Study of the Level Total Antioxidant Capacity in Urinary Stones Patient

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Abstract

The study was conducted over a hundred patients renal stone and forty apparently were taken as control group. The renal stone comprised one hundred patient aged (10-70 years) with mean ± standard deviation of (46.10+_16.30) years. The Control group includes forty apparently healthy individuals aged (20-65 years) with mean± standard deviation (30.22 + 11.36) yea . The study was conducted of the 1th period from February 2019 to the April 2019. Samples collected from outpatient Department AL- Hilla Teaching Hospital. All patients underwent full history and physical examination, including (age, sex, medical family history and the presence of stones formation frequently in the patient and other chronic diseases),Venous blood samples was collected from patients with renal stones and control subjects by using disposable (5 ml) of each patient taking (1 ml) of it and put it in tube with coagulation contain EDTA blood and leave the rest to coagulate for 10-15 minutes in Temperature of 37 ° C and then enter the rotation speed of 1800 rpm is obtained blood serum and then the serum was stored in -20 degree,

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Introduction

Urinary system stone is the most common cause of kidney disease and poses a remarkable health care burden on adults. Recent studies have shown that the prevalence of kidney stones is increasing, and that 1 out of every 11 Americans have kidney stones. On the other hand, global statistics have shown that the number of people with kidney stones has almost doubled in the last 15 years [(1)]. Several factors are effective in the development of kidney stones including sex, race, age, climate, nourishment, and genetics [(2,3)]. Recent studies have also shown that nutrition, lifestyle factors, and metabolic factors are instances of the most important factors involved in developing kidney stones [(3,4)]. In economically advanced countries, 70% of the total kidney stones contain calcium oxalate or phosphate [(3)]. The disease is more common among the people aged 30-60 years and, more common to men than to women [(3)]. The formation of kidney stones is multi factorial pathogenesis, and there are several stages in the formation of stones in the renal tubes [(5)].Among various mechanisms for the formation of kidney stones, the damage of tubular cells and thus facilitation of the crystallization of sediment could be considered as the most possible mechanism [(6,7)]. Numerous studies have determined that damage to tubular cells could be caused by the presence of oxalate and calcium oxalate crystals [(3)]. However, it is known that damage to renal epithelial cells in the patients with kidney stones could be due to oxidative stress [(8)]. Oxalate-induced membrane damage is promoted by lipid peroxidation (LPO) and oxidative stress, which is a degradative process due to the presence of reactive oxygen species (ROS) [(8,9)]. LPO could be assayed by measurement of serum malondialdehyde (MDA) levels in the patients with renal stones. In

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addition, various studies have reported that the vicinity of kidney epithelial cells with different crystals leads to the production of ROS [8]. On the other hand, ROS through damage to and chemical changes on proteins, lipids, and carbohydrates, alter the kidney function. Association of calcium stone formation and the reduction of antioxidant levels have been suggested [10]The most common type of urinary stone found in humans worldwide is calcium oxalate (CaOx). The important risk factors of CaOx stone formation are urinary supersaturation, increased urinary stone promotors, such as calcium and oxalate, and depleted urinary stone inhibitors such as citrate and magnesium [3,5]. Urinary supersaturation is a state that the concentration of solutes in urine exceeds the saturation point, causing spontaneous precipitation of solutes, with the inadequacy of stone inhibitors and urinary alkalization, calcium from a water-insoluble complex with oxalate. These crystals will aggregate and adhere to the renal tubular epithelium with the presence of urinary adhesion molecules. Regarding these, genetic susceptibility in a family with nephrolithiasis may play an important role in pathogenesis of stone formation than our current awareness. Evidence reported that stone disease occurred at a younger age and higher frequency in any population with nephrolithiasis patients in the family [11]. As an antioxidant enzyme, superoxide dismutase (SOD) plays an important role in ROS removal by resisting oxidative stress and decomposing super oxide into oxygen (O2) and hydrogen peroxide (H2O2) [10]

Material and Method

One hundred patients (67males and 33 females) in the age group ranging from 5-75 years old, admitted to Al-Hila Teaching Hospital, Urology Department from the period 1st of December 2013 till 30th of June 2013. Forty apparently healthy individuals were taken as a control group. This group comprises of 20 males their age ranging from 22-55 years, and 20 females their age ranging from 23-60 years. All tests had been performed on serum in Biochemistry department in the College of Medicine of Babylon University. Blood samples have been collected from patients and control subjects. Blood samples were withdrawn without the use of tourniquet. Both the sera from patients and controls are used for the measurements of the Serum total antioxidant.

Result

The total number of patients with renal stones was One hundred patients in the age group ranging from 5-75 years old at time of presentation, the high percentage of patients (23%) found in age group (35-45) years old. Most of antioxidants are electron donors and react with free radical to form more stable end products such as water. Thus, antioxidants can inhibit the free radical and protect against cellular damage from ROS. Concentration of Total antioxidant (TCA) was decrease in patient with kidney stone compare to control group show in the tables (1, and 2).

Table (1): Mean and standard deviation of age in renal stones and control groups

	Subjects	**Gender**	**No.**	**Mean ± SD**	**P-value**
Age (Years)	Patient group	Male+ Female	100	44.29 ± 16.30	P<0.05
		Male	67	40.47 ± 12.72	P<0.05
		Female	33	43.05 ± 15.05	
	Control group	Male+ Female	40	34.29 ± 10.38	P<0.05
		Male	20	30.10± 10.036	P<0.05
		Female	20	38.55 ±9.121	

Table (2) Characteristic of patients group and control groups related with the Total antioxidant in the different groups

	Groups	Number	TAC(u/ml) Mean & SD	P value
Patients	Uric acid	35	6.47±3.005	P<0.001
	Calcium oxalate	39	10.016±2.909	P<0.05
	Calcium phosphate	14	8.76±2.81	P<0.05
	Uric acid+ Carbonyl	1	10.580	__
	Calcium oxalate + Calcium phosphate	2	3.465±1.195	__
	Uric acid +Calcium phosphate	2	7.97±0.926	__
	Cystine	3	3.120±1.066	__
	Tri phosphate	4	9.53±1.529	P>0.05
Control		40	16.67±2.35	P>0.05

Discussion

The results showed a significant differences in age of patients with renal stones compare with those of the control group most pediatric kidney stones are predominantly composed of calcium oxalate; struvite and calcium phosphate stones are less common,Calcium oxalate stones in children are associated with high amounts of calcium, oxalate, and magnesium in acidicurine[12]. Urolithiasis was found to be most predominant in the age group of 31-40 years[13]. Age group of early twenties to late forties is physically most active period in life. another possible mechanism may be due to increased level of serum testosterone in age group of 21-40 years, which resulted in increased production of oxalate by liver from its endogenous precursors[14]. suggested that the statistically decrease in total antioxidant in kidney stone patients as compared to controls. Increased levels of TAC indicate absorption of stock organ antioxidants[15]. uric acid and the induction or activation of antioxidant enzymes as an adaptation to the oxidative stress, but at a later phase of oxidative stress, the TAC falls due to depletion of antioxidants[16]. In addition, high concentration of a number of metabolites, including uric acid can lead to pro-oxidant effects, introducing a further decrease of the antioxidant capacity [17].

Conclusion

The study showed that the serum concentration of total antioxidant (TAC) was decreased significant in patient with urinary stone when compared with control ($p<0.001$) in uric acid, ($p<0.05$) in clcium oxalate, ($p<0.05$) in calcium phosphate

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq.

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Reference

1. Cotran RS and Robbins SL, Basic pathology. 7th ed. Elsevier Saunders, (2002) :536-537.
2. Beckett G, Walker S, Rae P and Ashby P, Clinical Biochemistry. 7th ed. Blackwell. (2002) :53-54.
3. Walter F., PhD. Boron Medical physiology :A cellular and molecular Approach, (2004):766-767.
4. Ganon WF, Review of medical physiology.21st ed. McGraw-Hill companies.(2003):218-220.
5. Veena CK, Josephine A, PreethSP, et al. Renal peroxidative changes mediated by oxalate: The protective role of fucoidan. J life Sci.(2007). 79(19):1789-1795.
6. Thamilselvan S. and Khan SR. Oxalate and calcium crystals are injurious to renal epithelial rells: Results in vivo and in vitro studies. J Nephrol. (1998) 11:66-69.
7. Heptinstall RH. Pathology of the kidney. 4th ed. Little Brown. (1992):1572-1581.
8. Davison AMA, Cameron JS, Grunfeld J and et al. Oxford Text Book of Nephrology. 3rd ed. Oxford University Press.(2005):1199-1210.
9. Potts JM. Essential Urology: A guideline to clinical practice. Humana Press. (2004):117-130.

10. Tanagho EA, and McAninch JW. Smith's general urology. 17th ed. McGraw-Hill Companies. (2008). p:1-7,246-256.
11. Jennette, JC; Olson, JL; Schwartz, MM et al., eds .(6th ed.). Philadelphia: Lippincott Williams & Wilkins,(2007).: 435-436.
12. Cavendish, M. "Kidney disorders". Diseases and Disorders 2 (1st ed.). Tarrytown, New York: Marshall Cavendish Corporation. (2008).pp. 490-3.
13. Gabi Kevorkian . Kidney stones, Causes behavioral, (2012). 48:137-144 .
14. Yasunori Itoh, Atsushi Okada, Takahiro Yasui, Ryousuke Ando, Keiichi Tozawa, Shoichi Sasaki. Administration of the selective alpha 1A-adrenoceptor antagonist silodosin facilitates expulsion of size 5–10 mm distal ureteral stones, as compared to control,(2013). pp 675-678.
15. Rashed T, Menon M, Thamilselvan S. Molecular mechanism of oxalate-induced free radical production and glutathione redox imbalance in renal epithelial cells: effect of antioxidants. Am J Nephrol,(2004);24, 557–568.
16. Davalos M, Konno S, Eshghi M, Choudhury M. Oxidative renal cell injury induced by calcium oxalate crystal and renoprotection with antioxidants: a possible role of oxidative stress in nephrolithiasis. J Endourol,(2010). 24, 339–345.
17. Peixoto EB, Pessoa BS, Biswas SK, Lopes de Faria JB. Antioxidant SOD mimetic prevents NADPH oxidaseinduced oxidative stress and renal damage in the early stage of experimental diabetes and hypertension. Am J Nephrol, (2009). 29, 309–318.