

EFFECT OF RENAL STONE FORMATION ON SOME RENAL RELATED PARAMETERS IN KOYA CITY

Layla Kareem Ali

Koya Technical Institutes, Kurdistan Region – Iraq.

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Abstract:

The thirty stone former patients (12 men with 18 women) involved in the current study, were attended the Shaheed Khalid Hospital in Koya city between April to November 2013. The cases diagnosed in the hospital by clinical examination followed by kidney urinary bladder KUB x-ray and ultrasonography. Further more thirty healthy person (15 men with 15 women) were also involved in this study as control group.

The data of a current study revealed the dominant prevalence of the renal stone type both in men and women was for uric acid stone type, and calcium carbonate, calcium phosphate and calcium oxalate represent moderate types, and cysteine stone type represent the lowest type among involved patients. The stone formation was more prevalence in age group 51-60 that represent 27% of the total included formers.

The results showed significant ($p < 0.05$) elevation in serum creatinine, urea and uric acid levels in both sexes stone formers, whereas serum total protein and albumin levels were significantly lower in both men and women stone formers as compared with the levels in normal healthy group. The hematological results showed significantly lower numbers of RBC number and Hb content in both men and women stone formers, whereas, WBC count and platelets count showed higher numbers in both men and women stone formers as compared normal healthy group.

Key words: (Renal stone formers, Hepatorenal parameters, Heamatological parameters)

Introduction

Urolithiasis is the most common urological disease affecting human worldwide and stone formation contributed to genetic and environmental factors (Harpreet Kaur *et al.*, 2012). Stone disease is an increasing and major public health problem with more predominance in men (Memon *et al.*, 2009).

Pathogenesis of urinary stones formation is thought to be multifactorial, the infection of urinary tract is a major factor. Kidney stones may contain various combinations of chemical forms, that occur when salts in the urine precipitate and form solid materials that resulted from a wide variety of metabolic and environmental disturbances (Sharda and Zia, 2006). Urinary stones are typically classified by their chemical composition into calcium-containing, struvite, uric acid, or other compounds (Lieske and Segura, 2004). Stones were predominantly of mixed type, with calcium oxalate as commonest constitute (Qaader *et al.*, 2006).

Creatinine, urea and uric acid are frequently used to assess kidney function, and their elevated serum levels indicate kidney dysfunction (Lawrence *et al.*, 2003). Creatinine is released

into the blood at a constant rate and freely excreted by the kidneys. For this reason, creatinine test is frequently used to assess kidney function its elevation indicate kidney dysfunction (Hamid, 2008).

Urea is one of the major nitrogenous wastes in blood, which are toxic end products of catabolism and they are normally removed from the blood and excreted by kidneys at a rate that balances their rate of production.

Renal disease is one of the major disease states that are associated with elevated plasma uric acid concentration because its filtration and secretion are impaired (Lawrence *et al.*, 2003).

The kidneys maintain the blood volume and regulate the mineral content in the bloodstream. The liver converts nutrients into energy, forms proteins and stores carbohydrates. While these organs can be remarkably resilient in the elimination of toxins, their other functions can be damaged in the process.

Kidneys as the common endocrine organs are responsible for controlling red cell production through erythropoiesis by release of erythropoietin (EPO) hormone, which its deficiency leads to the decrease of RBCs and Hb (Suresh *et al.*, 2012). Renal diseases are

associated with a variety of haemopoietic changes. Anemia parallels the degree of renal impairment and its most important cause is failure of renal erythropoietin secretion. Other factors include chronic blood loss, hemolysis and bone marrow suppression by retained uremic factors (Suresh *et al.*, 2012). The current investigation aimed measurement of the hepatorenal functions tests and hematological parameters in stone formers.

Materials and Methods

This study included (30) patients of renal stone former (18 men with 12 women), who attended the Shaheed Khalid Hospital in Koya city from April to November 2013. The diagnosis of the cases was done in the hospital based on the clinical examination followed by kidney-urinary bladder KUB x-ray, ultrasonography, intravenous urography IVU and urinalysis. Furthermore this study also included 30 healthy (15 men with 15 women) subjects at same ages free of kidney disease signs, they were randomly selected as a healthy group for comparison.

Five ml of venous blood samples were obtained from both patients and healthy group by sterile disposable syringe. After coagulation of the blood, each blood sample was centrifuged for 3 minutes at 4000 rpm to get a clear and cell free serum. The serum was used for biochemical parameters assay.

The colorimetric Elitech Diagnostic kits were used for measurement of renal function test parameters (serum total protein, creatinine, urea,

uric acid, albumin and bilirubin. In this method, 1 ml of serum was added to flexor tube and the concentrations of the parameters were analyzed using automatic chemical analyzer (Benchtop automatic biochemistry analyzer (ELITech) (FLEXOR EL200, ELITech clinical systems), France.

An aliquot of blood was immediately removed and mixed with ethylene diamine tetra acetic acid (EDTA) as an anticoagulant. The blood samples were analyzed for blood parameters using a full automated hematological analyzer according to the manufacturer's protocol. The hematological parameters (WBC, RBC, Hb, Plt, and Hct) were analyzed on the same day a blood samples collection using Coulter Counter.

Statistical analysis

The SPSS (statistical package for social science) (V 20) T- test was used to analyze the data. The P value ($P < 0.05$) was considered to be statistically significant.

Results

The results showed that the prevalence of the uric acid renal stone type more dominant both in men and women and represent 38.09% of stones. The percentage of calcium carbonate, calcium phosphate and calcium oxalate types were 19.04% for each type and the remaining 4.76% was composed of cysteine stone (Table 1).

Table 1: The prevalence of the renal stone types

Type of stones	Cysteine stone	Calcium carbonate	Calcium phosphate	Calcium oxalate	Uric acid
% of Patients	4.76	19.04	19.04	19.04	38.09

Results showed that renal stone formations are more prevalence in age groups 51-60 which represent 27% of the total stone formers (Table 2).

Table 2: The prevalence of the renal stone in relation to age groups

Age groups	21-30	31-40	41-50	51-60	61-70	71-80	81-90
% of patients	3.57	10.71	21.42	27	23	14.28	3.57

The results showed significant elevation in serum creatinine level 1.137 ± 0.143 , 1.185 ± 0.184 in both men and women stone formers respectively as compared to normal men and women subjects 0.751 ± 0.047 , 0.630 ± 0.057 respectively, also serum urea level showed significant elevation in both men and women 35.08 ± 1.415 , 34.41 ± 1.881 respectively, as compared to its level in normal men and women subjects 21.21 ± 1.419 , 20.5 ± 2.121 respectively. The level of the uric acid was showed significant elevation in both men and women stone formers 5.528 ± 0.165 , 5.191 ± 0.211 respectively, as compared to its level in normal men and women subjects 3.33 ± 0.21 , 3.1 ± 0.271 respectively. Whereas both men and

women stone former showed significant lower serum total protein 6.725 ± 0.172 , 6.626 ± 0.166 respectively, as compared to their levels in normal men and women subjects 7.422 ± 0.141 , 7.283 ± 0.148 respectively. The level of the albumin was showed significant lower in men and women stone formers 4.250 ± 0.259 , 4.262 ± 0.208 respectively, as compared to their levels in normal men and women subjects 5.021 ± 0.103 , 4.868 ± 0.142 respectively. The level of bilirubin in men and women stone formers showed non-significant lowering 0.725 ± 0.138 , 0.403 ± 0.045 respectively, as compared to their levels in normal men and women subjects 0.803 ± 0.104 , 0.495 ± 0.046 respectively (Tables 3 & 4).

Table 3: Renal related parameters in renal stone former men compared to healthy men

Parameters	Groups	Controls M±S.E.	Patients M±S.E.	P value
Total protein (gm/dl)		7.422±0.141	6.725±0.172	0.005
Albumin (mg/dl)		5.021±0.103	4.250±0.259	0.012
Bilirubin (mg/dl)		0.803±0.104	0.725±0.138	NS
Creatinine (mg/dl)		0.751±0.047	1.137±0.143	0.029
Urea (mg/dl)		21.21 ± 1.419	35.08 ± 1.415*	0.004
Uric acid (mg/dl)		3.33 ± 0.21	5.528 ± 0.165*	0.0011

NS= non-significant

Table 4: Renal related parameters in renal stone former women compared to healthy women

Parameters	Groups	Controls M±S.E.	Patients M±S.E.	P value
Total protein (gm/dl)		7.283±0.148	6.626±0.166	0.008
Albumin (mg/dl)		4.868±0.142	4.262±0.208	0.030
Bilirubin (mg/dl)		0.495±0.046	0.403±0.045	NS
Creatinine (mg/dl)		0.630±0.057	1.185±0.184	0.014
Urea (mg/dl)		20.5 ± 2.121	34.41 ± 1.881*	0.005
Uric acid (mg/dl)		3.1 ± 0.271	5.191 ± 0.211*	0.002

NS= non-significant

The results showed significantly lower numbers of RBC and Hb content in both men and women stone formers, as compared with normal subjects, whereas WBC and platelets showed higher numbers in both men and women stone formers, as compared with normal subjects (Tables 5 and 6).

Table 5: Hematological parameters in renal stone former men

Parameters	Groups	Controls M±S.E.	Patients M±S.E.	P value
RBC x 10 ⁶ cell/mm ³		5.008±0.096	4.410±0.219	0.020
WBC cell/mm ³		6.876±0.250	8.525±0.615	0.021
Hb (gm/dl)		14.79±0.231	13.76±0.439	0.039
Platelet x 10 ³ cell/mm ³		227.3±11.10	273.8±14.73	0.019

Table 6: Hematological parameters in renal stone former women

Groups	Controls M±S.E.	Patients M±S.E.	P value
Parameters			
RBCx10 ⁶ cell/mm ³	4.778±0.154	3.508±0.190	0.0001
WBC cell/mm ³	6.891±0.499	8.446±0.433	0.032
Hb (gm/dl)	12.66±0.328	11.08±0.310	0.003
Platelet x 10 ³ cell/mm ³	207.5±10.61	243.4±11.75	0.035

Discussion

The data of the current study showed that the prevalence of the renal stone types both in men and women are higher for uric acid stone type than calcium carbonate calcium phosphate and calcium oxalate types. This results are in agree with previous results reported that approximately 80% of stones are composed of calcium, 10% of struvite, 9% of uric acid, and the remaining 1% are composed of cystine (Fredric *et al.*, 2005). In another study reported that calcium oxalate monohydrate is the most frequent stone component (Alaya *et al.*, 2011). In anther study results indicated that calcium stone predominated with male predominance of the most prevailing in Egypt (Al-Ali *et al.*, 2002).

The results showed significant elevation of serum creatinine, urea and uric acid levels in both men and women stone formers. Elevation of serum creatinine in the current study confirms the results of (Kasem (2004), who explained that this increase in creatinine level may be due to reduced renal function and increased acidic medium in renal tubules and impaired metabolism as well as kidney complications lead to higher creatinine. Recently, another study revealed a significant increase in serum levels of urea, creatinine, and uric acid and a significant decrease in total protein level in kidney stone former patients (Kaniaw, 2013). Kidney stone cause dysfunction of the kidney as a result of cell injuries and increasing the accumulation of nitrogenous waste products in the blood (Worcester *et al.*, 2006). Elevation of urea as a result of the damage of some renal nephrons units leads to a defect in urea filtration and excretion that reported in previous study (Hayder Bawa, 2008). High serum uric acid level might lead to stone formation and a decreases in the solubility of calcium oxalate salts in urine (Mehdi, 2008).

In the current study, serum total protein and albumin levels showed significant lowering levels in both men and women stone formers. These results are in agreement with another study in Sulaimani governorate (Kaniaw, 2013), she reported lower level of serum total protein and albumin levels in stone former patients cause of kidney dysfunction as a result of stone formation and kidney tissue damage.

The results showed significantly lowering in the numbers of RBC and Hb content in both men and women stone formers, whereas, WBC and platelets showed higher numbers in both men and women stone formers. This may be caused by impaired erythropoietin production and other factors which suppress marrow erythropoiesis and shortened red cell survival (Suresh *et al.*, 2012). In the absence of EPO, DNA cleavage is rapid and leads to cell death (Suresh *et al.*, 2012). RBC survival is decreased in uremic patient's in proportion to the blood urea nitrogen concentration and, it improves significantly after intensive hemodialysis. Uremic plasma increases the expression of phosphatidylserine on the outer cell surface in red blood cells. This enhances the recognition of damaged red blood cells by macrophage, leading to their subsequent destruction and decreased survival. (Michael *et al.*, 2004). Red blood cells survival is presumed to be a toxic substance normally excreted or metabolized by the kidneys, one such substance is guanidine and its derivatives which appear to be a subset of the many retained metabolites, adversely affect erythrocyte survival (Robert and means, 2004).

In conclusion renal stone patients have lower hematological indices, due to impaired production of erythropoietin, and other factors like increase haemolysis, suppression of bone marrow erythropoiesis, hematuria and gastrointestinal blood loss. The concentration of serum creatinine shows negative correlation with all the

haematological parameters. And the degree of changes depends on the severity of renal failure.

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پوختە

ئەم تووژینەوہیە سیی نەخۆشی بەردی گۆرچیلە لە خۆ کرت (12 لە رەگەزی نیر و 18 لە رەگەزی می) کە نشتەرگەریان بۆ ئەنجامرا لە نەخۆشخانە شہید خالد لە شاری کۆیە ئەنجام درا وە لە مانگی نیسان تا کو مانگی کانونی یەکەمی 2013 دا ، نەخۆشییەکانیان لە ھەمان خەستەخانە دیاری کرا لە رپی میژووی نەخۆشەکە، پشکنینی پزیشکی وەك تیشکی KUB، تیشکی X-ray، Ultrasonography. ھەر وەھا بۆ ئەم تووژینەوہیە (30) کەسی ئاسایی و ساغ وەرگیرا (15 لە رەگەزی نیر و 15 لە رەگەزی می) وەك کۆنترۆل کە بەدەر بوون لە ھەموو نیشانەکانی نەخۆشیەکانی گۆرچیلە و چەورییەکان و شەکرەو پەستانی خوین و دل.

ئەنجامەکانی تووژینەوہیە کە پیشانی دا کە زۆرینە بەردی گۆرچیلە لە ئەو نەخۆشەکان لە چۆری بەردی ترشی یوریکە و چۆرەکانی کالسیوم کاربۆنیت و کالسیەم فوسفیت و کالسیوم ئوکسالیت بە ریزەیکی مامناوەندین و چۆری بەردی سیستین بەکەمترین ریزەدا یە . و بەردی گۆرچیلە زۆرتر لەو کەسانە بڵاوە کە تەمەنیان لە نیوان (60-50) سالی دایە .

لە ئەنجامەکانی ئەم تووژینەوہیە بەرزبونەوہیەکی بەرچاوە لە ئاستەکانی کریاتینین و یوریا و ترشی یوریک بۆ ھەردوو رەگەزی نیر و می دەرکەوت ، لە گەل نزمونەوہیەکی بەرچاوە لە ئاستی پرۆتینی گشتی و البومین بۆ ھەردوو رەگەزی نیر و می لە نەخۆشەکان بە ھەرورد لە گەل کەسە ئاساییەکان لە ھەردوو رەگەز .

دەرئەنجامەکان پیشانی دا کە دابەزینی بەرچاوە لە بری ھیموگلوبین و لە ژمارەیی خۆرکەیی سوری خوینی لە ھەر دوو رەگەزی نیر و می ، لە کاتی کدا بەرزبونەوہیەکی بەرچاوە لە ژمارەیی خۆرکەیی سوری خوینی WBC و پەرەکانی خوین بۆ ھەردوو رەگەزی نیر و می دیترا لە نەخۆشەکان بە ھەرورد لە گەل کەسانی ساغ .

الخلاصة

اشتملت الدراسة هذه ثلاثون مريضاً لحصاة الكلى اثنا عشر من الذكور وثمانية عشر من الإناث من المراتدين إلى مستشفى الشهيد خالد في مدينة كويّة للفترة من نيسان إلى كانون الثاني لعام ٢٠١٣ . شخص الحالات المرضية في المستشفى اعلاہ بالاعتماد على الفحوصات السريرية وتصوير الكلى بالأشعة السينية و تم بالفحص بالناظور . وكذلك اشتملت الدراسة على ثلاثون شخصاً من الاصحاء من كلا الجنسين (خمسة عشر من الذكور وخمسة عشر من الإناث) اعتمدت كمجموعة ضابطة .

اظهرت نتائج الدراسة الحالية ان حصاة الكلى من نوع حامض اليوريك كانت اعلى نسبة في المرضى وتليها الحصى من الانواع كاربونات الكالسيوم و فوسفات الكالسيوم و اوكسالات الكالسيوم في حين شكلت حصى الكلى من نوع السيستين اقل نسبة ، مع ارتفاع معدل الاصابة في الفئة العمرية (60-51) سنة .

اظهرت النتائج ارتفاعاً معنوياً في مستويات الكرياتين و اليوريا و حامض اليوريك في مصل الدم في كلا الجنسين ، في مستويات البروتين الكلي و الالبومين اظهرت خفضاً معنوياً في كى الجنسين مقارنة مع مستوياتها في مصل دم الاصحاء في كلا الجنسين . اظهرت نتائج قياس المتغيرات الدموية خفضاً معنوياً في كمية الهيموغلوبين وعدد كريات الدم الحمر و ارتفاعاً معنوياً في اعداد خلايا الدم البيض و اعداد صفيحات الدم في المرضى من كلا الجنسين مقارنة مع الاصحاء في لكلا الجنسين .