LIPID PROFILES AND LIVER FUNCTIONS TESTS IN KIDNEY STONE FORMERS

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ABSTRACT

This study included 106 stone former patients (60 males with 46 females), who attended the Teaching Hospital in Sulaimani Governorate between April to June 2012. The diagnosis of the cases were done in the hospital, based on history, clinical examination followed by Kidney x-ray, ultrasonography, and urinalysis, also the study included 28 healthy (14 male with 14 female) person as control.The investigations included measurement of the liver function tests and renal functions tests beside the lipid profile in stone formers .

Automatic chemical analyzer (Benchtop automatic biochemistry analyzer,ELITech) used for measuring total serum glucose , serum cholesterol, triglycerides (TG), cholesterol-HDL, serum LDL, serum VLDLserum albumin, alkaline phosphatase (ALP), Aspartate transferase (AST), Alanine aminotransferase (ALT), gamma glutamyltransferase (GGT), serum bilirubin and serum blirubin.

The results demonstrated significant elevation in the levels of the serum cholesterol, triglyceride, LDL-cholesterol , VLDL- cholesterol, glucose, ALP, AST, GGT and LDH concentrations in renal stone former patients of both sex groups, with non significant lowering of the HDL- cholesterol in renal stone former patients.while albumin is lowered significantly with non significant differences in the serum ALT and bilirubin concentrations between renal stone former patients and controls groups. In conclusion, the results showed physiological relations of lipid metabolism and liver function with state of kidney dysfunction.

Keywords: *Renal Stone Formers, Lipid Profiles, Liver function test.*

INTRODUCTION

Kidney stone disease or as nephrolithiasis is a common problem defined as aggregate of crystals mixed with protein matrices, which are formed in the kidney or in the ureter, may cause obstruction of urine flow in the renal collecting system, ureter or urethra local erosion of kidney tissue (Tiselius *et al*., 2002). In this condition, the kidneys fail to remove metabolicend products from the blood and regulate the fluid, electrolyte,and pH balance of extracellular fluids. Renal stone disease is an increasing and major public health problem, urinary stones can cause two problems, when it moves or when it grows to disrupt renal functions and damage occurs, therefore a history of kidney stones may be a risk factor for chronic kidney disease (CKD), as even moderate renal dysfunction is associated with increased long-term cardiovascular morbidity (Weiner *et al*.,2004).

With respect to the lipid profile in stone formers, Lipid abnormalities are common in patients with renal disease, probably contributing to the high incidence of cardiovascular diseases in this population.Hypertriglyceridemia is the most common plasma lipid abnormality in patients with renal failure, coexisting with cholesterol levels within the normal range.In a study triglyceride levels were increased in the plasma and in erythrocyte membranes of CRF patients compared to healthy subjects,whereas plasma polyunsaturared fatty acids decreased andthe levels of the HDL-cholesterol and LDLcholesterol were similar to those of healthy controls (Nelva *et al*., 2001).

Because the liver has many crucial roles in the maintenance of a healthy body, any level of liver dysfunction can be problematic. The most commonly used serum liverfunction tests include serum ALT and AST activities that reflecthepatocellular injury andserum ALP and gamma glutamyltransferase (GGT)that reflect impaired bile excretion and bileflow and serum albumin that represent the synthetic functionof the liver.Previous study showed that , in calcium oxalate stone forming rats a significant increase in liver glycollate oxidase (GAO) activity and moderate elevation in LDH activity were observed, also lowering of ALT and AST activities were observed, whereas a reduction in the inorganic pyrophosphatase and aminotransferases were observed (Subha and Varalakshmi , 1992). This study was aimed the investigation of the changes in liver function and lipid metabolism in kidney stone formers.

Materials and Methods
Patients

The current study included (106) patients of renal stone former (60 males with 46 females), who attended the Teaching Hospital in Sulaimani Governorate between April to June 2012. The diagnosis of the cases were done in the hospital, based on history, clinical examination followed by KUB x-ray, ultrasonography, and urinalysis, farther more 28 healthy (14 male with 14 female) healthy person at same ages, they were randomly selected as control group. The patients were grouped according to the age and sex.

Collection of blood samples

Five mL of venous blood samples was withdrawn by sterile disposable syringe from an median cubical vein, and transferred to vacationer tube without ante coagulant. After coagulation of the blood, the blood sample was centrifuged for 10 minutes at 4000 rpm to get a clear and cell free serum.The serum samples were isolated with proper labeling, and used for biochemical measurements.

Biochemical measurements

The enzymatic colorimetric Elitech Diagnostic kits (France), were used for measuringtotal serum glucose , serum cholesterol, TG, cholesterol-HDL, serum albumin, ALP, AST, ALT, serum bilirubin, total protein, serum urea and creatinine , 1 ml of serum added to Flexor tube and the concentrations were analyzed using automatic chemical analyzer Bench top automatic biochemistry analyzer (ELITech) (FLEXOR EL200, ELITech clinical systems, France).Whereas,cholesterol-LDLwas

determined by applying the formula(LDL (mg/dl)= Total cholesterol – HDL-cholesterol – TG/5), and the VLDL-C level was determined by derivation from the formulas (VLDL-cholesterol(mg/dl) =Triglycerides/5).

GGT, was measured using Biolabo kit, France), in which 1 ml of reagent was mixed with 0.5 ml of the serum,the initial absorbance after 30 seconds was measured at 405 nm every minutes during 3 minutes using spectrophotometer (Angstrom Advanced Inc. Model UV 1600/1800 UV/VIS- Scanning Spectrophotometer Braintree, Massachusetts, USA). The absorbance change per minute mean abs/min) was calculated using this formula (IU/L = (mean abs./min.) x 2121.

Lactate dehydrogenase (LDH), was measured using (Spectrum /Egypt

Kit), in which 1 ml of reagent was mixed with 0.02 ml of the serum, the initial absorbance after 30 seconds was measured at 340 nm every minutes during 3 minutes using Uv/Vis spectrophotometer. The absorbance change per minute (mean abs/min) was calculated using the formula (IU/L = (mean abs./min.) x 8095.

The result of this study are represented as mean ± stander error (M±S.E.) and statistical analysis was performed by using statistically available software SPSS for comparisons parameters between groups, a two sample T-test was performed for evaluation the correlation between parameters the person correlation method was used $p < 0.05$ considered statistically significant.

RESULTS

Lipid profiles

The results of this study demonstrated significant elevation($P < 0.05$) in the levels of the serum cholesterol, TG, LDL- cholesterol and VLDL- cholesterol, with no significant lowering of the HDL- cholesterol in renal stone former male patients when compared with their levels in the control healthy subjects at studied age groups (Table-1).

Table (1) Serum lipid profiles in man with renal stone former patients.

Serum lipid profile	Age group(year)	Controlmean ± S.E.	Patientmean ± S.E.
Cholesterol	1 – 40	107.80 ± 3.382	155.74 ± 5.052*
	41 – 80	147.44 ± 5.455	193.09 ± 6.842*
Triglyceride	1 – 40	55.40 ± 6.210	155.24 ± 7.367*
	41 – 80	73.22 ± 4.536	184.05 ± 14.270*
HDL	1 – 40	39.800 ± 1.4629	35.618 ± 0.7984
	41 – 80	40.578 ± 0.9472	37.932 ± 1.1668
LDL	1 – 40	56.920 ± 5.3481	89.071 ± 5.2103*
	41 – 80	92.222 ± 5.0574	118.314 ± 7.4960*
VLDL	1 – 40	11.080 ± 1.2419	31.047± 1.4735*
	41 – 80	14.644 ± 0.9072	36.809 2.8540*

*Mean significant at ($P < 0.05$)

In female patients significant elevation (P< 0.05) in serum cholesterol, TG, LDL- cholesterol and VLDL concentrations of renal stone former patients was observed as compared with those of the control group in both different age groups,

while HDL- cholesterol was non significantly lowered (P< 0.05) in renal stone former patients as compared with those of the control group in both different age groups as shown in the (Table -2).

Table (2) :Serum lipid profiles in woman with renal stone former .

Serum lipid profile	Age group (year)	Control mean ± S.E.	Patient mean ± S.E.
Cholesterol	1 – 40	106.5 ± 3.519	149.56 ± 8.102*
	41 – 80	139.5 ± 2.5	190.1 ± 4.792*
Triglyceride	1 – 40	59.33 ± 4.787	138.2 ±12.726*
	41 – 80	94.0 ± 5.0	179.05 ± 6.322*
HDL	1 – 40	38.66 ± 2.76	34.27 ± 1.24
	41 – 80	39.05 ± 2.05	36.46 ± 0.97
LDL	1 – 40	55.96 ± 4.068	87.52 ± 7.22*
	41 – 80	81.65 ± 5.55	117.81 ± 4.8*
VLDL	1 – 40	11.86 ± 0.95	27.64 ± 2.54*
	41 – 80	18.8 ± 1.0	35.81 ± 1.26*

*Mean significant at (P< 0.05)

Liver function tests

The result of the current study showed significant elevation (P< 0.05) in serum glucose, ALP, AST, GGT, LDH concentrations in renal stone former patients when compared with concentrations in the control group of both sex groups, while albumin is lowered significantly (

P< 0.05) in renal stone former patients as compared with control group in both sex groups. Farther more results showed non significant differences (P< 0.05) in the serum ALT and bilirubin concentrations between renal stone former patients and controls groups as shown in (Table -3).

Table (3): Liver function test parameters in renal stone former patients.

Parameter	Sex group	Controlmean ± S.E.	Patientsmean ± S.E.
Glucose	Male	83.71 ± 2.31	106.97 ± 2.78 *
	Female	95.25 ± 2.25	111.83 ± 4.771 *
Albumin	Male	4.19 ± 0.064	3.65 ± 0.112 *
	Female	4.15 ± 0.073	3.7375 ± 0.12 *
ALP	Male	134.43 ± 9.96	203.85 ± 7.35 *
	Female	132.25 ± 8.83	202.46 ± 8.97 *
ALT	Male	18.64 ± 0.959	22.25 ± 2.24
	Female	18.25 ± 2.336	21.72 ± 1.78
AST	Male	20.07 ± 1.361	26.52 ±0.97 *
	Female	16.88 ± 1.60	23.0 ±1.201 *
Bilirubin	Male	0.71 ± 0.12	0.767 ± 0.048
	Female	0.57 ± 0.067	0.51 ± 0.033
GGT	Male	5.106 ±0.420	18.024 ± 1.313 *
	Female	5.21 ± 0.59	15.196 ± 1.574 *
LDH	Male	149.83 ± 2.035	328.52 ± 2.02 *
	Female	148.07 ± 6.98	336.14 ± 2.520 *

Discussion

Urolithiasis may result in loss of function by two general mechanisms, the first mechanism include episodic events, such as urethral obstruction during stone passage, or because of procedures needed for stone removal, and their attendant complications, and the second mechanism include continuous events, as a result of a disordered physiology that underlies stone formation (Gambaro, *et al.*, 2001).

Lipid profiles

The results of this study demonstrated significant elevation in serum Cholesterol, TG, LDL and VLDL concentrations, while HDL was non significantly lowered in renal stone former patients of both sexes.The results of the current investigation is in confirm with those mentioned by (Attman and Alaupovic, 1991). Previous study revealed that hypertriglyceridemia is the most common plasma lipid abnormality in patients with renal failure, coexisting with cholesterol levels within the normal range (Nelva, 2001).

Lipid abnormalities are common in patients with renal disease, probably contributing to the high incidence of cardiovascular diseases in this population. In previous study comparing lipid profiles in renal stone and healthy persons, the results revealed increasing in the TG levelin renal stone formers,whereas total cholesterol, HDL and LDL levels were not changed (Nelva, *et al.,* 2001). Recentlyit has been observed that total cholesterol and TG levels were significantly higher in stone formers as compared with the control group; this elevated hypercholesterolemia, and hyperlipidemia, which are leading components of metabolic syndrome, may be associated with different types of urinary stone formation(Inci,2012). Mean whileWeam, (2008) stated significant elevation in serum triglycerides, cholesterol , LDL, VLDL concentration in renal failure patients and non significant lowering in the serum HDL and albumin concentration.Serum TG concentration is frequently elevated inpatients with critical renal failure, this elevation is accompanied by increasedplasma concentration and impaired clearance of VLDL, which isassociated with the accumulation of atherogenic VLDL remnants.Fasting hypertriglyceridemia is a wellknown abnormality in chronic renal failure, (Vaziri and Liang, 1996). It has been found that down regulation of skeletal muscle and adipose tissue ,hepatic lipase, and VLDL receptor iscollectively responsible for hypertriglyceridemia, impairedclearance, and elevated plasma levels of VLDL andchylomicron remnants (Vaziri, 2003).Serum HDL concentration in renal failure patients is found tobe reduced, because chronic renal failure results inprofound dys-regulation of several key enzymes and receptorsinvolved in the metabolism of lipoproteins, particularly those of HDL. Peuchant *et al.*, (1998), observed higher cholesterol levels in renal disease patients than in normal healthy persons.

Liver function tests

The results of the current study showed significant elevation in serum glucose, ALP, AST, GGT, LDH concentrations in renal stone former patients, while albumin was lowered significantly, on the other, the results showed non significant differences in the serum ALT and bilirubin concentrations in both renal stone formers and healthy persons.In other study, it has been found that calcium oxalate stone formers have low ALT and AST activity compared to healthy individuals. As ALT and AST convert alanine and aspartic acid respectively into glutamic acid, a possible mechanism of retardation of kidney stone formation involving enzyme steps via glutamic acid creation in situ is suggested (Azoury, *et al.,* 1982).

References

Attman P.O. andAlaupovic P. , (1991). Lipid abnormalities in chronic renal insufficiency. *Kidney Int , 39, S16-S23.*

Azoury R., Sarig S., Garti N. and PerlbergS. ,(1982).Retardation of calcium oxalate precipitation by glutamic-oxalacetic-transaminase activity,*Urological Research, 10(4), 169-172.*

Gambaro G., Favaro S. and D'Angelo A., (2001).Risk for renal failure in nephrolithiasis. *Am J Kidney Dis , 37, 233-243 .*

Inci, M., Demirtas A., Sarli B., Akinsal, E., Baydilli, N., (2012).Association between Body Mass Index, Lipid Profiles, and Types of Urinary Stones.*J.Renal Failure, 34 (9), 1140-1143.*

Nelva T. de Gomezdumi, Anam G., Luis A. T., Clemente R., (2001) . Lipid Abnormalities in Chronic renal Failure Patients Undergoing Hemodialysis ,*MEDICINA,61(2), 142-146.*

Peuchant E., Salles C., Vallot C., Wone C., Jensen R., (1998).Increase of erythrocyte resistance to hemolysis and modification of membrane lipids induced by hemodialysis. *ClinChimActa, 178, 271-82.*

Subha K. and Varalakshmi P. , (1992). Enzymatic changes in liver in Calcium oxalate stone forming rats treated with sodium pentosanpolysulphate .*Indian Journal of Clinical Biochemistry*, (7)*, 115-120.*

Tiselius, H. G. et al. (2002). Stone disease: diagnosis and medical management. *European Urology 76, 1–9.*

Vaziri N.D., Sato T., and Liang K. ,(2003).Molecular mechanism of altered cholesterol metabolism in focal glomerulosclerosis.*Kidney Int 63, 1756–1763.*

Vaziri N. D. and Liang K.(1996). Downregulation of hepatic LDL receptor expression in experimental nephrosis.*Kidney Int 50, 887–893.*

Weam A. K .,(2008). Serum Lipid Profiles in Renal Failure Pateints , MSC thesis, College of Medicine, University of Kufa.

Weiner D., Tighiouart H., Amin M., Stark P., Maclead B., Griffith J., Salem D.N., Levey A.S. and Sarnak M.J., (2004).Kidney disease as a risk factor for recurrent cardiovascular disease and mortality,*J Am SocNephrol 15, 1307-1315.*

الخلاصة

اشتملت الدراسة هذه مائة وستة مريضا من المصابين بحصى الكلى (ستون منهم ذكرا وست واربعون انثى)، من المراجعين للمشفى التعليمي في مدينة السليمانية للفترة بين نيسان الى ايلول عام 2012. شخصت الحالات المرضية في المشفى اعتمادا الفحوصات السريرية والاشعة السينية للكلى وفحص السونار وتحليل الادرار. وكذلك تضمنت الدراسة هذه على 48 شخصا سليما (اربعة عشر منهم ذكرا و اربعة عشر انثى) اعتمدت كمجموعة ضابطة.

بحثت في هذه الدراسة قياس مستويا ت انزيمات اختبار وظائف الكلى ومستويات الدهون المصلية في المصابين بحصى الكلى. استخدم جهاز التحليل الكيمياوي الالي (Benchtop automatic biochemistry analyzer, ELITech) لقياس مستويا سكر الكلوكوز والكوليسترول والكليسيريدات الثلاثية والبروتين الدهني عالي الكثافة والبروتين الدهني الواطى الكثافة والبروتين الدهني الواطى الكثافة جدا وانزيم الفوسفاتيز القاعدي وانزيم اسبارتيت ترانسفيريز و الانين امينوترانسفيريزوكاما كلوتامبل ترانسفيريز والبليروبين في مصل الدم.

اظهرت النتائج زيادة معنوية في مستويات الكوليسترول والكليسيريدات الثلاثية والبروتين الدهني الواطى الكثافة والبروتين الدهني الؤاطى الكثافة جدا ومستوى سكر الكلوكوز وانزيم الفوسفاتيز القاعدي وانزيم اسبارتيت ترانسفيريز و انزيمكاما كلوتاميل ترانسفيريزوانزيم اللاكتيت ديهايدروجينيز في مصل دم المصابين بحصاة الكلى في كلا الجنسين ، وخفض غير معنوي في مستوى البروتين الدهني العالي الكثافة ، في حين اظهرت النتائج خفضا معنويا في مستوى الالبومين المصلي وعدم تغير معنوي في مستويات انزيم الانين ترانسفيريز والبليروبين في مصل دم المصابين بحصاة الكلى كلا الجنسين . يستنتج من نتائج هذه الدراسة وجود علاقات فسلجية لائض الدهون و وظائف الكبد بحالة تكون الحصى في الكلى.

پوخته

ئەم تویژینەوە 106 نەخۆشی بەردی گۆرچیلەی لە خو کرد لە هەردوو رەگەز (60 نێر و 46 مێ) لە دخوشخانەی فیرکردنی سلێمانی لە وانەی سەردانی نەخوسخانەکەیان کردوە لە نیوان مانگی نیسان و ایلول سالی 2012. و دەستنیشان کردنی نەخۆشیەکە پشت بەست بۆ بە نیشانەکانی نەخۆشی و تیشکی سینی و اقیکردنەوەی مێز . وەهەر وەها ئەم تویژینەوە 28 تاکی تەندروست لە هەر دوو رەگەز لە هەمان تەمەن لو خۆ کرد وك گرۆپی کونترول . لە ئەم تویژینەوە پارامێتەرەکانی پەیوەندی دار بە فەرمانەکانی جەرگ و ئاستی پارامێتەرەکانی چەوری وەرگیرا بە بەکار هینانی پیوەری ئوتوماتیکی کیمیاوی بۆ پیوانی رێژەی گشتی کۆلیسترۆڵ و و ترایگلیسیراید رێژەی شەکری کلۆکوز رێژەی گشتی (HDL, LDL)، (VLDL and والبۆمین و بلیرۆبین وئەنزیمه کانی (ALP,AST,GGT) لە زرداوی خوێن.

ئەنجامەکانی لێکۆڵینەوەکە بەرزبوونەوەیەکی بەرچاوی دەرخست لە رێژەی گشتی کۆلیسترۆڵی خوێن و رێژەی گشتی و ترایگلیسیریدات بە بەراورد لەگەڵ کۆنترۆڵدا و (LDL, VLDL) وشەکریکلۆکوز وئاستی ئەنزیمەکانی (ALP,AST,ALT,GGT, LDH) لە زەرداوی خوێنی تۆشبۆەکان بە بەردی گۆرچیله بەراورد بە تاکه ساخەکان ،له کاتیك دەرنجامەکان پیشانیان دا کە وا دابەزینیك هەبووه له ئاستەکانی البۆمین له زەرداوی خوێن وئەگۆرانیك لە ئاستەکانی بلیروبین وئەنزیمی (ALT)له زەرداوی خوینی تۆشبۆەکان بە بەردی گۆرچیله بەراورد بە تاکه ساخەکان.