

## Types of Renal Stones in Al-Anbar Governorate

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### Abstract

**Background:** Urinary calculi are the third most common affliction of the urinary tract, exceeded only by urinary tract infections and pathologic conditions of the prostate. The lifetime prevalence of kidney stone disease is estimated at 1% to 15%.

**Aim of study:** to determine different types of renal stones in Al-Anbar Governorate.

**Materials and methods:** from November 2008 till November 2010 (265) patients having upper tract stone disease were studied in Al-Ramadi Teaching Hospital. All these stones that were analyzed by chemical method were obtained from those patients either by spontaneous passage, medical expulsive therapy, Extracorporeal Shock Wave Lithotripsy [ESWL], or by surgical operation.

**Results:** In this study, the age of those patients ranges from 17-62 years old. The male to female ratio was 3:1. The distribution of stones in Al-Anbar Governorate was: Uric acid stone 50.6%, calcium oxalate stone 38.1%, calcium phosphate stone 5.3%, cystine stone 1.9%, mixed (calcium and uric acid) stone 4.1%.

**Conclusion:** High incidence of uric acid stones in Al-Anbar Governorate which are more in males than in females. The main cause for these results is unknown, but dietary factor (proteins) may play a major role in stone formation in Al-Anbar Governorate.

**Key words:** Renal stones, analysis, Al-Anbar Governorate (Iraq).

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### Introduction:

Urinary calculi are the third most common affliction of the urinary tract, exceeded only by urinary tract infections and pathologic conditions of the prostate.<sup>[1]</sup> The lifetime prevalence of kidney stone disease is estimated at 1% to 15%, with the probability of having a stone varying according to age, gender, race, and geographic location. In the United States, the prevalence of stone disease has been estimated at 10% to 15%.<sup>[2]</sup>

Nephrolithiasis (from Greek (nephros, "kidney") and (lithos, "stone")) refers to the condition of having kidney stones.<sup>[3]</sup> Kidney stones do not have single, well-defined cause, but are the result of a combination of factors. A stone is created when the urine does not have the correct balance of fluid and a combination of minerals and acids.<sup>[4]</sup>

Kidney stones or calcium oxalate crystals in kidney can be due to underlying metabolic conditions, such as renal tubular acidosis,<sup>[5]</sup> Dent's disease,<sup>[6]</sup> hyperparathyroidism,<sup>[7]</sup> primary hyperoxaluria<sup>[8]</sup> and medullary sponge kidney.<sup>[9]</sup> Kidney stones are also more common in patients with Crohn's disease.<sup>[10]</sup> Patients with recurrent kidney stones should be screened. This is typically done with a 24 hour urine collection that is chemically analyzed for deficiencies and excesses that promote stone formation.<sup>[11]</sup> There has been some evidence that water fluoridation may increase the risk of kidney stone formation.<sup>[12]</sup> Vitamin C can cause kidney stones, and this is based on several circular references, ultimately attributing the belief to a wider pattern of skepticism regarding efficacy of vitamin supplements.<sup>[13]</sup>

A more recent study suggested a causal relationship may exist, but it was not conclusive.<sup>[14]</sup> The American Urological Association has projected that increasing global temperatures will lead to greater future prevalence of kidney stones, notably by expanding the "kidney stone belt" of the southern United States.<sup>[15]</sup> Astronauts seem to show a higher risk of developing kidney stones during or after long duration space flights.<sup>[16]</sup>

The most common type of kidney stone is composed of calcium oxalate crystals, occurring in about 80% of cases.<sup>[5]</sup> About 5–10% of all stones are formed from uric acid.<sup>[5]</sup> Uric acid stones form in association with conditions that cause hyperuricosuria with or without high blood serum uric acid levels (hyperuricemia); and with acid/base metabolism disorders where the urine is excessively acidic (low pH) resulting in uric acid precipitation. A diagnosis of uric acid nephrolithiasis is supported if there is a radiolucent stone, a persistent undue urine acidity, and uric acid crystals in fresh urine samples.<sup>[17]</sup> Other types of kidney stones are composed of struvite (magnesium, ammonium and phosphate); calcium phosphate; and cystine. Struvite stones are also known as infection stones, urease or triple-phosphate stones. About 10–15% of urinary calculi consist of struvite stones.<sup>[18]</sup> The formation of struvite stones is associated with the presence of urea-splitting bacteria,<sup>[19]</sup> most commonly *Proteus mirabilis* (but also *Klebsiella*, *Serratia*, *Providencia* species). Struvite stones are always associated with urinary tract infections.<sup>[18]</sup>

Urolithiasis has also been noted to occur in the setting of therapeutic drug use, with crystals of drug forming within the renal tract in some patients currently being treated with Indinavir, Sulfadiazine or Triamterene.<sup>[18]</sup>

**Aim of study:** to determine different types of renal stones in Al-Anbar Governorate.

## Materials and Methods:

From November 2008 till November 2010, 265 patients having upper tract stone disease were studied in Al-Ramadi Teaching Hospital. All these stones that were analyzed by chemical method were obtained from those patients either by spontaneous passage, medical expulsive therapy, Extracorporeal Shock Wave Lithotripsy [ESWL] or by surgical operation. The age and sex were recorded. Stone analysis set is a chemical qualitative method produced by BIOLABO SA, 02160, Maisy, France. This method is used for identification of main mineral components and one organical component (cysteine) of urinary calculi by chemical tests.

## Results:

In this study, the age of those patients ranges from 17-62 years old (mean  $39.8 \pm 1.35$ ). The male to female ratio was 3:1.

The stone affecting 191 (72.1%) males and 74 (27.9%) females.

The number of patients with uric acid stone was 134, of them 96 (71.6%) are males and 38 (28.4%) are females.

The numbers of patients with Calcium oxalate stones was 134, of them 69 (68.3%) are males and 32 (31.7%) are females.

The number of patients with calcium stones was 115, of them 101 (87.8%) have calcium oxalate stones and 14 (12.2%) have calcium phosphate stones.

Fourteen patients had calcium phosphate stones, of them 13 (92.9%) were females and 1 (7.1%) was male.

All patients with cystine stones were male. The number of patients with mixed Stones was 11, of them 9 (81.8%) are males and 2 (18.2%) are females.

The distribution of stones in Al-Anbar Governorate was : Uric acid stone 50.6%, calcium oxalate stone 38.1%, calcium phosphate stone 5.3%, cystine stone 1.9%, mixed (calcium and uric acid) stone 4.1%. Table 1.

Table 1: The Distribution of Stones Types

Stone Types	Number	Percentage
Uric Acid Stones	134	50.6
Calcium Oxalate Stones	101	38.1
Calcium Phosphate Stones	14	5.3
Cystine Stones	5	1.9
Mixed	11	4.1
Total	265	100

## Discussion:

Patients who consume high quantities of meat are at risk for forming uric acid stones because of the increased purine load and acid-ash content of animal protein. This promotes hyperuricosuria and a mild metabolic acidosis resulting in a lowering of urinary pH. Therefore, dietary measures may help to prevent uric acid stone formation.<sup>[22]</sup>

In an analysis of 14,557 renal and ureteral stones in Newfoundland, Canada; 52% were purely calcium oxalate, 13% purely calcium phosphate, 15% a mixture of calcium oxalate and phosphate, 4% struvite, 8% uric acid, and 8% other compounds.<sup>[21]</sup>

It well known that calcium oxalate stones are the most common type of renal stone<sup>[1,-4,8,9,17-21]</sup> but in this study, the most common types were uric acid (50.6%) followed by calcium oxalate (38.1%), calcium phosphate (5.3%), mixed (4.1%) and cystine (1.9%). So uric acid stones are the most common type in our locality, this high incidence of uric acid stones may be due to high intake of animal protein, specifically red meat, high salt intake, hot dry climate, and decreased amount of fluid intake. High incidence depends on water softening machines may decrease the natural stone inhibitor which herald the thinking toward the disadvantages of this water softening.

The male to female ratio were 3:1 and this may be attributed to the lithogenic effect of testosterone that cause increases in urinary calcium and oxalate excretions and decreases in urinary citrates excretions. This male to female ratio is

compatible with the reported ratios in many areas in the world.<sup>[17-21]</sup>

Does the loss of blood during menses may have effect on the low incidence of stone formation in women?

A dietary history should be obtained from all patients with uric acid calculi because they may have a tendency to purine gluttony (high intake of animal protein, specifically red meat), an astute clinician will at least give a brief consideration to the possibility of a neoplastic or myeloproliferative disorder, patients with diabetes mellitus may also form uric acid calculi as a result of disorders in ammonium handling with subsequent low urine pH.<sup>[20]</sup> In our study, when we reviewed the history of patients thoroughly, we found that all patients with uric acid stones had high intake of animal protein, specially red meat, this may be the only explanation for this high incidence of uric acid stones in contrary to other areas in the world.

The familial predisposition to form urinary stones is well established, the *ZNF365* gene on chromosome 10q21-q22 was discovered to be associated with uric acid nephrolithiasis. Although this gene encodes for 4 different proteins through alternate splicing, only 1 predisposes to the development of uric acid stones. It seems that this novel gene surfaced in the Miocene era around the time that primates lost the function of uricase. It is possible that the product of this gene protects against the harmful effects of hyperuricemia due to silencing of the uricase gene without losing its beneficial effects. The identification of the urate

transporter URAT1 as well as the discovery of the *ZNF365* gene associated with uric acid nephrolithiasis foreshadows many more exciting discoveries to come.<sup>[23]</sup>

## Conclusion:

High incidence of uric acid stones in Al-Anbar governorate which are more in males than in females. The main cause for these results is unknown, but dietary factor may play a major role (proteins) in stone formation in Al-Anbar Governorate. Further researches about dietary factor and balanced diet in Al-Anbar governorate is important.

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