

Concentrations of Serum creatinine in blood of patients visiting Tamimi, Al baida and Alabyar Hospitals

تراكيز مصل الكرياتينين في دم المرضى الذين يزورون مستشفيات التميمي والبيضاء والأبيار

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المخلص: عادة ما يستخدم الكرياتينين في الدم في تقييم وظائف الكلى لاكتشاف وتشخيص حالات ضعف وظائف الكلى. تم جمع وتحليل دم 232 مريضاً من مستشفى التميمي - مدينة التميمي ومستشفى الأبيار - مدينة الأبيار ومختبر البيضاء - مدينة البيضاء خلال الفترة من 3 يوليو إلى 7 أغسطس 2016. معظم المرضى ينتمون إلى الفئة العمرية < 50 سنة (43.1%) يليهم المرضى من 30 - 39 سنة و أقل من 20 سنة (15.1%) بالتساوي. 7 (03.0%) كانت كرياتينين غير طبيعي بينهم الذكور والإناث 12 (5.20%). 19 مصل دم يحتوي على نسبة عالية من الكرياتينين ، 12 (5.20%) من الإناث و 7 (03.0%) من الذكور. ينتمي معظمهم إلى الفئة العمرية < 50 عاماً (6.9%) ، يليهم المرضى الذين تتراوح أعمارهم بين 40-49 عاماً (9%). إجمالي المشاركين 55 ذكراً ، معظم المشاركين غير الطبيعي كانوا ينتمون إلى الفئة العمرية < 50 عاماً (7.1%). إجمالي 55 مشاركة من الإناث ، من أصل 12 (9.0%) تم تحديدها على أنها كرياتينين غير طبيعية ، 40-49 تم تسجيل الفئات العمرية على أنها أعلى مجموعة ذات مستويات غير طبيعية من الكرياتينين (1.5%) تليها أقل من 20 عاماً (7%). إن قيمة الكرياتينين في الدم في الكشف عن مستويات وظائف الكلى غير كاملة ، خاصة في حالات الضعف السابقة وفي المرضى الذين يعانون من أمراض أخرى.

الكلمات الدالة: التركيز، الكرياتينين، الدم.

Abstract

Serum creatinine is usually used in the valuation of renal function to detect and diagnosis of conditions with impaired renal function. Blood of 232 patients was collected and analyzed from Al-tameamy Hospital- Tameamy town, Al- abyar Hospital- Alabyar city and Al baida laboratory- Baida city during the period 3rd July to 7th August 2016. Most of patients belonged to the age group ≥ 50 years age (43.1%), followed by patients of 30 - 39 years and < 20 of age (15.1%) equally. 7 (03.0%) were abnormal creatinine among whom the male represented and females 12 (5.20%). 19 patient's serum with high levels creatinine, 12 (5.20%) were from females and 7(03.0%) were from males. Most of them belonged to the age group ≥ 50 years of age (6.9%), followed by patients of 40-49 years of age (9%). Total of 55 males' participant, most of abnormal scr was belonged to the age group ≥ 50 years (7.1%).total of 55 females' participant, out of 12 (9.0%) that were identified as abnormal creatinine, 40-49 years age groups registering as the highest group with abnormal creatinine levels (1.5%) followed by < 20 years age groups (7%). The value of serum creatinine in detection of levels of kidney function is imperfect, especially in the earlier impairment and in patients with other disease.

Key words: concentration, creatinine, blood.

Introduction

Chronic kidney disease (CKD) is one of the major public health problems.¹² Chronic renal failure induces a slow and continuing failure of kidney function. It is usually a result of difficulties from additional severe medical condition. Dissimilar acute renal failure, which occurs rapidly and unexpectedly, chronic renal failure occurs slowly - over a period of weeks, months, or years - as the kidneys gradually stop working, leading to end-stage renal disease (ESRD).¹ And known as one of the major public health problems.² This increases is owing to numerous factors, the elongated long life and the greater presence of cardiovascular pathology, specially diabetes mellitus and hypertension are leading causes of chronic renal failure epically in elderly patients and entry into a regular dialysis program in Spain.^{3,4} Hypertension may destruction the blood vessels in the kidney and effect the secretion of waste product. Waste may secrete in extra cellular fluid and more increase the blood pressure finally leading to ESRD (end-stage renal disease). G-protein coupled and Ca^{2+} dependent kinases are responsible for the control of blood pressure. Mutations may cause changes in receptors, which in turn increase blood pressure.^{9, 10} Libya has a high incidence risk factor for chronic kidney disease such as hypertension, obesity and diabetes.^{13, 14} Creatinine measurement Creatinine is mostly formed from creatine and phosphocreatine in skeletal muscle. In various patients, Creatinine is produced in the muscles by the non-enzymatic changes of creatine and phosphocreatinine. The liver has a vital role in the gathering of creatinine through methylation of guanidine aminoacetic acid. The normal serum creatinine level is 0.5 to 1.0 mg/d.¹¹ Renal function valuation is done through plasma creatinine determination.⁵. Creatinine is freely excreted through kidneys makes it useful to read kidney function. Serum creatinine is used in the detection and valuation of acute kidney damage and chronic kidney disease.⁶ Limitations of serum creatinine as a sign of kidney function should be measured.⁷ Most common methods of measuring serum creatinine are based on Jaffé reaction. Creatinine reacts with picrate in an alkaline medium and the resulting orange-red complex is measured spectrophotometrically. Several factors are found to interfere with creatinine assays; glucose and ketoacids and protein in serum.⁸ Aim of this study was to measure renal function by plasma creatinine levels in Libyan patients.

Material and Methods

Blood of 232 patients was collected Diabetes from Al-tameamy Hospital- Tameamy town, Al- abyar Hospital- Alabyar city and Al baida laboratory- Baida city during the period 3rd July to 7th August 2016. 5 ml of the blood was obtained from each patient; blood was placed in plain tube containing clot activator. Clotted blood was centrifuge to separate serum and was used for bio systems Spain.

Creatinine valuation

Creatinine was valued by the Jaffe reaction, a calorimetric method in which creatinine forms a yellowish orange compound in alkaline solution with picric acid. This colored compound is determined photometrically. The strength of created colored is directly related to the quantity of creatinine in the sample and determined photometrically using biosystems BT-350 system, bio Tina GMBH Germany, biosystems BT-350, Fugifilm system.

Normal range of females: 0.6-1.1 mg/dl

Normal range of males: 0.9-1.3 mg/dl.

Statistical Analysis:

Analysis was done by the standard deviation function is STDEV, and the test uses is T- test.

Results

A total of 232 serums of diabetic patients was analyzed. These patients were randomly selected and their serum creatinine level was checked. There were 98 (42.2%) serum samples from male patient and 134 (57.8%) from female patient.

4.1 Distribution of age groups by gender.

Most of the patients belonged to the age group ≥ 50 years age (43.1%), followed by patients of 30 - 39 years and < 20 of age (15.1%) equally as shown in Table 1.

Table. 1 Distribution of age groups by gender.

Gender age group in years	SEX				Total	
	Male		Female			
	No.	%	No.	%	No.	%
< 20	13	5.6	22	9.5	35	15.1
20 - 29	11	4.7	18	7.8	29	12.5
30 - 39	13	5.6	22	9.5	35	15.1
40 - 49	15	6.5	18	7.8	33	14.2
>=50	46	19.8	54	23.3	100	43.1
Total	98	42.2	134	57.8	232	100.0

4.2 creatinine concentrations distributions according to age groups of the study population.

Of 232 serum sample, 7 (03.0%) were abnormal creatinine among whom the male represented and females 12 (5.20%).

Table. 2 creatinine concentrations distributions according to age groups of the study population.

Creatinine level	SEX				Total	
	Male		Female			
	No.	%	No.	%	No.	%
Less than normal level	32	13.8	55	23.7	87	37.5
Normal level	59	25.4	67	28.9	126	54.3
Abnormal level level	7	03.0	12	5.2.0	19	08.2
Total	98	42.2	134	57.8	232	100.0

4.3 Distribution of creatinine concentration levels by age groups

Out of a total of 232 clinical specimens investigated. The rate of high creatinine levels was 08.2%. Of these 19 patient's serum with high levels creatinine, 12 (5.20%) were from females and 7(03.0%) were from males. Most of them belonged to the age group ≥ 50 years of age (6.9%), followed by patients of 40-49 years of age (9%) as shown in Table 3.

Table. 3 Distribution of creatinine concentration levels by age groups

Creatinine age group in years	Less than normal level < 0.6		Normal level 0.6 - 1.3		Abnormal level >+1.3		Total	
	No.	%	No.	%	No.	%	No.	%
< 20	16	6.9	18	7.8	1	4	35	15.1
20 - 29	17	7.3	12	5.2	00	0.0	29	12.5
30 - 39	14	6.0	21	9.1	00	0.0	35	15.1
40 - 49	13	5.6	18	7.8	2	9	33	14.2
≥ 50	27	11.6	57	24.6	16	6.9	100	43.1
Total	87	37.5	126	54.3	19	8.2	232	100.0

4.4 Distribution of creatinine concentration levels for male participant by age groups

Total of 55 males' participant, the males, most of abnormal Scr was belonged to the age group ≥ 50 years (7.1%).

Table. 4 Distribution of creatinine concentration levels for male participant by age groups

Male age group in years	Less than normal level < 0.6		Normal level 0.6 - 1.3		Abnormal level >+1.3		Total	
	No.	%	No.	%	No.	%	No.	%
< 20	9	9.2%	4	4.1%	0	0.0	13	13.3%
20 - 29	6	6.1%	5	5.1%	0	0.0	11	11.2%
30 - 39	5	5.1%	8	8.2%	0	0.0	13	13.3%
40 - 49	5	5.1%	10	10.2%	0	0.0	15	15.3%
≥ 50	7	7.1	32	32.7	7	7.1	46	46.9
Total	32	32.7%	59	60.2%	7	7.1%	98	100.0%

4.5 Distribution of creatinine concentration levels for Female participant by age groups.

According to sex, total of 55 females' participant, out of 12 (9.0%) that were identified as abnormal creatinine, 40-49 years age group registering as the highest group with abnormal creatinine levels (1.5%) followed by < 20 years age group (7%).

Table. 5 Distribution of creatinine concentration levels for Female participant by age groups

Female age group	Less than normal level < 0.6	Normal level 0.6 - 1.3	Abnormal level >+1.3	Total
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in years	No.	%	No.	%	No.	%	No.	%
< 20	7	5.2%	14	10.4%	1	7%	22	16.4%
20 - 29	11	8.2%	7	5.2%	0	0.0	18	13.4%
30 - 39	9	6.7%	13	9.7%	0	0.0	22	16.4%
40 - 49	8	6.0%	8	6.0%	2	1.5%	18	13.4%
>=50	20	14.9	25	18.7	9	6.7	54	40.3%
Total	55	41.0%	67	50.0%	12	9.0%	134	100.0%

Discussion

The relationship between plasma creatinine and glomerular filtration shows how serious function impairment, measured by creatinine clearance, is not translated into an increase of plasma creatinine levels. So, an increase in plasma creatinine indicates an already important loss of glomerular filtration.¹⁴⁻¹⁵ Data from this study of patients show that creatinine clearance is a much more reliable restriction for renal function study, especially in elderly patients leading to various other dangerous diseases. The study shows SCr increases with age belonged to >=50 years age groups (6.9%), followed by patients of 40-49 years age group (9%). Previous study was similar to the present study; show an increase of serum creatinine with increasing the age.¹⁶ According to current study, females were more creatinine values are higher than males, unlike to other study was reported males were more affected by kidney disease than females.¹⁷

Conclusion

The value of serum creatinine in detection of levels of kidney function is imperfect, especially in the earlier impairment and in patients with other disease. Many patient specific factors related to protein metabolism and muscle mass change serum creatinine levels.

References

- . Couchoud C, Pozet N and Labeeuw M. Screening early renal failure: cut-off values for serum creatinine as an indicator of renal impairment. 1999. *Kidney International*; 55: 1878-1884.
- . Levey A S, Atkins R, Coresh J, Cohen E P, Collins A J and Eckardt K U. Chronic kidney disease as a global public health problem: Approaches and initiatives -a position statement from Kidney Disease Improving Global Outcomes. 2007. *Kidney International*; 72: 247-259.
- . Schmidt RJ, Domico JR, Sorkin MI, Hobbls G: Early referral and is impact on emergence first dialyses, health care costs and outcome. *Am J Kidney Dis* 32: 278-283, 1998.
- . Ledebro I, Kessler M, Van Biesen W, Wanner C, Wiecek A, Prichard S, Argiles A, Ritz E, Van Viesen E: Initiation of dialysis-opinions from an international survey: report on the Dialysis Opinion Symposium at the ERA-SDTA Congress, 18 september 2000 Nice. *Nephrol Dial Trasplant* 16: 1132-1138, 2001..
- . Levey AS, Perrone RD, Madias NE: Serum creatinine and renal function. *Annu Rev Med* 39: 465-490, 1988.
- . Baumgarten M. Chronic Kidney Disease: Detection and Evaluation. *Am Fam Physician*. 2011 Nov 15;84(10):1138-1148.
- . Tattersall J, Dekker F, Heimbürger O, Jager KJ, Lameire N, Lindley E, Van Biesen W, Vanholder R, Zoccali C. When to start dialysis: updated guidance following publication of the Initiating Dialysis Early and Late (IDEAL) study. *Nephrology Dialysis Transplantation*. 2011 Jul 1;26(7):2082-6.
- . NKF. Frequently asked questions about GFR estimates. Available at: https://www.kidney.org/sites/default/files/docs/12-10-4004_abe_faqs_aboutgfrrev1b_singleb.pdf

- . Santulli G, Cipolletta E, Sorriento D, Giudice G D, Anastasio A, Monaco S, Maione A S, Condorelli G, Puca A, Trimarco B, Illario M and Iaccarino G. Cam MK4 gene deletion induces hypertension. 2012. Journal of American Heart Association; 1(4): e001081
- . Santulli G, Trimarco B and Iaccarino G. G-protein-coupled receptor kinase 2 and hypertension: molecular insights and pathophysiological mechanisms. 2013. High Blood Pressure Cardiovascular Prevention; 20(1): 5-12.
- . Hamilton R W, Gardner L B, Penn A S and Goldberg M. Acute tubular necrosis caused by exercise-induced myoglobinuria. 1972. Annals of. Internal Medicine; 77(1): 77-82.
- . Levey A S, Atkins R, Coresh J, Cohen E P, Collins A J and Eckardt K U. Chronic kidney disease as a global public health problem: Approaches and initiatives -a position statement from Kidney Disease Improving Global Outcomes. 2007. Kidney International; 72: 247-259.
- . Kadiki, O.A., Roaeid, R.B. (2001) Prevalence of diabetes mellitus and impaired glucose tolerance in Benghazi Libya. Diabetes Metab., 27(6):647-654
- . Fernández-Fresnedo G, De Francisco AL, Rodrigo E, Pinera C, Herráez I, Ruíz JC, Arias M: «Insuficiencia renal “oculta” por valoración de la función renal mediante la creatinina sérica». Nefrología 22 (2): 95-97, 2002.
- . Cockcroft DW, Gault MH: Prediction of creatinine clearance from serum creatinine. Nephron 16: 31-41, 1976. 13. Levey AS, Greene T, Beck GJ, Caggiula AW, Kusek JW, H
- . N. S. Jabary, D. Martín, M. F. Muñoz*, M. Santos, J. Herruzo, R. Gordillo and J. Bustamante. RENAL FUNCTION IN PATIENTS WITH ESSENTIAL HYPERTENSION. NEFROLOGÍA. Volumen 26. Número 1. 2006
- . LABORATORY PROFILES OF LIBYAN PATIENTS ON HEMODIALYSIS: A RETROSPECTIVE STUDY IN TWO MAIN HOSPITALS IN BENGHAZI CITY. Salma A. Bukhatwa, Wafa M. Almajbri, Waed T. Alzuwawi, Turkeya Y. Ellgeryni And Narges M. Kablan. Int. J. Adv. Res. 7(5), 821-825. 2019.