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TO STUDY INFLUENCE OF AGE AND GENDER ON RENAL FUNCTION BY USING eGFR IN INDIAN HEALTHY POPULATION

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ABSTRACT
Background: Prevalence of chronic kidney disease is increasing and became one of the biggest health problem around the globe. Researchers in western countries had done researches on eGFR to diagnose the kidney disease at the initial stages and to prevent the progression of the disease. Indian population eGFR values varies from the western population eGFR. To evaluate the eGFR calculated using MDRD formula in different age groups of healthy Indian individuals and observe the association between GFR and age, gender in healthy Indian population. A total of 410 healthy individuals of age from 31 to 70 years were selected and divided into four groups accordingly to the age. Group I – 31 to 40 years, Group II – 41 to 50 years, Group III – 51 to 60 years and Group IV – 61 to 70 years. Serum creatinine levels was estimated by Jaffe's method. eGFR was assessed by MDRD formula. We observed a statistical significances between both the genders in the group I ($p < 0.001$), group II ($p < 0.001$), group III ($p < 0.05$) and group IV ($p < 0.001$). Females mean value of eGFR is slightly lower than the eGFR mean value of males. Among 410 healthy individuals age from 31 to 70 years, majority of the individuals have eGFR value less than 90 ml/min in both genders. Elderly individuals normally had low eGFR compared to adult individuals in many studies. Low eGFR value in elderly people should not be misdiagnosed as kidney disease. eGFR calculated using MDRD formula highlights the importances in diagnosing kidney disease except in elderly individuals..

Key words: eGFR, MDRD formula and kidney disease.

INTRODUCTION

Chronic kidney disease has become a prominent issue in the world wide health management. [1, 2] Chronic kidney disease prevalence is rapidly increasing in combination with other chronic diseases like diabetes mellitus, hypertension, etc. [3,4] For few decades serum creatinine levels was used as a standard marker of GFR to diagnose the kidney function but it is well known fact that serum creatinine is not an accurate marker of GFR because serum creatinine is directly influenced by muscle mass, age and gender.[5,6] Usually GFR values are lower in women compared to men. [7] The reasons hidden behind these facts are males have increased muscle mass than females and males maintain GFR by increasing the filtration fraction of the kidneys than females.[8] As age increases, the GFR decreases. This implies that age and GFR are inversely proportional to one another. [5].

Scientists have done researches to assess the GFR of the kidneys through another way and the researches had ended up with eGFR (estimated glomerular filtration rate) calculation using formulas. Formulas requires specific details like gender, serum creatinine levels, race, age, etc. eGFR can be calculated using different formulas.

Among all the formulas, Modification of diet in renal disease (MDRD) formula gives a better interpretation. [9, 10 & 11] Therefore of interest, we have decided to evaluate the eGFR values using MDRD formula

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in different age groups of healthy Indian population and observe the association between age, gender and GFR in healthy Indian population.

MATERIALS AND METHODS

The present study has been carried and approved by Sri Lakshmi Narayana Institute of Medical sciences, Pondicherry and obtained institutional ethics committee. Individual informed consents was signed by the participants. 410 healthy individuals were selected as the participants. According to the participants age, participants are categorized into four groups.

Group I (n = 100) – Participants age from 31 to 40 years were selected (50 male and 50 female participants)

Group II (n = 110) – Consists of participants age from 41 to 50 years were involved (55 male and 55 female participants)

Group III (n = 100) - Participants age from 51 to 60 years were selected (50 male and 50 female participants)

Group IV – Comprises of participants age from 61 to 70 years were included (50 male and 50 female participants)

Exclusion criteria for all the four groups are known alcoholic individuals, pregnant and lactating women. Blood samples were collected from the participants using vacutainers. These vacutainers were centrifuged at 3500 rpm for 10 minutes. Serum creatinine levels was analyzed by Jaffe's method in Konelab 20 fully automated analyzer on the same day of collection. National kidney foundation recommends MDRD formula for calculating eGFR.

$$eGFR = 186 \times (\text{Serum Creatinine levels})^{-1.154} \times (\text{Age in years})^{-0.203} \times (\text{If female}) 0.742 \times (\text{If black}) 1.210$$

The results of the parameters were expressed as mean ± standard deviation. Statistical analysis was done by Student's 'T' test and the p value was arrived to determine the statistical significances between the groups.

RESULT

In the present study, both the genders were classified according to the age of the participants.(Table – I) eGFR was arrived by MDRD formula in both genders of the participants. Mean and standard deviation of eGFR was determined in group – I, group – II, group – III and group – IV.(Table – II)

Table II shows a statistical significance between both the genders in the group I.($p < 0.001$) In group II, mean of the males are statistical significant when compared to the females mean.($p < 0.001$) A statistical significant p value was obtained between the genders of the group III.($p < 0.05$) The p value reported in the Group IV was statistical significant when compared between the genders.($p < 0.001$).

Female gender eGFR mean is slightly lower than the mean of male gender.

Participants having eGFR value greater than 90 ml/mim is considered as normal eGFR. Normal eGFR percentage was calculated in male and female gender among four groups. As the participants age ascents, normal eGFR percentage descents in the Table III.

Table IV shows a clear image of abnormal eGFR in participants of both genders among four age groups. eGFR value lesser than 90 ml/min in the participant is considered as abnormal eGFR. In group I, 56% of male and 96% of female have abnormal eGFR. Group II consist of 80% males and 93% females with abnormal eGFR values. 88% of males and 94% of females have abnormal eGFR in group III. Group IV have 66% of males and 100% of females with abnormal eGFR.

Table 1: Age and gender wise distribution of participants

AGE GROUPS (years)	MALE (n)	FEMALE (n)	TOTAL
GROUP – I (31 TO 40 years)	50	50	100
GROUP – II (41 to 50 years)	55	55	110
GROUP – III (51 to 60 years)	50	50	100
GROUP – IV (61 to 70 years)	50	50	100
TOTAL	205	205	410

Table 2: eGFR calculated using MDRD formula in the participants

AGE GROUPS (years)	MALE MEAN ± SD	FEMALE MEAN ± SD	P VALUE
GROUP – I (31 TO 40 years)	87 ± 11	71 ±12	<0.001
GROUP – II (41 to 50 years)	82 ± 18	68 ± 13	<0.001
GROUP – III (51 to 60 years)	71 ± 7	65 ± 14	<0.05
GROUP – IV (61 to 70 years)	79 ± 8.5	64 ± 16	<0.001

Table 3: Percentage of normal eGFR (eGFR > 90 ml/min) among different age groups in both genders

AGE GROUPS (years)	MALE		FEMALE	
	n	%	n	%
GROUP – I (31 TO 40 years)	22	44%	02	4%

GROUP – II (41 to 50 years)	11	20%	04	7%
GROUP – III (51 to 60 years)	06	12%	03	6%
GROUP – IV (61 to 70 years)	17	34%	-	-

Table 4: Percentage of abnormal eGFR (eGFR < 90 ml/min) among different age groups in both genders

AGE GROUPS (years)	MALE		FEMALE	
	n	%	n	%
GROUP – I (31 TO 40 years)	28	56%	48	96%
GROUP – II (41 to 50 years)	44	80%	51	93%
GROUP – III (51 to 60 years)	44	88%	47	94%
GROUP – IV (61 to 70 years)	33	66%	50	100%

DISCUSSION:

The present study have derived a statistical significant p values in all the four groups when male gender is compared to the corresponding female gender. D. Padma sree, et al had also concluded same results. [12] Our study have reported that females eGFR values are slightly lower than the males eGFR values. C. Kuriakose, et al study had shown that eGFR values was higher in males compared to females. This may be because of the gender specific variation in glomerular structure, hemodynamic conditions, activity of local cytokines, gene expressions and the effects of sex hormones on kidney cells [8]

Healthy individuals age and eGFR values are inversely proportional to one another in the present study. As the age increases, the normal eGFR percentage decreases in the healthy individuals. Decrease in GFR above 30 years of age is a normal biological process. [7] GFR descent begins above the age of 30 years and descent accelerated above the age of 60 years. Many studies had reported that GFR decreases with advancing age in normal individuals. [13,14 & 15] The association between age and eGFR strongly confounded each other in the study conducted. [16] This study result is inaccordance with our study

CONCLUSION

Out of 410 healthy individuals aged from 31 to 70 years, 345 individuals have abnormally low eGFR values in the present study. Similar results was also observed by the study.[17] The physiological factors involved in the ageing process that lowers the GFR are glomerulosclerosis, low activity of rennin angiotensin aldosterone system, increased vasoconstriction, impaired water, sodium and potassium balance, oxidative stress, endothelial dysfunction, etc. [10,18] Reduced GFR in the elderly individuals should not be recognized as kidney disease.[19 & 20] eGFR calculated by MDRD formula can be used to detect the impairment of kidney function at the initial stages. Hence, the conclusion of the present study is to include eGFR as a parameter in the renal function test and this may improve the diagnosis of kidney disease except in elderly individuals.

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