors that discovered during the study and also to compare it with other studies in the same topic.

**Discussion:** Making a comparison between this study and other studies were done in USA and UK, it has been found that the main risk factors for renal stones formation in western countries is the supplemental calcium and chronic or recurrent UTI and the gender factors are similar to this study.

**Conclusion:** This study shows the most common risk factor for renal stone formation is chronic UTI then history of previous stone and the family history of renal calculi and effect of climate. Also increase incidence of renal stones in female more than male. The study also shows the living in urban area is more risk for renal stone formation than rural area.

**Keywords:** Urolithiasis, UTI (urinary tract infection), Urinary stasis, Calculus.

## Introduction

**Urolithiasis**, or urinary calculus disease, may affect up to 10% of the population over the course of a lifetime.

"The most common types of renal calculus contain calcium (most often calcium oxalate or calcium phosphate), representing 90% of all calculi."<sup>(1)</sup>

"Renal calculi are a common cause of blood in the urine and pain in the abdomen, flank, or groin".<sup>(2)</sup>

47% of Calculi are crystalline aggregates of one or more components. They also may

contain magnesium ammonium phosphate, uric acid, or cysteine. Calcium and struvite-containing stones often are visible on plain radiographs but CT scans will demonstrate all calculi except those composed of crystalline-excreted indinavir, an antiretroviral medication.

There are many aetiological factors that lead to stone formation in the renal system like:

-Dehydration and changed urinary solutes and colloids: whenever there is increasing in the concentration of urinary solutes, there is a chance to precipitate.

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-Low urinary citrate: The existence of citrate in urine, 300-900 mg/24hrs. (1.6- 4.7 mmol/ 24hrs.) as citric acid, it will keep calcium phosphate and citrate insoluble in solution relatively. Urine excretion of citrate is under endocrine effect and reduces during menstrual cycle.

-Urinary tract infection: Presence of urinary tract infection may leads to formation of renal stone. Clinically and experimentally, stones formation is common when there is urinary tract infection especially with staphylococci, urea-splitting streptococci and Proteus spp. The staphylococci and E. coli. are the predominant bacteria that may found in the nuclei of urinary calculi.

-Urinary stasis and inadequate urinary drainage: When there is difficult to pass urine, the stones are more liable for formation in the urinary tract.

-Prolonged immobilization: Immobilization for example due to paralysis of lower limbs may lead to urinary stasis and increasing risk of stone formation, "however there is a case study show prolonged immobilization lead to bone decalcification which may lead to increase calcium in urine which lead to the calcium phosphate calculi formation".<sup>(3)</sup>

-Hyperparathyroidism: It is one of the risk factor which is leading to hypercalcaemia and hypercalciuria and it is found in less than 5% of those who present with radiopaque calculi.

There are many types of renal calculi e.g.:

-Calcium oxalate: "Oxalate stones are the most common type of kidney stones"<sup>(4)</sup>. They form when calcium in the urine combines with oxalate, a chemical that's naturally in many foods. They have usually irregular shape and covered with sharp projections, which may cause haemorrhage.

-Phosphate calculus: It is more common in the female due to recurrent UTI. Phosphate stone account for 12-20% of all stones. It is with a downward trend for ammonium magnesium phosphate (struvite) and it is dirty white and smooth. It is preferred alkaline urine, especially with presence of

urea-splitting Proteus bacteria. It is also called stag horn calculus as it may increase in size to occupy most of the collecting system.

-Urate and Uric acid calculi: They are multiple, hard and smooth stones. Their colour change from yellow to reddish brown and sometimes have a multifaceted character. "They are the most common cause of radiolucent kidney stones in children. Several products of purine metabolism are relatively insoluble and can precipitate when urinary pH is low"<sup>(5)</sup>. As they are radiolucent, they appear as a filling defect on an excretion urogram and can be mistaken for a transitional tumour of the upper renal system. Their presence is confirmed by computed tomography (CT) scan.

-Cystine calculus:" They are due to cystinuria, an inherited (genetic) disorder of the transport of an amino acid (a building block of protein) called cysteine that results in an excess of cystine in the urine and the formation of cystine calculi"<sup>(6)</sup>. They are translucent, hexagonal and the crystals of cysteine appear only in acidic urine. Often they are multiple stones and may increase in size to form a cast of the collecting system. When extracted, its colour first is pink or yellow but when exposed to the air, they change to a greenish colour. Cystine calculi contain Sulphur so that they are radiopaque and they are very hard.

-Xanthine calculus: Extremely it is rare. Usually their appearance is round and smooth, brick-red in colour. It may cause ureteric obstruction.

The aim of this study is to determine the most common risk factor for renal stones formation in patients treating in Al-Sader Teaching Hospital in Misan Province.

## Patients and method

The present study is prospective, 67 cases have been chosen of different age groups from (5-90 y.) and different social background, where they attended Al-Sader Teaching Hospital in Misan province from

October 2016 to April 2017 and data were collected by direct meeting with the patients and from their medical reports.

The most common risk factors for renal stones formation have been consumed and try to identify them.

Most of the patients have been diagnosed as a renal stone and already investigated and treated conservatively first by their own doctors.

The entire patient have been treated either by medical (conservative) or by surgery and admitted in the surgical ward for further management.

## Result

The results of the present study revealed that history of chronic urinary tract infections (UTIs) has significant risk factor of renal stone formation and it represents about 85.07% (57/67 cases) compare with those who has no history of UTIs which is only 13.43% (9/67 cases) as in table 1.

In the present study, the result revealed that the formation of renal stone is significant in Summer season which represents 50.75% (34/67 cases) comparing with Winter season which is 43.28% (29/67 cases) as show in table 2.

The present study revealed the living in urban area has a significant role in renal

stone formation as it represents 47.76% (32/67 cases) while the living in rural area represents 23.88% (16/67 cases) as in table 3.

In the present study, gender is revealed the female who have history of renal stone is little more than the male. It represents 50.75% (34/67 cases) while the male is 49.25% (33/67 cases) as in table 4.

History of previous stones consider as a risk factor of renal stone formation, it represents 44.78% (30/67 cases) while other patients who has no previous stone in urinary system is 47.76% (32/67 cases) as in table 5.

Family history is also consider as one of risk factor of renal stone formation, it revealed in this study 38.81% (26/67 cases) while the patients with no family history of renal stone are 61.19% (41/67 cases) as in table 6.

History of gastro-intestinal (G.I.) surgery is also a risk factor of renal stone formation but it represents only 10.45% (7/67 cases) while others who have no such surgeries are 85.07% (57/67 cases) as in table 7.

Chronic catheterization (Foley's catheterization) of urethra represents only 2.99% (2/67 cases) only as one of risk factor while 95.52% (64/67 cases) are not as in table 8.

**Table 1.** History of chronic UTIs as a result risk factor of renal stone formation.

| Chronic UTIs | Frequency | Percent        | Cum. Percent   | Exact 95% LCL | Exact 95% LCL |
|--------------|-----------|----------------|----------------|---------------|---------------|
| 1            | 57        | 85.07%         | 85.07%         | 74.26%        | 92.60%        |
| 2            | 9         | 13.43%         | 98.51%         | 6.33%         | 23.97%        |
| 3            | 1         | 1.49%          | 100.00%        | 0.04%         | 8.04%         |
| <b>TOTAL</b> | <b>67</b> | <b>100.00%</b> | <b>100.00%</b> |               |               |

**Table 2.** effect of climate as a risk factor of renal stone formation

| Climate      | Frequency | Percent        | Cum. Percent   | Exact 95% LCL | Exact 95% LCL |
|--------------|-----------|----------------|----------------|---------------|---------------|
| 1            | 29        | 43.28%         | 43.28%         | 31.22%        | 55.96%        |
| 2            | 34        | 50.75%         | 94.03%         | 38.24%        | 63.18%        |
| 3            | 4         | 5.97%          | 100.00%        | 1.65%         | 14.59%        |
| <b>TOTAL</b> | <b>67</b> | <b>100.00%</b> | <b>100.00%</b> |               |               |

**Table 3.** living area as a result risk factor in renal stone formation

| Living area  | Frequency | Percent        | Cum. Percent   | Exact 95% LCL | Exact 95% LCL |
|--------------|-----------|----------------|----------------|---------------|---------------|
| 1            | 32        | 47.76%         | 47.76%         | 35.40%        | 60.33%        |
| 2            | 16        | 23.88%         | 71.64%         | 14.31%        | 35.86%        |
| 3            | 19        | 28.36%         | 100.00%        | 18.01%        | 40.69%        |
| <b>TOTAL</b> | <b>67</b> | <b>100.00%</b> | <b>100.00%</b> |               |               |

**Table 4.** Gender as a result risk factor of renal stone formation

| Gender       | Frequency | Percent        | Cum. Percent   | Exact 95% LCL | Exact 95% LCL |
|--------------|-----------|----------------|----------------|---------------|---------------|
| 1            | 33        | 49.25%         | 49.25%         | 36.82%        | 61.76%        |
| 2            | 34        | 50.75%         | 100.00%        | 38.24%        | 63.18%        |
| <b>TOTAL</b> | <b>67</b> | <b>100.00%</b> | <b>100.00%</b> |               |               |

**Table 5.** History of previous stone as a risk factor of renal stone formation

| Hx. of previous stones | Frequency | Percent        | Cum. Percent   | Exact 95% LCL | Exact 95% LCL |
|------------------------|-----------|----------------|----------------|---------------|---------------|
| 1                      | 30        | 44.78%         | 44.78%         | 32.60%        | 57.42%        |
| 2                      | 32        | 47.76%         | 92.54%         | 35.40%        | 60.33%        |
| 3                      | 5         | 7.46%          | 100.00%        | 2.47%         | 16.56%        |
| <b>TOTAL</b>           | <b>67</b> | <b>100.00%</b> | <b>100.00%</b> |               |               |

**Table 6.** Incidence of family history of renal stone as risk factor

| Family Hx.   | Frequency | Percent        | Cum. Percent   | Exact 95% LCL | Exact 95% LCL |
|--------------|-----------|----------------|----------------|---------------|---------------|
| 1            | 26        | 38.81%         | 38.81%         | 27.14%        | 51.50%        |
| 2            | 41        | 61.19%         | 100.00%        | 48.50%        | 72.86%        |
| <b>TOTAL</b> | <b>67</b> | <b>100.00%</b> | <b>100.00%</b> |               |               |

**Table 7.** History of G.I surgery as a risk factors of renal stone formation

| G.I. surgery | Frequency | Percent        | Cum. Percent   | Exact 95% LCL | Exact 95% LCL |
|--------------|-----------|----------------|----------------|---------------|---------------|
| 1            | 7         | 10.45%         | 10.45%         | 4.30%         | 20.35%        |
| 2            | 57        | 85.07%         | 95.52%         | 74.26%        | 92.60%        |
| 3            | 3         | 4.48%          | 100.00%        | 0.93%         | 12.53%        |
| <b>TOTAL</b> | <b>67</b> | <b>100.00%</b> | <b>100.00%</b> |               |               |

**Table 8.** Chronic catheterization as a result risk factor of renal stone formation

| Chronic catheterization | Frequency | Percent        | Cum. Percent   | Exact 95% LCL | Exact 95% LCL |
|-------------------------|-----------|----------------|----------------|---------------|---------------|
| 1                       | 2         | 2.99%          | 2.99%          | 0.36%         | 10.37%        |
| 2                       | 64        | 95.52%         | 98.51%         | 87.47%        | 99.07%        |
| 3                       | 1         | 1.49%          | 100.00%        | 0.04%         | 8.04%         |
| <b>TOTAL</b>            | <b>67</b> | <b>100.00%</b> | <b>100.00%</b> |               |               |

## Discussion

In the present study, the risk of renal stone formation in female especially in middle age group is more than the male and it increases in those with history of chronic UTI (71%). A history of previous stone (39%) and family history of stone (46%) have higher risk also increase the risk of renal stone in urban area (63%) more than rural.

Comparing this study with previously same topic studies were done in U.S.A. in 1997<sup>(5)</sup>, they found that the risk for symptomatic kidney stone is decreased with high intake of dietary calcium, whereas intake supplemental calcium in

form of medication may raise the risk because "dietary calcium reduces the absorption of oxalate form GIT"<sup>(7)</sup>. It has been noticed that the different effects due to the type of calcium may be associated with the timing of calcium ingestion rather than to the amount of oxalate intake. However, dairy products which are "the major source of dietary calcium intake could be responsible for the reducing risk seen with dietary calcium"<sup>(8)</sup> while in another study were done in 1984 in U.S.A. shows relation between the stones and urinary tract infections suggest that branched renal calculi associated with bacteriuria usually are infected but that documentation of infection and identification of the infecting organism require culture of the stone <sup>(9)</sup>.

. "Stones that may occur following urinary tract infections (UTIs) especially caused by urease-producing gram-negative bacteria, they consist of magnesium ammonium phosphate, carbonate apatite and monoammonium urate"<sup>(10)</sup>. The most preferable to their formation is alkaline urine. UTIs show two different clinical features: "(i) stones that develop following UTIs (infection stones) play a key role in stone pathogenesis and (ii) stones complicated by UTIs (stones with infection) which are metabolic stones that passively trap bacteria from coexistent UTIs and may consist of calcium or non-calcium".

Another study at 1990 shows metabolic factors (Citrate, uric acid, oxalate, calcium and pH). Factors related to the environment were total volume, sulfate, sodium, phosphate and magnesium. "Physico-chemical factors represented saturation of calcium oxalate, brushite, monosodium urate, struvite and uric acid. A scheme for graphic display of risk factors was important risk factors presumed to cause stone formation"<sup>(11)</sup>.

## Conclusion

The present study shows the most common risk factor for renal stone formation is chronic UTI then history of previous stone and the family history of renal calculi and climate effect. Also increase incidence of renal stones in female more than male. The study also shows the

living in urban is more risk for renal stone formation than rural area.

Our recommendation to the patient is to treat UTI properly as early as possible and increase fluid intake and avoid sedentary life style and dehydration. Also patients with positive family history should take precaution.

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