Original Research Article

Estimation of GFR in First Degree Relatives and Spouses of Patients on Maintenance Hemodialysis by Using Formulae

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ABSTRACT

Glomerular filtration rate can be estimated by various formulae including Cockroft - Gault formula, MDRD equation, CKD-EPI. The first degree relatives and the spouses of patients with kidney disease are at high risk of development of chronic kidney disease.
In this background, we undertook a prospective study of estimation of GFR in FDRs and spouses of patients on maintenance hemodialysis using various formulae.

Key words: GFR, spouses, FDRs, hemodialysis, formulae.

INTRODUCTION

Chronic kidney disease is a global health problem. The increase in incidence of metabolic risk factors such as diabetes, hypertension obesity, dyslipidemia is the major contributory factors. It is estimated that the incidence of end stage renal disease in India is 229 per million populations and an addition of one lakh new cases every year. [1,2] There is an increasing disproportion between the demand and the availability of resources. In this context, the concept of targeted screening has been emphasized. Targeted screening of the individuals has shown a promising benefit in early identification of at risk individuals.

In this background, we studied the glomerular filtration rates of first degree relatives and spouses of patients on maintenance hemodialysis using various formulae

Aim

To estimate the glomerular filtration rate (GFR) using various formulae in the first degree relatives (FDR) and spouses of patients on maintenance hemodialysis in our centre.

MATERIALS AND METHODS

This is a cross sectional study of FDRs and spouses of patients on maintenance hemodialysis done in government medical college. All the subjects belonged to low socioeconomic status. Hemodialysis was supported by government funded organization. A total of 210 hemodialysis patients are enrolled for dialysis in our unit. All the patients are undergoing dialysis through government funded cashless scheme (Aarogyasri)

Inclusion criteria:

- All FDRs and spouses above 18 years of age
- Subjects who have given consent

Exclusion criteria:

1. Subjects younger than 18 years of age
2. Subjects who have not given consent
3. Subjects who are known to have diabetes, or claim to be on insulin or

oral hypoglycemic drugs were recorded to be having diabetes.

Blood pressure was recorded on two occasions. Hypertension was defined according to JNC -7 criteria. Subjects satisfying the above said criteria or on antihypertensive drugs or labeled to have hypertension previously were recorded as hypertensives.

Assessment of proteinuria which needs two occasions by dipstix or a thorough estimation during 24 hours and the assessment of hematuria could not be done in all the subjects due to financial issues.

A questionnaire with demographic profile, socio economic data, family history, personal and dietary habits, details about marriage status was made. Examination and anthropometry findings were recorded.

Serum creatinine was estimated using Jaffe method with IDMS correction. Estimated GFR (eGFR) was estimated using three different equations; Cockroft - gault formula (CGF), MDRD and CKD-EPI. CKD in our study was defined based on eGFR.

Statistical analyses

Statistical analysis was done using the SPSS package, version 20.0. Descriptive analysis was used to characterize the study population by its demographic (age, gender) medical history and investigations (history of hypertension, diabetes, serum creatinine, and e GFR). Results were expressed as mean ± 1 SD done by ANOVA. Significance was considered for $P < 0.05$.

Reliability test was performed and represented as Cronbach's alpha. Cronbach's α of more than 0.7 says that there is agreement and correlation between two measurements. The more the value the higher is the correlation

RESULTS

Total numbers of subjects included in the study were 298. Of these, numbers of FDRs were 188, spouses were 110. Total numbers of males were 184 and females were 114. There is no statistically significant difference in baseline characteristics like age, height, weight and blood pressure between first degree relatives and spouses except for mean BMI which is more in spouses. (Tables 1, 2) Mean serum creatinine value in spouses (0.89± 0.15) is higher than in first degree relatives (0.87± 0.14). Mean glomerular filtration rate by various equations is lower in spouses than in first degree relatives (Table 3) and the distribution of FDRs and spouses based on GFR value is also tabulated. (Table 4)

Table 1: Baseline characteristics of all the subjects

		Total No.	%
Age (years)	18 - 35	145	48.7%
	36 - 55	121	40.6%
	56 - 75	32	10.7%
	76+	0	0.0%
Sex	Females	114	38.3%
	Males	184	61.7%
Relation Ship	First degree	188	63.1%
	Spouse	110	36.9%
HTN	No	247	82.9%
	Yes	51	17.1%
Diabetes	No	279	93.6%
	Yes	19	6.4%

Table 2: Baseline characteristics of FDRs and spouses

	First degree Relatives			**Spouses**			**P value**	
Parameter	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Relatives vs. spouses**	
Age(years)	31.87±11.09	35.55±13.46	33.12±12.05	44.43±13.18	44.54±11.83	44.48±12.53	0.632	
Weight(Kgs)	58.92± 9.25	56.89± 9.396	58.23± 9.33	61.52± 9.94	58.44± 9.52	60.12± 9.82	0.533	
Height(cm)	159.72±10.23	151.53± 9.54	156.93±10.704	155.88±10.01	151.90± 9.66	154.07±10.01	0.442	
BMI	23.16± 3.49	24.83± 3.89	23.73± 3.71	25.66± 5.9	25.63± 5.18	25.64± 5.56	**<.0001**	
Systolic BP	120.40±13.69	125.63±18.93	122.18±15.82	130.83±18.44	129.40±18.23	130.18±18.3	0.08	
Diastolic BP	76.21± 9.07	78.59±10.82	77.02± 9.74	83.67±11.19	81.80±10.44	82.82±10.85	0.19	

Table 3: Serum creatinine and eGFR of FDRs and spouses

	First degree relative			**Spouse**		
Parameter	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Creatinine	0.90± 0.133	0.80± 0.123	0.87± 0.137	0.92± 0.176	0.85± 0.107	0.89± 0.15
CGF	100.34±21.57	89.74±23.65	96.73±22.8	91.73±26.26	78.51±18.97	85.72±24.04
MDRD	108.72±20.59	90.05±17.178	102.37±21.4	100.26±23.15	78.84±12.01	90.52±21.68
CKD EPI	109.83±15.12	97.46±18.183	105.62±17.21	99.12±19.63	84.82±14.37	92.62±18.77

Table 4: Distribution according to GFR STAGING in subgroups

Parameter	SEX	Stage	CGF (%)	MDRD (%)	CKD-EPI (%)
First degree Relatives	**Female**	1	27(42.2)	36 (56..3)	42(65.6)
		2	31(48.4)	27 (42.2)	21(32.8)
		3	6 (9.4)	1 (1.6)	1 (1.6)
	Male	1	87(70.2)	105 (84.7)	109(87.9)
		2	29(23.4)	19(15.3)	15(12.1)
		3	8 (6.5)		
	Total	1	114(60.6)	141 (75.0)	151(80.3)
		2	60 (31.9)	46 (24.5)	36(19.1)
		3	14(7.4)	1(0.5)	1 (0.5)
Spouse	**Female**	1	18(36.0)	12(24.0)	19(38.0)
		2	21(42.0)	36(72.0)	30(60.0)
		3	11(22.0)	2 (4.0)	1 (2.0)
	Male	1	29(48.3)	39(65.0)	42(70.0)
		2	26(43.3)	19(31.7)	16(26.7)
		3	5(8.3)	2 (3.3)	2 (3.3)
	Total	1	47(42.7)	51(46.4)	61(55.5)
		2	47(42.7)	55(50.0)	46(41.8)
		3	16(14.5)	4 (3.6)	3 (2.7)

Table 5: Baseline characteristics between those with GFR>60ml/min Vs GFR <60ml/min

s. No	Variable	GFR ≥ 60ml (mean ± SD)/ n (%)	GFR < 60ml (mean ± SD)/ n (%)	P Value
1	Age in years	35.4 ± 12.01	54.83 ± 11.44	**<0.05**
2	Weight	59.94 ± 8.93	148.97 ± 10.90	**<0.05**
3	Height in CM	156.62 ± 10.22	148.97 ± 10.90	**<0.05**
4	BMI	24.52 ± 4.52	22.99 ± 6.52	0.9
5	Blood Pressure	124/79 ± 15.7/10.2	135/83 ± 25.15/11.18	**<0.05**
6	Male	171 (93)	13(7)	**<0.05**
7	Diabetes Mellitus	16 (6.3)	3(10)	0.29

DISCUSSION

With the increasing prevalence of ESRD patients globally, the need to focus on "high risk group" is being emphasized. Apart from those with co-morbidities predisposing to the development of CKD, the first degree relatives and spouses form a definite high risk category, who are often overlooked.

Clustering of chronic kidney disease in families was thought to be due to genetic susceptibility and environmental factors. The cohort of first and second degree relatives form the prototype for explaining genetic susceptibility and the cohort of spouses form a prototype for explaining environmental factor influence.

According to SEEK-India study, prevalence of CKD in India is 17.2% and the percentage distribution of CKD stages 1,2,3,4 and 5 is 7.3%, 4.3%, 4.3%, 0.8% and 0.8% respectively. The risk factors identified were old age, anemia, diabetes, hypertension, lack of awareness and poverty. The prevalence in India is slightly higher than SEEK-China, SEEK-Arabia. [3]

Tsai et al in a study of 195 first degree relatives, second degree relatives and 45 spouses of 175 hemodialysis patients found age, female gender, obesity, hypertension, diabetes, hyperuricemia to be significant factors for CKD though hypertension and age were found to be independent risk factors for relatives and diabetes mellitus was found to be a significant risk factor in spouses. [4] Wei X et al studied 1187 FDRs of 419 CKD patients and found that age, hypertension, diabetes, female gender, obesity, hypertriglyceridemia, hyperuricemia to be significant risk factors. [5] In a study Inserra F et al a threefold higher risk of CKD was reported in first degree relatives of CKD patients. [6] Bagchi et al studied 606 FDRs of 145 CKD patients, observed that older age, female gender, proteinuria, hypertension were significant risk factors for development of CKD. 61.2% of FDRs had eGFR in stage 1, 34.7% in stage 2, 3.6% in stage 3, and 0.5% in stage 4-5. 8.6% had CKD. [7]

In our study, high incidence of low eGFR was noted in spouses compared to

first degree relatives. Age, weight, BMI, SBP/DBP was higher among spouses than the FDRs though BMI alone was found to be statistically significant. (BMI of spouses was more than the FDRs). Both male and female FDRs were younger than the spousal male and females. Weight of both male and female spouses was higher than the male and female FDRs. SBP, DBP of male and female spouses were higher than their FDR counterparts though DBP in male spouses was slightly higher than female spouses (83.67+_11.1 vs 81.8+_10.4)

Serum creatinine was found to be higher in both male and female spouses compared to male and female FDRs. With all the three equations, it was found that eGFR of spouses was less than FDRs. CGF underestimated GFR in both the groups thereby the number of subjects with low GFR were high compared to the numbers when calculated using MDRD and CKD EPI. In FDRs, using MDRD, the number of subjects with eGFR >60ml/min were 46 and those with eGFR <60 ml/min was 1 patient. And in spouses it was 55 and 4 respectively and with CKD EPI it was 36 and 1 in FDRs, 46 and 3 in spouses. The total number of subjects with GFR < 60ml/min were four of which one subject was FDRs and remaining 3 subjects are spouses thereby making the incidence to be 0.005 and 0.036 respectively.

In our study, age, weight and height, female gender and blood pressure were found to be significant factors for lower GFR <60ml/min (Table 5). This is in concordance with other studies of lower GFR in female gender. Unlike in other studies, diabetes and hypertension were not associated with lower GFR in our study.

This study highlights the observation of low eGFR in spouses compared to FDRs. Whether low eGFRs translate in to existence of chronic kidney disease can only be confirmed by the presence of proteinuria. The possible explanation for these findings in our study may be due to older age, hypertension, high BMI in spousal group.

But this needs to confirm in a larger population study.

Though the role of environmental factors could not be assessed, it is understood almost all our patients come from low socioeconomic status. The smoking status, alcohol intake, herbal medicine usage and analgesic abuse were revealed by few patients. Data regarding duration of marriage life or cohabitation and the diet history including salt intake could not be recorded in all the patients and hence the results are not tabulated.

CONCLUSIONS
1. Spouses of maintenance hemodialysis patients had low eGFR compared to first degree relatives.
2. Factors associated with low eGFR were age, female gender, height, weight and blood pressure

Limitations
1. Assessment of proteinuria, hematuria, and lipid profile could not be done due to technical issues.
2. A single measurement of serum creatinine could only be done
3. Small population study done for a short period

REFERENCES
1. Modi G, Jha V. The incidence of end-stage renal disease in India: A population-based study. Kidney International. 2006;70(12):2131-3
2. Kher V. End-stage renal disease in developing countries. Kidney International. 2002; 62(1):350-62.
3. Singh AK, Farag YM, Mittal BV, Subramanian KK, Reddy SRK, Acharya VN, et al. Epidemiology and risk factors of chronic kidney disease in India - results from the SEEK (Screening and Early Evaluation of Kidney Disease) study. BMC Nephrol BMC Nephrology. 2013;14(1)
4. Tsai J-C, Chen S-C, Hwang S-J, Chang J-M, Lin M-Y, Chen H-C. Prevalence and Risk Factors for CKD in Spouses and Relatives of Hemodialysis Patients. American Journal of Kidney Diseases. 2010;55(5):856-66

5. Wei X, Li Z, Chen W, Mao H, Li Z, Dong X, et al. Prevalence and risk factors of chronic kidney disease in first-degree relatives of chronic kidney disease patients in Southern China. Nephrology. 2012; 17(2):123-30.
6. Inserra F, de la Llave G, Alpino M, Castagna R, de la Fuente I, Dorado E, Norbis M, Pinelli L, Puddu M, Santos JC, Vivas N, Marelli C. Survey of risk factors and renal disease in first-degree relatives of dialysis patients. Medicina (B Aires). 2007; 67(1):8-18. Spanish.
7. Bagchi S, Agarwal SK, Gupta S. Targeted Screening of Adult First-Degree Relatives for Chronic Kidney Disease and Its Risk Factors. Nephron Clinical Practice Nephron Clin Pract. 2010; 116(2):c128-c136.

How to cite this article: Yadla M, Burri S. Estimation of GFR in first degree relatives and spouses of patients on maintenance hemodialysis by using formulae. Int J Health Sci Res. 2016; 6(8):89-93.

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