

IS eGFR A BETTER MARKER THAN SERUM CREATININE ALONE TO ASSESS KIDNEY DYSFUNCTION

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ABSTRACT

Chronic Kidney Disease (CKD) is associated with a decrease in kidney function over months or years that are often progressive. Early detection of kidney dysfunction can help to minimize the damage. Serum creatinine (SCr) is the routine test done in almost all the hospitals across the world to assess the kidney function, although the isolated use of SCr concentration may not reflect the actual degree of renal function. Hence, measured Glomerular Filtration Rate (GFR) is considered the most accurate way to detect changes in kidney status but not often done.

In the present study 493 patients of both genders in the age group of 20-80 years were selected randomly. Their serum creatinine estimation was done by modified Jaffe's method and eGFR is calculated by abbreviated MDRD equation. Twenty five patients had normal SCr level but their eGFR was abnormal and showed that it has misplaced 5.07% patients with impaired kidney function. So eGFR should be included along with serum creatinine as a routine to assess the normal kidney function to avoid misrepresentation of patients with impaired kidney function which may facilitate the early identification and intervention of patients with renal impairment and prevention of further damage.

KEY WORDS

Chronic Kidney Disease, Serum Creatinine, eGFR.

INTRODUCTION

Chronic Kidney Disease (CKD) is associated with a decrease in kidney function over months or years that is often progressive. Early detection of kidney dysfunction can help to minimize the damage. Serum creatinine (SCr) is the routine test done in almost all the hospitals across the world to assess the kidney function, although the isolated use of SCr concentration may not reflect the actual degree of renal function [1]. However, patients can have significantly decreased glomerular filtration rate (GFR) with normal SCr values and making the recognition of kidney dysfunction more difficult [2].

Hence, measured Glomerular Filtration Rate (GFR) is considered the most accurate way to detect changes in kidney status but not often done [3]. GFR can be measured directly by clearance studies of exogenous substances like iothexol, iothalamate, and Cr51-EDTA. However, these procedures are costly, time consuming and are not suited to the routine detection of kidney disease. Even to measure the clearance of endogenous substances like urea and creatinine it requires both serum and an accurately timed urine collection. So efforts have been directed at more convenient "urine-free" estimates of GFR [4]. Measurement of GFR however is cumbersome and hence efforts have been directed for more

convenient estimation of GFR.³ Modified Diet for Renal Diseases (MDRD) equation provides a rapid method of assessing GFR from SCr and routine data [5]. Hence, this study was undertaken to determine the extent of misclassification of the patients who have significantly reduced GFR as calculated by reexpressed four variable MDRD equation.

OBJECTIVES

To determine serum creatinine and eGFR by MDRD equation and also to determine if any misclassification of patients who had kidney dysfunction occurs based on SCr and eGFR

METHODOLOGY

The study was conducted at a referral tertiary care hospital, Davangere. It includes 493 patients attending the outpatient department of the hospital of both genders in the age group of 20-80 years and were randomly selected. Each subject gave an informed written consent and the protocol of the study was explained in detail in vernacular language. The study was approved by the Institutional Ethical Committee.

Exclusion criteria: Persons below 20 years, persons above 80 years, renal transplant patients, on hemodialysis, on medication affecting kidney

function, diseases affecting serum creatinine (liver diseases, muscular dystrophies)

A detailed medical, personal and dietary history was obtained and detailed medical examination was done. Two millilitre of blood sample was collected under aseptic precautions, allowed to clot for 20 minute, centrifuged for 10 minute at the rate of 3000 rpm to separate the serum which was used to estimate serum creatinine by modified Jaffe's assay (kinetic method) using auto-analyser. and eGFR is calculated by abbreviated MDRD equation

1. $eGFR = 186 \times SCr^{-1.154} \times age^{-0.203}$
2. If female, multiply the equation by 0.742
3. If africo-american, multiply the equation by 1.212

RESULTS AND DISCUSSION

In the present study, out of 493 patients, 110 (22.31%) had abnormal eGFR calculated by abbreviated MDRD equation, while 85 (17.24%) had abnormal SCr values and 25 (5.07%) patients had normal SCr level but their eGFR was abnormal (Table 1) and is in accordance with other studies [5,6].

When gender wise comparison was done, about 21 (4.27%) females had normal SCr level but their eGFR was abnormal and 4 (0.81%) males had normal SCr level but their eGFR was abnormal (Table1). So more female patients were misrepresented when compared to male patients [2].

Table 1 shows gender wise comparison of serum creatinine and eGFR

	Total	%	eGFR<60	%	SrCr> 1.3	%	Difference	% Difference
Subjects	493	100	110	22.31	85	17.24	25	5.07
Male	307	62.27	66	13.39	62	12.58	4	0.81
Female	186	37.73	44	8.93	23	4.66	21	4.27

Table 2 shows age wise comparison of serum creatinine and eGFR

Age	Total	%	eGFR<60	%	SrCr> 1.3	%	Difference	% Difference
20-29	80	16.22	5	1.01	5	1.01	0	0
30-39	77	15.62	2	0.41	2	0.41	0	0
40-49	82	16.63	11	2.23	10	2.03	1	0.2
50-59	96	19.47	29	5.88	27	5.48	2	0.4
60-69	99	20.08	37	7.51	25	5.07	12	2.44
>70	59	11.97	26	5.27	16	3.24	10	2.03

When age wise comparison was done, the discordance between SCr and eGFR value was more

pronounced in the older age group than younger age group (Table 2) and is similar to Levy et al [7].

This states that renal function decreases over time as a part of the normal ageing process [7].

The most common laboratory method of assessing chronic kidney disease is SCr estimation. But the present study shows that it has misplaced 5.07% patients with impaired kidney function. This study is in harmony with Singh NP et al [5] and M. Kannapiran et al [2].

Hence eGFR is chosen as a better indicator of overall kidney function and therefore its assessment has become an important clinical tool in the daily care of patients [1, 3]. The MDRD equation uses age, the inverse of serum creatinine, gender and race. This equation directly relates the accounted variables to GFR adjusted for body surface area. As the determinants of body size are prepackaged in the equation so the additional adjustment is not required [2]. Currently, international recommendations also suggest that measurement of SCr should be supplemented with an estimation of the GFR and the revised MDRD equation is thought to be the least biased and most accurate method of achieving this [5].

CONCLUSION

The present study states that a large proportion of patients with impaired renal function are not diagnosed if only SCr estimation is done as evidence of normal renal function. So inclusion of calculated eGFR a quick, cheap and simple method may facilitate the early identification and intervention of patients with renal impairment and prevention of further damage. So eGFR should be included along with serum creatinine as a routine to assess the normal

kidney function to avoid misrepresentation of patients with impaired kidney function.

CONFLICT OF INTEREST: None.

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REFERENCES

1. Martin E.Lascano, Emilio D Poggio .Kidney function assessment by creatinine-based equations.Cleveland Clinic; publications: Disease Management Project; August 1, 2010.
2. Kannapiran M, Nisha D, Madhusudhana Rao A. Underestimation of Impaired Kidney Function with Serum Creatinine. *Ind J Clin Biochem.* 2010; 25(4): 380-4
3. Levey AS, Coresh J, Greene T, Stevens LA, Zhang Y. Using standardized serum creatinine values in the modification of diet in renal disease study equation for estimating glomerular filtration rate. *Ann Intern Med.* 2006;145:247-54
4. Rahn KH, Heidenreich S, Bruckner D. How to assess glomerular function and damage in humans. *J Hypertens.* 1999;17:309-17
5. Singh NP, Ingle GK, Saini VK, Jamil A, Beniwal P, Lal M, et al. Prevalence of low glomerular filtration rate proteinuria and associated risk factors in North India using Cockcroft-Gault and modification of diet in renal disease equation: an observational, cross-sectional study. *BMC Nephrol.* 2009;10:1-13.
6. Duncan L, Heathcote J, Djurdjev O, Levin A. Screening for renal disease using serum creatinine: who are we missing? *Nephrol Dial Transplant.* 2001;16:1042-6
7. Levy AS, Perrone RD, Madias NE. Serum creatinine and renal function. *Annu Rev Med.* 1988; 39:465-90.



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