Measurement of some Biochemical Values in Hemodialysis Patients in Baghdad

Hiba A.Hassan [*,1]

[*]College of Health and Medical Technology , Baghdad, Iraq.

Abstract

One hundred of dialysis patients' mean age (51.18±8.28) years and one hundred healthy control group , where carried out from different hospitals of Baghdad city , during the period between November /2012 until March/2013. Blood samples were collected before dialyzing for estimation the concentration of urea, creatinine, uric acid, random blood sugar , calcium and cholesterol by enzymatic method detected spectrophotometerically.

The aim of this study is to determine concentration of urea, creatinine, uric acid, RBS , calcium and cholesterol in hemodialysis patients in Baghdad . The results showed that there were highly significant increases ($P<0.01$) in the mean of creatinine , urea , uric acid and RBS for patients (587.86µmol/l , 25.57 mmol/l, 414.36mmol/l and 6.47mmol/l) compared to the mean of healthy control (88.60 µmol/l , 5.07mmol/l ,270.76mmol/l and 4.65mmol/l) was detected . Also there was highly significant decrease($P< 0.01$) in the mean of calcium and cholesterol for patients (1.93mmol/l and3.33mmol/l) compared to the mean of healthy control (2.34mmol/l and5.02mmol/l). It is concluded that in hemodialysis was associated with the higher levels of urea ,creatinine , uric acid and RBS with low level of cholesterol and calcium.

Key words: RBS (random blood sugar), SUA (serum uric acid), Cholesterol, Urea, Creatinine.

قياس بعض القيم الكيموحيوية لدى مرضى الغسيل الكلوي في بغداد

هبـــا عبد الحسين حسن [*,١]

[*] كلية التقنيات الصحية والطبية ، بغداد ، العراق .

الخلاصة

لدراسة تركيز جوهر البول ، الكرياتينين ، حمض البوليك ، الكولسترول ،الكالسيوم ، تركيز السكر العشوائي في مصل مرضى غسيل الكلى .مائة من مرضى غسيل الكلى متوسط العمر (٥١،١٨ ±٨،٢٨) سنة ومائة مجموعة مراقبة صحية ، التجربة نفذت في مستشفيات مختلفة من مدينة بغداد ، خلال الفترة بين تشرين الثاني / ٢٠١٢ حتى اذار / ٢٠١٣ .تم جمع عينات الدم قبل الديلزة لتقدير تركيز جوهر البول و الكرياتينين وحمض البوليك والكولسترول والكالسيوم و تركيزالسكر العشوائي في الدم التي اعتمدت بقياسها على الانزيمات وتم قياسها بجهاز المطياف اللوني. أظهرت النتائج أن هناك زيادة كبيرة للغاية ($P < 0.01$) في متوسط الكرياتينين وجوهر البول وحمض البوليك وتركيز السكرالعشوائي للمرضى
(587.86µmol/l , 25.57 mmol/l, 414.36mmol/l , 6.47mmol/l)
مقارنة مع متوسط مراقبة صحية (270.76mmol/l and 4.65mmol/l ,5.07mmol/l , 88.60 µmol/l) كان هناك أيضا انخفاض ملحوظ للغاية ($P < 0.01$) في متوسط الكولسترول و الكالسيوم للمرضى (3.33mmol/l and 1.93mmol/l) مقارنة مع متوسط مراقبة صحية (5.02mmol/l and 2.34mmol/l) .

وقد استنتج من الدراسة ان غسيل الكلى لة علاقة مع المستويات العالية لجوهر البول والكرياتينين وحمض البوليك و تركيزالسكر العشوائي ومع انخفاض مستوى الكوليسترول والكالسيوم.

الكلمات المفتاحية: حامض البوليك ، كوليستيرول ، الغسيل الكلوي .

Introduction

In medicine dialysis (from Greek dialusis meaning dissolution, dia, meaning through, and lysis , meaning loosening or splitting) is a process for removing waste and excess water from the blood, and is used primarily to provide an artificial replacement for lost kidney function in people with renal failure[(1)]. Dialysis may be used for those with an acute disturbance in kidney function (acute kidney injury, previously acute renal failure), or progressive but chronically worsening Kidney function–a state known as chronic kidney disease stage 5 (previously chronic renal failure or end-stage renal disease). The latter form may develop over months or years, but in contrast to acute kidney injury is not usually reversible, and dialysis is regarded as a "holding measure" until a renal transplant can be performed, or sometimes as the only supportive measure in those for whom a transplant would be inappropriate[(2,3)].

[1]Corresponding author E-mail: hebaabdul@yahoo.com
Received:22 /4/2013
Accepted: 5/1/2014

In hemodialysis, the patient's blood is pumped through the blood compartment of a dialyzer, exposing it to a partially permeable membrane. The dialyzer is composed of thousands of tiny synthetic hollow fibers. The fiber wall acts as the semipermeable membrane. Blood flows through the fibers, dialysis solution flows around the outside of the fibers, and water and wastes move between these two solutions.[4] The cleansed blood is then returned via the circuit back to the body. Ultrafiltration occurs by increasing the hydrostatic pressure across the dialyzer membrane. This usually is done by applying a negative pressure to the dialysate compartment of the dialyzer. This pressure gradient causes water and dissolved solutes to move from blood to dialysate, and allows the removal of several litres of excess fluid during a typical 4-hour treatment. In the US, hemodialysis treatments are typically given in a dialysis center three times per week (due in the US to Medicare reimbursement rules); however, as of 2007 over 2,500 people in the US are dialyzing at home more frequently for various treatment lengths[5] .Studies have demonstrated the clinical benefits of dialyzing 5 to 7 times a week, for 6 to 8 hours. This type of hemodialysis is usually called "nocturnal daily hemodialysis", which a study has shown a significant improvement in both small and large molecular weight clearance and decrease the requirement of taking phosphate binders.[6] These frequent long treatments are often done at home while sleeping, but home dialysis is a flexible modality and schedules can be changed day to day, week to week. In general, studies have shown that both increased treatment length and frequency are clinically beneficial.[7]

Patients and Methods

Patients

This study included (100) dialysis patients (49 male and 51 female) from different hospitals of Baghdad city(Baghdad Teaching Hospital ,surgery specialist hospital and private nursing home hospital) patients' mean age for both sex (51.18±8.28) years and one hundred healthy control group(46 male and 64 female). Selection of the patients depending on history of patients (included most of the patients have diabetes and excluded the patients which have other disease) and the first time undergoing dialysis.

Sample collection

From each patients' before dialyzing included in this study the blood was transferred into disposable plain tube and let stand for 30 minute to clot . serum was separated by centrifugation at 3000 rpm for 5 minute ,which was collected in plain tube and kept frozen unless analyzed immediately[8]. The serum was utilized for determination of blood urea, serum creatinine, serum uric acid, serum cholesterol, serum calcium and random blood sugar during the period between November /2012 until March/2013.

Commercial Kits

For biochemical analysis , the following kits were used:

Kits	supplier
Kit for determination of serum glucose	Randox / united kindom
Kit for determination of serum urea	Biomaghreb/ Ibn Khaldoun- Tunisia
Kit for determination of serum creatinine	Biomaghreb/ Ibn Khaldoun- Tunisia
Kit for determination of serum cholesterol	Randox / united kindom
Kit for determination of serum calcium	Randox / united kindom

Statistical analysis

Suitable statistical methods were used in order to analyze and assess the results, includes the following [9]:

1- Descriptive statistics:

A) Statistical tables including observed frequencies with their percentages.

B) Summary statistic of the readings distribution (mean, SD, SEM, minimum and maximum).

2 – Inferential statistics:

These were used to accept or reject the statistical hypotheses, they include Repeated student test (t-test) by using SPSS program version-10.

Results and Discussion

A. Distribution of patients and control according to mean age.

The distribution of dialysis patients according to mean age is listed in table (1)shows the mean age have no significant difference(P>0.05) . But when comparing the mean age in present study with the mean age of other studies [4,10] shows decrease in the mean age .This result may be related to some environmental factors.

Table (1) Distribution of studied groups according to mean age / year.

Parameters	Groups	No.	Mean	Std. Dev.	Std. Error	95% C. I. for Mean		Min.	Max.
						Lower Bound	Upper Bound		
Age	Control	100	51.34	8.73	1.24	48.86	53.82	37	76
	patients	100	51.18	8.28	1.17	48.83	53.53	37	71

t-test for Equality of Means	t	d.f.	Sig. (2-tailed)	C.S.
	0.094	98	0.925	NS*

NS* : Non Significant at P>0.05

B.Distribution of patients and control according to gender.

In the table (2) showed a no significant differences(P>0.05) between gender for patients and control This results agree with other studies[11-13] which found no differences in the incidence and/or rate of progression of renal disease between men and women.

Table (2) Distribution of studied groups according to gender

			groups		C.S. P-value
			patients	control	
gender	male	Count	49	46	
		% within gender	49%	46%	F.E.P.T. P=1.000 NS*
	female	Count	51	64	
		% within gender	51%	64%	
Total		Count	100	100	
		% within gender	100 %	100%	

NS* : Non Significant at P>0.05

C.Distribution of patients and control according to the mean concentration of urea , creatinine , uric acid ,RBS ,calcium and cholesterol.

Table (3) shows a highly significant increase (P<0.01) in the mean concentration of urea , creatinine , uric acid and RBS in the studied groups (25.57 mmol/l , 587.86 µmol/ l , 414.36 mmol/l and 6.47mmol/l) respectively compared with control (5.07 mmol/l, 88.60 µmol/ l ,270.76 mmol/l and4.65mmol/l) respectively. Also there was highly significant decrease(P< 0.01) in the mean of calcium and cholesterol for patients (1.93mmol/l and 3.33mmol/l) compared to the mean of healthy control (2.34mmol/l and 5.02mmol/l). Elevated creatinine and urea levels are likely evidence of decreased kidney function[3, 14,15]. While increase in uric acid may be caused secondarily by renal impairment which that the urate handling by the kidneys involves filtration at the glomerulus, reabsorption, secretion and, finally, post-secretory reabsorption at tubules which are handled by multiple organic anion transporters that have been recently identified such as the urate/anion exchanger, the human organic anion transporter and the urate transporter. Consequently, elevated serum uric acid levels—as observed in our study—may result secondary to decreased glomerular filtration, decreased tubular secretion or enhanced tubular reabsorption. Decreased urate filtration can contribute to the increased in uric acid of renal insufficiency[16,17,18]. But elevated in RBS due to most of the patients have diabetes which cause damage to the kidneys, and this condition can lead to kidney failure [19,20]. Decreased calcium in present study which found when the kidneys fail, they are unable to process and filter the blood from waste products, decreasing its ability to reabsorb calcium and leading to loss of calcium in the urine[21,22]. Serum cholesterol is often low in dialysis patients, probably because of malnutrition and chronic inflammation [23,24].

Table (3) Distribution of studied groups according to the mean concentration of urea , creatinine ,uric acid ,RBS, calcium and cholesterol.

Parameters	Groups	No.	Mean	Std. Dev.	Std. Error	95% C. I. for Mean		Min.	Max.
						Lower Bound	Upper Bound		
Urea (mmol/l)	Control	100	5.07	1.45	0.20	4.66	5.48	3.1	7.5
	patients	100	25.57	7.39	1.05	23.47	27.67	14	41
Creatinine (µmol/ l)	Control	100	88.60	20.91	2.96	82.66	94.54	62	124
	patients	100	587.86	233.40	33.01	521.53	654.19	212	1132
Uric Acid (mmol/l)	Control	100	270.76	85.12	12.04	246.57	294.95	180	410
	patients	100	414.36	96.28	13.62	387.00	441.72	204	564
R.B.S (mmol/l)	Control	100	4.65	0.94	0.13	4.38	4.92	3.1	6.1
	Study	100	6.47	3.16	0.45	5.57	7.37	1.4	14.7
Ca (mmol/l)	Control	100	2.34	0.19	0.03	2.29	2.40	2	2.7
	patients	100	1.93	0.33	0.05	1.83	2.02	1.3	2.7
Cholesterol (mmol/l)	Control	100	5.02	0.96	0.14	4.75	5.29	3.2	6.47
	patients	100	3.33	0.55	0.08	3.17	3.48	2.17	4.26

Parameters	t-test for Equality of Means			
	t	d.f.	Sig. (2-tailed)	C.S.
Urea	-19.25	98	0.000	*HS
Creatinene	-15.07	98	0.000	*HS
Uric Acid	-7.90	98	0.000	*HS
RBS	-3.90	98	0.000	*HS
calcium	7.66	98	0.000	*HS
cholesterol	10.85	98	0.000	*HS

* HS highly significance

References

1. Pendse S, Singh A, Zawada E.et al. Initiation of Dialysis. In: Handbook of Dialysis. 4th ed. New York, NY, 2008:14–21.
2. Iseki K and Fukiyama K. Predictors of stroke in patients receiving chronic hemodialysis. Kidney Int 1996, 50: 1672–1675
3. Wolfe RA, Hulbert-Shearon TE, Ashby VB, et al. Improvements in dialysis patient mortality are associated with improvements in urea reduction ratio and hematocrit, 1999 to 2002. Am J Kidney Dis 2005,45:127-135.
4. Locatelli1 and P Pozzoni1. Chronic kidney disease in the elderly: is it really a premise for overwhelming renal failure? Kidney International 2006, 69, 2118–2120.
5. Eknoyan G, Beck GJ, Cheung AK, et al. Effect of dialysis dose and membrane flux in maintenance hemodialysis. N. Engl. J. Med. 2002, 347 (25): 2010–9.
6. Locatelli F, Martin-Malo A, Hannedouche T, et al. Effect of Membrane Permeability on Survival of Hemodialysis Patients". J Am Soc Nephrol,2009,20 (3): 645–54.
7. Ahmad S, Misra M, Hoenich N, Daugirdas J. Hemodialysis Apparatus. In: Handbook of Dialysis. 4th ed. New York, NY, 2008:59-78.
8. Tietz N.W.;Fundamentals of clinical chemistry , Philadelphia, W.B. saunders 1976, 729.
9. Sorlie DE. Medical biostatistics & epidemiology : Examination & board review. First ed. Norwalk, Connecticut, Appleton and Lange ,1995:47-88.
10. P. Jungers, P. Chauveau, and B. Descamps-Latscha et al. Age and gender-related incidence of chronic renal failure in a French urban area: a prospective

epidemiologic study, oxford j. 2013, 11 (8) : 1542-1546.

11. Breyer JA, Bain RP, Evans JK, Nahman NS Jr, Lewis EJ, Cooper M, McGill J, Berl T. Predictors of the progression of renal insufficiency in patients with insulin-dependent diabetes and overt diabetic nephropathy. The Collaborative Study Group. Kidney Int 1996,50, 1651–1658.

12. Monti MC, Lonsdale JT, Montomoli C, Montross R, Schlag E, Greenberg DA. Familial risk factors for microvascular complications and differential male-female risk in a large cohort of American families with type 1 diabetes. J Clin Endocrinol Metab 2007,92, 4650–4655.

13. Rossing P, Hougaard P, Parving HH. Risk factors for development of incipient and overt diabetic nephropathy in type 1 diabetic patients: a 10-year prospective observational study. Diabetes Care 2002,25,859–864.

14. Linda Shavita, , Meyer Lifschitza, Ilia Galperinb. Influence of enteric nutrition on blood urea nitrogen (BUN) in very old patients with chronic kidney disease (CKD),Archives of Gerontology and Geriatrics, 2012, 54(1):228–231<IVSL>.

15. Carmen A. Peralta MD, Anne Lee BA, Michelle C. Odden PhD, et al. Association Between Chronic Kidney Disease Detected Using Creatinine and Cystatin C and Death and Cardiovascular Events in Elderly Mexican Americans: The Sacramento Area Latino Study on Aging ,Journal of the American Geriatrics Society, 2013,61(1): 90–95<IVSL>.

16. Eraly S, Vallon V, Rieg T, et al. Multiple organic anion transporters contribute to net renal excretion of uric acid. Physiol Genomics 2008,33*:*180-192.

17. Madero M, Sarnak M, Wang X, et al. Uric acid and long-term outcomes in CKD. *Am* J Kidney Dis 2009,53*:*796-803.

18. .Kang DH, Chen W. Uric acid and chronic kidney disease: new understanding of an old problemSemin ,Nephrol. 2011 ,31(5):447-52.

19. Sørensen, V. R. Mathiesen, E. R. Watt, T. Bjorner, J. B. et al. Diabetic patients treated with dialysis: complications and quality of life , Diabetologia **,** 2007, 50 **(** 11): 2254-2262

20. Jamie P. Traynor, Peter C. Thomson, Keith Simpson. Comparison of patient survival in non-diabetic transplant-listed patients initially treated with haemodialysis or peritoneal dialysis ,Nephrol. Dial. Transplant, 2011, 26 (1): 245-252.

21. L. Viaene B.K.I. Meijers Y. Vanrenterghem P. Evenepoel *,et al* .Evidence in Favor of a Severely Impaired Net Intestinal Calcium Absorption in Patients with (Early-Stage) Chronic Kidney Disease, Am J Nephrol 2012;35:434–441

22. .Renkema KY, Alexander RT, Bindels RJ, Ho-enderop Jg, et al. Calcium and phosphate homeo-stasis: concerted interplay of new regulators. Ann Med 2008; 40: 82–91

23. .Bologa RM , Levine DM and Parker TS *et al*. Interleukin-6 predicts hypo-albuminemia , hypocholesterolemia, and mortality in hemodialysis patients. Am J Kidney Dis 1998, 32: 107–114.

24. Iseki K, Yamazato M, Tozawa M, Takishita S. Hypocholesterolemia is a significant predictor of death in a cohort of chronic hemodialysis patients. Kidney Int 2002,61:1887-93.

.