URINARY STONE ANALYSIS: A COMPARATIVE STUDY WITH CLINICAL AND BIOCHEMICAL ASSESSMENT

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تحليل حصاة المجاري البولية: دراسة مقارنة للحالة السريرية والكيمياحيوية

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الخلاصة خلفية الدر اسة: خضع لهذه الدراسة (١٠٠) مائة مريض يشكون من حصاة المجاري البولية ادخلوا إلى المستشفى التعليمي في النجف للفترة من(تشرين الأول ١٩٩٧ - تشرين الأول١٩٩٨)، بعد أن توفرت علامات سريرية تؤكد ذلك. هدف الدراسة : معرفة التركيب الكيميائي لحصاة المجاري البولية ودر إسة الحالة السريرية والفحوصات الكيمياحيوية للمرضى . طريقة الدراسة : إجراء تحليل كيميائي للحصبي ٢. إجراء تحليل الدم: أ. نسبة الكالسيوم في الدم. ب. نسبة حامض البوليك في الدم. ٣. فحص وظائف الكلية : أ. نسبة يوريا الدم. ب. نسبة الكرياتينين في الدم. ع. فحص الإدرار العام وزرع الإدرار. الفحو صات الشعاعية : أبالأشعة الاعتبادية ب. الأشعة الملونة (وحسب الحاجة). ج. فحص الموجات فوقق الصوتية (السونار). النتائ<u>ج :</u> أظهرت النتائج ان معدل أعمار المرضى المصابين بحصاة المجاري البولية يتراوح بين (30-40) سنة وان نسبة إصابة الذكور إلى الإناث هي (١/٤)، كما أظهرت الدراسة ان أكثر الأعراض السريرية حدوثًا هي سلس التبول والتبول الدموي. أما تحليل الحصبي كيميائياً فأظهر ان جميع أنواع الحصبي تحوي مادتي الكالسيوم والفوسفات، بينما نسبة مادة حامض البوليك هو ٥٦% في تركيبها. أظهرت تحاليل الدم الحيوية ان نسبة الكالسيوم في الدم عند جميع المرضى ضمن الحدود الطبيعية ، في حين ان نسبة حامض البوليك مرتفعة عن الحد الأعلى الطبيعي في ٢٠ % من المرضى . أظهرت الفحوصات الشعاعية العلاقة القوية بين التشو هات الخلقية في الكليتين مثل (فقدان إحدى الكليتين الولادي، انشطار الحالب الجزئي والكلية الحوضية) والإصابة بحصاة المجاري البولية . مفتاح الكلمات: حصاة المجاري البولية التحليل الكيميائي للحصي التركيب الكيميائي للحصبي

KEYWORDS

Urinary Tract Stone Chemical Stones Analysis Chemical Stones Structure

<u>Abstract</u>

Background :

One hundred patients suffered from urinary stones underwent this prospective study, which was carried out in Al-Najaf Teaching Hospital for the period from (October, 1997–October 1998), according to their clinical signs and symptoms.

Objective :

The purpose of this study is to do chemical analysis of urinary stones and to assess the clinical and biochemical state of the patients.

Methods :

- 1. Chemical analysis of the stone.
- 2. Biochemical Examination :
 - a. Serum calcium.
 - b. Serum uric acid.
- 3. Renal Function Test.
 - a. Blood urea
 - b. Serum creatinine
- 4. General urine examination and culture & sensitivity of urine.
- 5. Radiological Examination :
 - a. Plain X-ray.
 - b. IVU (as indicated).
 - c. Ultrasound (US).

Results :

The results had showed that the average age of the patients was between (30-40) years and the male to female ratio was 4:1.

It had been observed that the most significant clinical symptoms were frequency of micturition and hemacturia.

Chemical analysis of the stones showed that almost all the stones contain calcium and phosphate in their composition while the uric acid found in 56% of their structure.

The biochemical examination showed normal value of serum calcium in all the patients while serum uric acid was high in 20%.

The radiological examination revealed the close relationship between the congenital anomalies like (unilateral agenesis of the kidney, partial bifid of the ureter, and pelvic kidney) and urinary tract stone formation.

Conclusion :

All stones in the current study were composed of calcium phosphate. This result is higher than other studies in Iraq.

Further work is still needed on renal stones to substantiate these observations.

INTRODUCTION

Analysis of the stone to ascertain its chemical composition would be a realistic starting point for the investigation and management of the stone former patients. Yet this important consideration is often overlooked by the clinician, largely because the facilities for stone analysis are not always readily available. The purpose of stone analysis is to provide information that will be both useful and significant for the

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diagnosis of the underlying disease and as preventive measure to decrease their recurrence.

METHODS

One hundred patients with urinary stones were admitted to the surgical wards in Al-Najaf Teaching Hospital. The patients were managed as follow :

The name, age, address and Occupation, history of pain, haematuria, frequency of micturition, previous history of urinary diseases and family history of urinary diseases.

Physical examination: Temperature, Pulse rate, Blood pressure, abdominal examination and examination of external genitalia.

Laboratory investigation includes:

-General urine examination with culture and sensitivity of urine.

-Biochemical examination for blood urea, serum creatinine, serum calcium and serum uric acid.

-Radiological examination includes: KUB, US, for all patients and IVU as indicated clinically to detect anatomical abnormalities.

-Chemical stone analysis using the following procedure ⁽¹⁾:

-Washing the stone with tab water.

-Crushing the stone to make it as powder.

-Dissolving the powder with (0.1 N) HCl.

-Filtration.

-Dividing the filtrate into five test tubes each contains (0.5 ml).

-Examination for each chemical constituent as follow:

Test	reagent	positive reaction
1-Calcium	0.5ml saturated ammonium	cloud with precipitate
2-Ammonium	1 ml Nissler reagent	orange- brown
3- phosphate	0.5 ml sulfuric acid + 0.1 ml vit. C	blue color
4-Oxalate	0.5 ml potassium permanganate	color disappear
5-Uric acid	0.5 ml sodium carbonate +	deep blue
	0.5 ml phosphatotengastic acid	_

RESULTS

This prospective study include (100) consecutive patients with urinary stones that had been treated in the surgical department of Al-Najaf teaching hospital during the period from (October 1997-October 1998). The average patient's age between (6-65) years, they are (80 male and 20 female). Sixty patients had open surgery, (24 stones) extracted by endoscopic procedure, (8) stones granules were obtained after extra corporeal shock wave lithotripsy and in(8) patient, spontaneous passage of the stones.

The main age group of urinary calculi was (30-40) year. The male to female ratio was(4:1). The main presenting complain was frequency of micturtion (60%), hematuria (40%), fever (40%) loin pain (36%) burning micturtion (24%) supra-pubic pain (12%) retention of urine (12%).

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Twenty eight percent of patients had a history of previous urinary stone and (16%) had a positive family history of urinary stone.

The laboratory investigations showed that most of the patients had microscopic heamaturia (92%) and pyuria (80%), while culture of urine was positive in about (60%).

The radiological examination showed that, one patient (6 years old) had Pelvic kidney. Simple renal cysts were seen in (8 cases). One patient had a single kidney (Congenital Agenesis).

The radiological examination showed a single case of radio-lucent stone which was diagnosed by ultra-sound and all other stone were radio-opaque (99%).

The most common type of urinary stone were, in order of frequency (vesicle 60%, renal 28% and ureteric 12%)

Bio-chemically, all patients had normal renal function (blood urea and serum creatinine). Bio-chemical examination of serum calcium showed that all patients had a normal level of serum calcium, while serum uric acid is raised in (20%) of the patients.

Chemical analysis of the urinary stones showed that almost all the stones contain calcium and phosphate (100%), uric acid found in (56%) in combination with other chemical constituent. Ammonium containing stones (28%) and Oxalate stone (8%).

Frequency of micturition	60%
Heamaturia	40%
Fever	40%
Loin pain	36%
Burning micturition	24%
Retention of urine	12%
Supra pubic pain	12%
Prostate enlargement	8%
hypertension	4%

Table (1) symptoms and signs of patient with urinary stones

Table (2) laboratory examination (GUE, URINE-C&S) Of patients with urinary stones

R.B.C	92%
Pus Cell	80%
C&S(+ve)	60%

 Table (3) Bio-chemical examination of patients with urinary stones.

	normal	Above-normal
Serum Calcium	100%	
Serum Uric Acid	68%	32%

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Table (4) chemical analysis of urinary stone

Constituent	%
Calcium	100
Phosphorus	100
Uric acid	56
Ammonium	36
oxalate	8

Table (5) chemical structure of urinary stone

Chemical structure	%
Calcium phosphate	36
Calcium phosphate-Uric acid	20
Calcium phosphate-ammonium urate	36
Calcium phosphate-calcium- Oxalate	8

DISCUSSION

All patients in the current study had normal serum calcium with normal renal function and all the stones contain calcium, while in (Al-Kadi study)⁽²⁾, which was done in Baghdad, chemical analysis of fifty stones showed that calcium is the main constituent (86%). Calcium oxalate contribute to 8% in this study while in Al-Kadi study oxalate contribute to 50% of stone composition, and the results from USA ⁽³⁾ showed that (80%) of the stone have calcium oxalate in their composition. In the current study all_the stones have calcium phosphate in their composition.

Most of the stones in the current study were radio-opaque while only one stone was radio-lucent, although that stone was composed of uric acid and calcium phosphate but still it remained radio-lucent, this means that it composed mainly of uric acid while calcium phosphate found in trace amount not enough to make the stone radio-opaque one. This enforces the ideas that calcium phosphate may deposit on already formed stone. Fifty-six percent of the stones in the current study contain uric acid. One national figure was obtained by (Al-Kadi study) showed that uric acid contribute in composition to (40%) of urinary stones in his study in Baghdad, we attribute this high percent of uric acid contribution to stone formation in this study for geographical factor which is the hot dry climate of Najaf City. Fifty-six stones contained uric acid; twenty-four stones of them were from hyper-uricemic patients. The relationship between the congenital anomalies of the urinary system (i.e. Pelvic kidney, the unilateral congenital agenesis of kidney) and the urinary tract infection and stone formation, is a well known, and this study confirm that. Twenty-eight patient's urine culture reveals positive bacterial growth.

CONCLUSION

- 1. The peck age of incidence of urolethiasis is the fourth decade of life and male to female ratio is four to one.
- 2. All stones in the current study composed of calcium phosphate and the percent of the stones that contain uric acid and ammonium is higher than their percent in other studies in Iraq.
- 3. There is a high rate of incidence of renal stone and the urinary congenital anomalies.
- 4. Further work still needed on renal stone to substantiate these observations.

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