

Original Research Article

Comparative study of serum urea, creatinine and C-reactive protein level in chronic kidney disease patients with healthy subjects

Dileep Singh Nirwan*, R. K. Vyas, Sunil Jain

Department of Biochemistry, S.P. Medical College, Bikaner, Rajasthan, India

Received: 28 January 2017

Accepted: 06 March 2017

***Correspondence:**

Dr. Dileep Singh Nirwan,

E-mail: dsnktr@rediffmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Chronic diseases are a leading cause of morbidity and mortality in India. Globally, chronic kidney disease is the 12th cause of death and the 17th cause of disability, respectively. CKD is defined as kidney damage or glomerular filtration rate (GFR) <60 mL/min/1.73 m² for 3 months or more, irrespective of cause. The present study aimed to find out correlation between serum urea, creatinine and C-reactive protein (CRP) level among patients suffering from chronic kidney disease in an urban based tertiary care hospital in Bikaner, western Rajasthan, India.

Methods: This study was conducted at Sardar Patel Medical College and Associated Hospitals at Bikaner, Rajasthan from August 2015 to December 2016. There were 50 cases and 50 controls in the age groups from 10 to 60 years. We took fresh samples and performed required tests following standard protocol. CRP has been done by Antigen Antibody reaction (latex method). RFT has been performed on semi-automatic analyzer.

Results: Levels of serum urea and creatinine were significantly raised in CKD patients (p-value<0.005) and CRP level was raised in 52% cases. While 48% cases having normal level (%), which requires further study. Renal function tests were significantly higher in cases than controls.

Conclusions: Serum creatinine and urea level were significantly higher in cases as compared to control group.

Keywords: CRP, Chronic kidney disease, Creatinine, Urea

INTRODUCTION

Chronic kidney disease (CKD) is a worldwide major disease, both for the number of patients and cost of treatment involved. Globally, chronic kidney disease is the 12th cause of death and the 17th cause of disability, respectively.¹

The exact prevalence of CKD in general population remains unknown. A large study in primary care suggested an age standardized prevalence of stages 3-5 CKD of 8.5%. The prevalence of CKD in general population in the US and in Europe is about 10% of adults.²⁻³ The prevalence of early stages of the CKD disease (CKD1-4, 3.3%, 3.0%, 4.3% and 0.2%

respectively) is 100 times higher than the prevalence of end-stage kidney disease (G5 0.1%). The incidence of CKD increases with age. The annual incidence in middle aged is about 1%. Women have higher incidence of CKD but lower risk for kidney failure than men. African Americans have higher risk for kidney failure.⁴⁻⁶

The yearly incidence of ESRD in India is approximately 150-200pmp and DM is an important cause of CKD in approximately 30-40% of the patients.⁷ CKD is defined as kidney damage or glomerular filtration rate (GFR) <60 mL/min/1.73 m² for 3 months or more, irrespective of cause.⁸ CRP short pentraxin and an established biomarker of inflammation in kidney disease. A high degree of inflammation exists in predialysis patients as seen by

high C Reactive protein values.⁹⁻¹⁰ C-reactive protein (CRP) has been found to predict cardiovascular events and mortality in apparently healthy individuals and in patients with established vascular disease.¹¹⁻¹² It is evident that the serum concentration of urea and creatinine should be viewed as being readily measured, but incomplete, surrogate markers for these compounds, and monitoring the level of urea and creatinine in the patient with impaired kidney function represents a vast oversimplification of the uremic state. The reason attributed to change serum urea and creatinine in patients with CKD is the declining of glomerular filtration rate, Catabolism of proteins and nucleic acids results in formation of urea, so called non protein nitrogenous compound.

Creatinine is derived from creatine and phosphocreatine breakdown in muscle. Creatinine is freely filtered by glomerulus and its concentration is inversely related to GFR. The reference interval for serum creatinine (0.5-1.5 mg/dl) encompasses the range of muscle mass observed in reference population used. This limitation contributes to insensitivity of creatinine as a marker of diminished GFR. It is recommended that serum creatinine measurement alone is not used to assess kidney function.¹³

METHODS

The study was conducted in Sardar Patel medical college and PBM Hospital situated in Bikaner district (Rajasthan) from august 2015 to December 2016. CKD patients attending outpatient Department of Medicine and Nephrology of PBM Hospital were selected. Level of renal function tests and CRP was measured in 50 CKD patients and compared with 50 healthy persons without CKD or any other disease.

Inclusion criteria

- Patients admitted and diagnosed as cases of chronic kidney disease confirmed clinically and with relevant investigations.
- Patients who gave valid consent
- Age between 10 to 60 years.

Exclusion criteria

- Patients on renal replacement therapy (Hemodialysis, Peritoneal dialysis and renal transplantation).
- Congestive heart failure
- Congenital kidney disease like polycystic kidney disease, medullary sponge kidney.
- Patient with obstructive uropathy

Sample collection and preparation

Taking written consent from all subjects, about 10 ml blood was drawn by aseptic technique and transferred to

a clean and metal free test tube without any anticoagulant to avoid hemolysis. Test tube was left at room temperature for 20 minutes and after clotting, centrifuged at 3000rpm for 10 minutes.

Biochemical analysis

Renal functions were measured by automated analyser and CRP level was measured by antigen-antibody reaction method.

Determination of renal function tests

Serum urea was measured by kit (precision), according to urease modified end point Beathlot method. Serum creatinine was measured by kit (Erba), according to Jaffe’s modified kinetic method.

Determination of CRP level

Serum CRP level was measured by kit (Latex slide test) using antigen-antibody reaction. A positive test indicates human serum containing more than 0.8 mg/dl CRP level. A negative test indicates less than this value in serum.

Statistical analysis

Results are expressed as Mean±SD. Data were analysed with help of Microsoft excel 2007. A p-value <0.05 was considered as statistically significant.

RESULTS

The mean serum urea level was 102.34±24.92mg/dl in cases and 32.78±4.52mg/dl in control group. Mean serum urea level was significantly high in cases compare to control group (P=0.0001) (Table 1).

Table 1: Comparison of serum urea levels between cases and controls.

Study population	Mean (mg/dl)	SD (mg/dl)	P value
Cases (N1=50)	102.34	24.92	Z=19.439, df=98 P=0.0001 (significant)
Controls (N2=50)	32.78	4.52	

Table 2: Comparison of serum creatinine levels between cases and controls.

Study population	Mean (mg/dl)	SD (mg/dl)	P value
Cases (N1=50)	10.64	2.56	Z=26.515, df=98 P=0.0001 (significant)
Controls (N2=50)	1.014	0.19	

The mean serum creatinine level was 10.64±2.56mg/dl in cases and 1.014±0.19mg/dl in control group. Mean

serum urea level was significantly high in cases compare to control group ($P=0.0001$) (Table 2). Out of 50 cases, 24 (48%) case were negative and 26 (52%) were positive CRP level in chronic kidney disease patients (Figure 1).

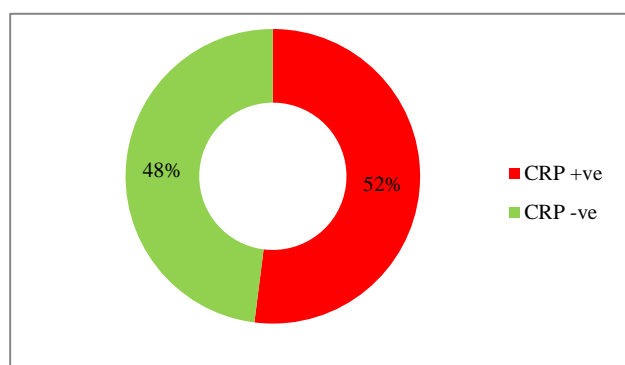


Figure 1: Distribution of study population according to their CRP test result.

DISCUSSION

The present study was conducted in urban based tertiary hospital in west Rajasthan, India on 100 subjects aged between 10 to 60 years comprising of 50 healthy control and 50 patients diagnosed as chronic kidney disease acted as study group. The blood samples of controls as well as study groups were withdrawn and analyzed for serum urea, creatinine and CRP concentration.

In our study serum urea and creatinine level was significantly higher in cases compare to control group. This study supports the finding of previous study done by Xia Y et al in 2012.¹³

In our study chronic kidney disease, 26 patients (52%) show CRP test is positive and 24 patients (48%) shows negative CRP test. Fox ER et al found that serum CRP level was high in patients with CKD in 2010.¹⁵ A study done by Nagarajarao H et al in 2007 on African – Americans patients of CKD also shows increased level of CRP in CKD patients but in our study 52% patients are showing increased level of CRP but 48% patients show negative CRP level which means low level and this value does not correlates with previous studies done in past and establish the need of further study of CRP level in CKD patients.¹⁴ The question as to whether inflammation contributes to progressive renal dysfunction in CKD patients needs further investigation.

CONCLUSION

Serum creatinine and urea level were significantly higher in cases as compared to control group.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Sicree R, Shaw J, Zimmet P. Diabetes and impaired glucose tolerance. In: Gan D (Ed). Diabetes Atlas, 3rd edition. Brussels: International Diabetes Federation. 2006:15-109.
2. Eckardt KU, Coresh J, Devuyst O, Johnson RJ, Kottgen A, Levey AS, et al. Evolving importance of kidney disease: from subspecialty to global health burden. Lancet. 2013;382(9887):158-69.
3. Coresh J, Selvin E, Stevens LA, Manzi J, Kusek JW, Eggers P, et al. Prevalence of chronic kidney disease in the United States. JAMA. 2007;298(17):2038-47.
4. Bash LD, Coresh J, Kottgen A, Parekh RS, Fulop T, Wang Y, Astor BC. Defining incident chronic kidney disease in the research setting: The ARIC Study. AmJ epidemiology. 2009;170(4):414-24.
5. Grams ME, Chow EK, Segev DL, Coresh J. Lifetime incidence of CKD stages 3-5 in the United States. American journal of kidney diseases. The official J National Kidney Foundation. 2013;62(2):245-52.
6. Peralta CA, Katz R, DeBoer I, Ix J, Sarnak M, Kramer H, et al. Racial and ethnic differences in kidney function decline among persons without chronic kidney disease. J American Society of Nephrology. 2011;22(7):1327-34.
7. Levey AS, Eckardt KU, Tsukamoto Y, Kidney Int. Kidney definition and classification of chronic kidney disease : a position statement from kidney disease. Improving Global Outcomes (KDIGO). 2005;67(6):2089-100.
8. CKD registry of India: Indian Society of Nephrology. Available from <http://www.ckdri.org> [Accessed September, 2012].
9. Garg AX, Blake PG, Clark WF, Clase CM, Haynes RB, Moist LM. Association between renal insufficiency and malnutrition in older adults: results from the NHANES III. Kidney international. 2001;60(5):1867-74.
10. Shlipak MG, Fried LF, Crump C, Bleyer AJ, Manolio TA, Tracy RP, et al. Elevations of inflammatory and procoagulant biomarkers in elderly persons with renal insufficiency. Circulation. 2003;107(1):87-92.
11. Libby P, Ridker PM, Maseri A. Inflammation and atherosclerosis. Circulation. 2002;105:1135-43.
12. Ridker PM, Rifai N, Rose L, Buring JE, Cook NR. Comparison of C-reactive protein and low-density lipoprotein cholesterol levels in the prediction of first cardiovascular events. N Engl J Med. 2002;347:1557-65.
13. Xia Y, Peng C, Zhou Z, Cheng P, Sun L, Peng Y, Xiao P. Clinical significance of urea, creatinine and uric acid levels in patients with chronic kidney disease. J Central South University. Medical sciences. 2012;37(11):1171-6.
14. Nagarajarao H, Taylor HA, Benjamin EJ, Taylor JK, Sarpong D, Akylbekova EL, et al. The Relation

of C-reactive Protein to Chronic Kidney Disease in African Americans: The Jackson Heart Study. *Circulation.* 2007;116(Suppl 16):800.

15. Fox ER, Benjamin EJ, Sarpong DF, Nagarajao H, Taylor JK, Steffes MW, et al. The relation of C-reactive protein to chronic kidney disease in African Americans: the Jackson Heart Study. *BMC Nephrology.* 2010;11(1):1.

Cite this article as: Nirwan DS, Vyas RK, Jain S. Comparative study of serum urea, creatinine and C-reactive protein level in chronic kidney disease patients with healthy subjects. *Int J Res Med Sci* 2017;5:1480-3.