

# PREVALENCE OF URINARY TRACT INFECTIONS IN PATIENTS WITH RENAL STONES <sup>+</sup>

مدى انتشار التهاب المجاري البولية في المرضى المصابين بحصاة الكليه

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## Abstract:

The study was carried out in Kirkuk province, on patients attending Kirkuk hospitals, and private clinics from the 15th December 2004 until the 1st July 2005. Urine and blood samples were collected from 152 persons including 102 patients with urinary tract stones (61 males, 41 females), and 50 control healthy subjects (30 males, 20 females).

General urine examination was done, and the results showed that 74 of the patients group were suffering from urinary tract infection, 25 of them were on antibiotics, and urine culture was done for the remaining patients. The results of urine culture showed that *Escherichia coli* infection (10.8%) was the commonest among patients with urinary tract stones, followed by *proteus species* (5.4%), *Acinetobacter spp*, *Klebsiella spp* (2.7%) for each and *Pseudomonas spp*, *Staphylococci saprophyticus*, *Enterococci faecalis* (1.35%) respectively.

Significant increase in prevalence of urinary tract stones was demonstrated at age group (21-30 year), the highest rate was among housewives and officials, and (41.18%) of them had familial history of urinary tract stones.

Key words: UTI, Renal stone.

## المستخلص:

تم إجراء هذه الدراسة في مدينة كركوك للفترة من ١٥ شهر كانون الأول عام ٢٠٠٤ حتى الأول من شهر تموز عام ٢٠٠٥ للمرضى المراجعين للمستشفيات والعيادات الخاصة في مدينة كركوك. شملت هذه الدراسة ١٥٢ شخصا، ١٠٢ منهم كانوا يعانون من حصيات المجاري البولية (٦١ ذكور، ٤١ إناث)، وخمسون أصحاء لغرض المقارنة (٣٠ ذكور، ٢٠ إناث)، ولقد تم جمع نماذج من الدم الوريدي والإدرار وتاريخ الحالة لكل واحد منهم. تم إجراء فحص الإدرار العام لجميع نماذج الإدرار وقد بينت النتائج بان ٧٤ مريضا كانوا يعانون من التهابات المجاري، ٢٥ منهم كانوا في طور العلاج بالمضادات الحيوية. تم إجراء زرع عينات الإدرار للمرضى الذين يعانون من التهابات المجاري البولية وكانت النتائج

<sup>+</sup>Received on 19/1/2009 , Accepted on 22/6/2010 .

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كالآتي: إن الإشيريشيا القولونية (*Escherichia coli*) كانت الأكثر شيوعاً بين العوامل المرضية المسببة لالتهابات الجهاز البولي (١٠,١٨ %)، (*Proteus spp*) (٥,٤ %)، (*Acinetobacter spp*, *Klebsiella spp*) (٢,٧ %) لكل منهما، و (١,٣٥ %) لكل من (*Enterococci fecalis*), (*Staphylococci saprophyticus*), (*Pseudomonas spp*) . كما أظهرت هذه الدراسة بأن النسبة الأعلى للإصابة بحصيات المجاري البولية كانت بين المجاميع العمرية (٣٠-٢١ سنة)، مع أعلى نسبة في ربات البيوت (٣٣,٣٤ %) والموظفين (١٥,٦٨ %). كما تبين من الدراسة أن (٤١,١٨ %) من المرضى كان لديهم تأريخ عائلي للإصابة بحصيات المجاري البولية.

## **Introduction:**

Renal stone disease has been recognized in many parts of the world since antiquity. It is one of the most painful and commonest urological disorders. The evidence of urinary calculi has been found in 7000 years old Egyptian mummy. Its incidence has increased considerably during the twentieth century [1]. The urea splitting bacteria were responsible for urinary ammonia, alkalinity and stone formation [2].

Struvite stones (infectious) are invariably associated with urinary infections. Specifically, the presence of urease-producing bacteria, including *Ureaplasma urealyticum* and *Proteus* (most common), *Staphylococcus*, *Klebsiella*, and *Pseudomonas* species, leads to the hydrolysis of urea into ammonium, hydroxyl ions and carbon dioxide. *Escherichia coli* do not produce ureas and is not associated with struvite stone formation. The resulting increase in ammonium and phosphate concentrations combined with the alkaloid urine (pH> 7.2) is necessary for struvite and carbonate apatite crystallization [2,3].

In Misan province- Iraq, it was found that the rate of urinary problems was 34% of total patients attended out-patients clinics; the rate of renal stone associated with infections were 32% with male:female ratio 1.1:1 [4]. In Baghdad, it has been reported that the ratio of male: female renal calculi were 2.12:1 [5], 2.86:1 [6].

In Abbottabad, a study was carried out on 100 patients with urinary infection showed that the frequency of renal stone disease was 18.98% (12.6% in male and 6.3% in female; and male to female ratio was 1.5:1) and the mean age of patients with renal stones was 31.26 years. The commonest organisms isolated were *E. coli* (30%), followed by *Proteus* (19%), *Klebsiella* (11%), *Pseudomonas* (7%), *Staphylococcus aureus* (3%) respectively [7].

The present study was planned to show the prevalence of urinary tract infections in patients suffering from urinary tract stones and healthy individuals.

## **MATERIALS AND METHODS**

This study was carried-out in Kirkuk city from 15th December 2004 until the 1st of July 2005 on patients who attended Kirkuk hospitals suffering from urinary tract stone as they were diagnosed by consultant physicians.

The study included 102 patients with urinary tract stone (61 males, 41 females) and their age ranged between (4-79) years and 50 healthy control groups (30 males, 20 females) and their age ranged between (5-75) years.

Midstream urine samples were collected from patients and healthy controls in sterile container, and divided into two portions. The first portion is used for general urine examination and second portion for culture. Positive urine analysis findings include leukocytes, erythrocytes, bacteria and others in an otherwise uncontaminated urine specimen.

The threshold of establishing true UTI includes finding greater than or equal to (2-5) WBCs or 15 bacteria per high power field (HPF) in centrifuged urine sediment [8].

The urine samples were cultured on Nutrient agar, blood agar and McConkey agar plates, using sterile standard loops (1µl) then incubated at (37 ± 2) °C for 20-24 hours. A significant growth was obtained as expressed as more than 100 colonies (10 cell/ml) of pure culture [9]. Morphology, size and shape of the colonies were examined. Furthermore, Gram stained smears examination was carried out according to the method of [10]. The isolates were identified by their colonial morphology, Gram stain and biochemical tests such as: catalase, oxidase, urease, indole, coagulase and motility tests [11,12].

Chi-square analysis was done to show significant difference between groups and t-test was performed to show significant difference between any two groups. P value of 0.05 or less was considered to be significant [13].

## **Results:**

Among 102 patients with urinary tract stone (U.T.S), 74 were suffering from urinary tract infection (72.54%), 39 (52.7%) of them were males and 35 (47.29%) were females, with male to female ratio was 1.48:1 and 50 normal subjects as a control group. Table 1, showed that the highest rate of renal stones was among 20- <30 years old. Statistically there was no significant relationship between age and the formation of renal calculi.

Table 1. Distribution of renal stones according to age.

Age group (years)	Total No. examined	Percentage (%)
1- < 10	4	3.92
10- < 20	7	6.86
20- < 30	25	24.51
30- < 40	19	18.63
40- < 50	17	16.67
50- < 60	16	15.69
60 & over	14	13.72
Total	102	100

$$\chi^2 = 5.42$$

$$d.f = 3$$

$$p > 0.05$$

Regarding the occupation, the highest rate of renal stones was among housewives (33.34%) followed by officials (15.68%), workers (7.85%), students (5.88%), drivers (5.88%), farmers (3.92%), soldiers (3.92%), children (2.94%), and others (such as blacksmith, painter, shopkeeper, free business) (20.59%) as shown in Table (2).

**Table (2):** Distribution of renal stones according to occupation.

Occupation	No. examined	Percentage %
House wives	34	33.34
Officials	16	15.68
Workers	8	7.85
Students	6	5.88
Drivers	6	5.88
Farmers	4	3.92
Soldiers	4	3.92
Children	4	3.92
**Others	20	19.6
Total	102	100

\*\* Others (blacksmith, Painter, Shopkeeper ...etc).

It was found that (41.18%) of the patients with urinary calculi were with familial history while (58.82%) of them were without familial history as indicated in table (3).

**Table (3):** Distribution of renal stones according to familial History.

Familial history	Number	Percentage (%)
Yes	42	41.18
No	60	58.82
Total	102	100

It is shown in table (4) that *E. coli* infection (10.8%) was commonest among patients with urinary tract stones, followed by *Proteus spp* (5.4%), *Acinetobacter spp*, *Klebsiella spp* (2.7%) for each and *Pseudomonas spp*, *Staphylococci saprophyticus*, *Enterococci faecalis* (1.35%) for each.

**Table (4):** The microorganisms isolated from (102) patients with urinary tract stones.

Micro organism	Number	% from 74 patients with U.T.I	% from total 102 patients
- <i>Escherichia coli</i>	8	10.8	7.84
- <i>Proteus spp</i>	4	5.4	3.92
- <i>Acinetobacter spp</i>	2	2.7	1.96
- <i>Klebsiella spp</i>	2	2.7	1.96
- <i>Pseudomonas spp</i>	1	1.35	0.98
- <i>Staphylococci saprophyticus</i>	1	1.35	0.98
- <i>Enterococci faecalis</i>	1	1.35	0.98

## **DISCUSSION:**

The results of the present study showed that male patients were affected with nephrolithiasis more than females, with a male to female ratio of (1.48:1). This result is in agreement with other studies, which showed that urinary tract stones affect men more than women; the reported ratio of male to female renal calculi in Baghdad was: 2.12:1 [5], 2.86:1 [6], 4:1 [14]. These differences in the results may be due to differences in place of study, number of patients examined, type of diets, and period of study.

From some experimental data, the higher prevalence of nephrolithiasis in males can be attributed to effect of sex hormones on some lithogenic risk factors: androgens appeared to increase, urinary oxalate excretion and kidney calcium oxalate deposition, while estrogen may help to prevent the formation of calcium stones by keeping urine alkaline and raising protective citrate levels [15]. Other causes may be due to differences in the occupational conditions that differ in males from females.

This study also showed that the renal calculi develop more frequently in the third and fourth decades of life. This finding is in agreement with two other studies done in Baghdad, which showed that urolithiasis occurs more frequently in the third and fourth decades of life [5,14]. Other study from Baghdad also showed that the fourth and fifth decades of life were more affected [6]. There is no significant relationship between age and the formation of renal calculi.

It is important to elucidate whether a UTI is related to the stone formation. In this study (66.66%) of patients had UTI associated with urinary calculi, (36.76%) of them were on antibiotics, (47.06%) of them were male (39.706% of them married, and 7.353% of them single), and (52.94%) were female (41.18% of them married, and 11.76% of them single). *E. coli* and *P. mirabilis* were the most commonly isolated microorganisms. This result is in agreement with other studies from Baghdad which showed that (46.5%) of patients with

urinary stones were suffering from UTI, and the most microorganisms that were isolated were, *Ps. aeruginosa*, *K. pneumoniae*, *P. mirabilis*, and *E. coli* [16]. In another study in Baghdad showed that (4%) from the patients with urinary calculi were suffering from UTI, *E. coli* and *Klebsiella* were most commonly isolated [5].

Holmgren reported that of 796 consecutive patients at a stone clinic over a 10-year period, 52 (7%) had recurrent or chronic UTI that was considered to be of pathogenic importance in the stone formation [17]. In the present study, the UTIs were more common also that the prevalence of UTIs was more common among married patients in males (52.94) than in females (47.06). This may be due to the fact that most of the patients with urinary stones were males, this may be explained as the sexual intercourse is one of the predisposing factors for UTIs [18].

The distribution of renal calculi among different occupations was housewives (33.34%), officials (15.68%), students (5.88%), drivers (5.88%). These occupations predispose the sedimentation of the urine which is one of the risk factors for urinary calculi formation [19]. Workers (7.85%), farmers (3.92%), soldiers (3.92%), These occupations will cause dehydration which is one of the risk factors for renal calculi formation [20], (3.92%) children ( they were 4 children, one with urinary tract infection by *Proteus spp* and a family history of renal calculi, one with family history of renal calculi, and two with urinary tract infection by *Proteus spp.*). Urinary tract infection by *proteus spp* [2] and family history of renal calculi [19] were the most common causes of urinary calculi formation. The presence of (19.6%) of urinary calculi among other occupations (blacksmith, painter, shopkeeper ...etc) may be related to the dehydration during their working hours [20].

It is important to elucidate whether a familial history of urinary stones is related to the urinary calculi formation. In the present study the percentage of patients, who have a family history of stone formation was (41.18%). However familial recurrence does not necessarily imply an inherited transmission, it may be an effect of environmental factors shared by family members [21]. It has been observed that from a threefold higher relative risk for stone disease among family members of stone formers, a double risk persisted after normalization for known environmental factors. Thus, they found that about (60%) of the enhanced risk of stone formation among relatives of patients with idiopathic nephrolithiasis may be related to genetic inheritance [22].

It is concluded that the rate of urinary tract stone was highest among patients in Kirkuk province. The prevalence of urinary tract stones among males was higher than females and was highest among patients 21-30 years old. There was relationship between family history and urinary stone formation. It is shown that *Escherichia coli* infection was the commonest among patients with urinary tract stones, followed by *Proteus spp*, *Acinetobacter spp*, *Klebsiella spp*, *Pseudomonas spp*, *Staphylococci saprophyticus*, *Enterococci faecalis* respectively.

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