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The Study of Some Biochemical Parameters Related To Renal Stone.

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ABSTRACT

The research is carried out to investigate the relation between the levels of some parameters and the formation of a renal stone, where the patients were suffering from painful urination, bloody urine and feeling a sharp pain in the back or lower abdomen etc. , and these are the primary diagnostic factors for renal stones cases. By contrasting the serum results we gained from patients to the control, found some significant increment in the values of blood sugar (121.42 mg\dl in men, 138.61mg\dl in women). Serum Urea (136.82mg\dl in men, 121mg\dl in women). Serum Uric Acid (4.16mg\dl in men, 5.71mg\dl in women). Serum Creatinine (1. 96mg\dl in men, 1.67mg\dl in women). Also found a significant increase in the values of blood pH and serum electrolytes (serum calcium, sodium & phosphate) in both patients' genders. While there was a significant decrease in the values of serum Potassium in the in males and females respectively.

Keywords: renal stones, serum electrolytes, General Urine examination, blood pH.

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INTRODUCTION

The urinary tract is the body's drainage system for removing wastes and extra water.

A kidney stone is a piece of materials that form as a result of urine super saturation with substances normally found in urine and that increases the probability of salt crystals formation which is the basis for kidney stones [1].

Renal stone diseases are disorders resulting from one or more of epidemiological, biochemical and genetic factors. The disease is considered as one of the major causes of chronic kidney diseases and chronic renal failure [2].

The stone has different shapes and sizes (it may be very small or as large as the orange size) [3].

There are four types of renal stones which are:

1- Calcium stones : they are the most common type of kidney stone and have two major forms:

- Calcium oxalate, which may be caused by high calcium and oxalate serum levels.
- Calcium phosphate, which are caused by the combination of high urine calcium and alkaline urine medium.

2- Uric Acid stones: these are formed in acidic urine.
3- Struvite stones (magnesium ammonium phosphate) : this is the infectious type of kidney stones.
4- Cystine stones : (genetic disorder) they form as a result of leakage of cystine (an amino acid that does not dissolve well) through the kidneys to the urine leading to crystal accumulation [1].

Researchers found that increased dietary calcium reduces the risk of stone formation by binding to digested oxalate preventing it's absorption to blood and then to urine unlike the supplemental calcium[4]. Increased urinary calcium excretion in combination with high dietary sodium may increase the risk of kidney stone formation [5].

METHODS AND MATERIAL

The samples collected as serum and urine from both suspected and healthy adult persons attend Al-Sadr hospital in Najaf district/Iraq. The specimens were centrifuged then incubated to be analyzed.

General Urine Examination: the sediment was investigated for the presence of any abnormal contents as: RBC's , pus , crystals and others.

Blood biochemical tests:

Serum Uric Acid: measured it's concentration according to [Barhan and Trinder Analyst method [6].
Serum Urea: have been measured it's concentration according to[Clinical Guide to laboratory method [7].
Serum Creatinine: have been measured it's concentration according to D.Labbe et al., Ann. Biol. Clin. method [8].
Glucose: we determined it's concentration of blood sugar according to the colorimetric method of Trinder, P.Ann. Clin. Biochem. [9].
Sodium: the ions are precipitated with Mg-uranyl acetate, the remaining uranyl ions form a yellow-brown complex the concentration of which is proportional to the sodium present [10].
Potassium: we made potassium ions react with sodium tetraphenylboron to produce turbid suspension of potassium tetraphenylboron. The measurement of the turbidity is proportional to the amount of potassium present [11].
Calcium: Calcium with o-cresolphtaleine yields a red colored complex, the intensity of which is proportional to the concentration of calcium [12].
Phosphorus: The organic Phosphorus forms a colored complex when treated with Ammonium molybdate which is reduced by hydrowylamine to molybdenum bleu [13].

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RESULTS

The demographic study for BMI (Body Mass Index), age and divided into groups as in Table1.

Table 1 : The demographic study

Cases	Number	BMI	Age (Year)	Groups
Control [M]	26	25.5*	37	A
Control [F]	24	24.6**	31	B
Patient [M]	33	28±2	58	C
Patient [F]	18	27±3	54	D

*means group A significant decrease from groups C and D.
** means group B significant decrease from groups C and D.
P-value < 0.05.

The results of urine examination (crystals, pus cells and red blood cells RBC's) in Table 2.

Table 2: The results of the General Urine Examination

Microscopic Examination	Group A	Group B	Group C	Group D
Calcium Oxalate crystal (HPF)	1±1*	1±1**	15±13	13±13
Uric Acid crystal (HPF)	0*	0**	12±6	16±11
Amorphous urate (HPF)	6±4	6±4	7±6	7±6
RBC (Cell/HPF)	2±1*	2±1**	13±10	15±14
Pus (Cell/HPF)	3±1*	3±1**	24±19	14±12

*means group A significant lowering from groups C and D.
**means group B significant lowering from group C and D.
The P-value < 0.05.

The biochemical parameters of patients and healthy blood in Table 3.

Table 3: The results of serum parameters analysis

Biochemical Parameters	Group A	Group B	Group C	Group D
Fasting Blood sugar (mg/dl)	79.58±12.58*	83±10.19**	121.42±43.37	138.61±58.41
Blood urea (mg/dl)	30.42±6.57*	27.5±5.82**	136.82±75.18	121±76.81
S. Creatinine (mg/dl)	0.83±0.23*	0.64±0.17**	1. 96±0.71	1.67±0.68
S. Uric acid (mg/dl)	4.22±1.04*	4.16±1.06**	6.27±2.9	5.71±2.22
S. Sodium (mg/dl)	142.66±7.68*	145.47±6.74**	150.03±9.79	150.78±6.89
S. Potassium (mg/dl)	4.49±0.77*a	4.2±0.78*a	4.07±0.76	3.67±0.73
S. Phosphate (mg/dl)	3.48±1.19	3.39±1.16	3.73±0.79	3.79±0.86
Total serum calcium (mg/dl)	9.14±0.74*	9.65±0.48**	9.64±0.53	9.24±0.54
Blood pH	7.4±0.04*	7.39±0.04**	7.51±0.18	7.5±0.17

* It means group A significant lowering from groups C and D.
**It means group B significant lowering from groups C and D. *a It means group A and B significant increase from groups D.
The P-value < 0.05.

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DISCUSSION

In Table 1 there was no significant difference between patients' BMI results. In contrast, we found significant increase in group C and D compared with group A and D. This may be cause to incidence of kidney stones formation in obese individuals that lack exercises.

Also in the age factor, there was a significant differ between (groups A and B) with groups (C and D), where we found an increased prevalence of the disease in the elderly persons, which may be due to reduced glomerular filtration rate.

In Table 2 there is a significant increase in the calcium oxalate crystals which maybe caused by a hormonal effect or increased calcium and oxalate levels in blood due to increased intake of foods and medication supplements in groups C and D contrasting to groups A and B. the uric acid crystals also show a significant increase because of it's increase in the blood probably due to increased dietary intake of meat, drinking too much alcohol, genetic, Tumor lysis syndrome [14]. The amorphous urate does not show any significant difference. The RBC's in urine are of high significant increase which may be due to the injury of the basement membrane of the glomeruli because of the stone. The pus cells also has a significant increase which indicates to a bacterial infection.

In Table 3 Blood urea increased in groups (C and D) compared with groups (A and B) maybe due to obstruction to the urine flow which leads to urine retention and reabsorption of the urea from the glomerular and high protein diet in some persons. Serum creatinine levels increased which may be due to dehydration, low blood volume, eating large amounts of meat, the supplement foods (creatine rich proteins) can have the same effect [15]. Uric acid also have a significant increase.

In sodium there is a significant increase in patients' values contrasting to control, that may be caused by dehydration, not drinking enough water, eating a lot of salts and insufficient anti diuretic hormone that causes loss of thirst leading to diabetes insipidus which causes polyuria [16]. Calcium also shows a significant increase.

Decreased levels of serum potassium patients than control because of increased sodium and that may result in decreased citrate excretion (citrate inhibits crystal formation, growth and aggregation) which leads to calcium super saturation.

In blood pH there was a significant increase in groups C and D values contrasting to groups A and B , which is a result of blood alkalosis may be caused by eating alkaline foods and this leads to triple phosphate urine crystals then development to renal stone [17].

CONCLUSION

Bearing in mind the observation of the present study knowing that most of the biochemical abnormalities if treated can considerably lower the recurrence rate of post renal diseases (one of them renal stone).

In this study we found that the incidence of renal stone is increased in males more than females which may be related to physiological factors, BMI and busy by their works making them lowering the monitor of their bodies by blood and urine analysis. The levels of age factor prevalence increases with age until 70 years.

Finally, modern lifestyle changes, habits, unhealthy foods and obesity problems are considered as promoters of the stones formation.

RECOMMENDATIONS

- Doing exercises.
- Increasing water intake and increasing frequent urination.
- Eating healthy foods.

- reducing from intake sodium and salts.
- reducing soft drinks containing phosphoric acid that changes the pH of blood and urine.
-reducing drinking alcohol which may also change the blood and urine pH.
- Avoiding foods that are responsible for the production of crystals when found in GUE.
- Reduce the intake of oxalate rich foods.
- Eating more form lemon which is rich of citrate.

- Urine and blood examinations when feeling sharp pain in the back and lower abdomen.
- Controlling sugar levels in diabetic patients because it may lead to ketone bodies producing and as a consequence to blood pH medium change.
- Bringing the stone to the laboratory if possible in order to examine it's type and structure to prevent the recurrence of it in future.
- Persons with high blood calcium are recommended to check their thyroid hormones.

REFERENCES

[1] Urinary tract stones. In: Litwin MD, Saigal CS, eds. *Urologic diseases in America*, NIH publication (2012) 12-7865.
[2] KK Malhotra – Journal, Indian Academy of Clinical Medicine. (2008) Vol. 9, No. 4. October-December.
[3] Jaber Muhbes, Fakhria. Health Science Journal., (2012) Vol. 6, Issue 4, p714-725. 12p. 4 Charts, Oct-Dec.
[4] "Summary". In Committee to Review Dietary Reference Intakes for Vitamin D and Calcium, (2011) pp. 403-56.
[5] Johri, N; Cooper, B; Robertson, W; Choong, S; et al. "An update and practical guide to renal stone management". *Nephron Clinical Practice* (2010) 116 (3): c159-71.
[6] Barhan and Trinder Analyst (1972) 97,142.
[7] Clinical Guide to laboratory test, (2006) 4thED., N.W.TIETZ ,p.1096-1099.
[8] D.Labbe et al., Ann. Biol. Clin., (1996) 54, p.285-298.
[9] Trinder, P.Ann. Clin. Biochem. (1969) 6,24.
[10] Henry R.J. et al. Clin. Chem. , Harper and Row New York, (1974) sec. Edit. 643.
[11] Tietz N.W. , Fundamentals of Clinical Chemistry, Saunders, Philadelphia, (2006) 4th Edit. , 984.
[12] Ste, J. and Lewis W.H.P. Clin chim Acta (1957) 2, 576.
[13] Baginski (F.S), Foa (P.P) and Zak (B)- Clin. Chem. Acta, (1967) 15, 155-158.
[14] Hochberg J, et al. Tumor lysis syndrome: Current perspective. Haematologica, (2008) 93:9.
[15] Rohren CH (expert opinion). Mayo Clinic, Rochester, Minn. (2015) Dec. 4.
[16] chemocare.com\chemotherapy\side-effects\hypernatremia-high-sodium.aspx.
[17] Yee AH, Rabinstein AA. "Neurologic presentations of acid-base imbalance, electrolyte abnormalities, and endocrine emergencies". *Neurol Clin* (2010) 28 (1): 1-16, February.