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## Community Study to estimate the GRF in rural population

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### ABSTRACT

Systemic hypertension and diabetes are major risk factors for the development of chronic kidney disease. The current study was aimed to estimate the prevalence of systemic hypertension, diabetes mellitus and proteinuria and GFR status in a population in Ernakulam. 519 subjects were screened using a questionnaire which chronicled the population demographics, education, occupation, diet, salt intake, smoking and alcohol intake habits, physical activity, past medical history, current treatment. The awareness questionnaire was filled chronicling the response of the subjects in the form. The prevalence of diabetes was 17.6% in our study. Microalbuminuria was reported in 24% males were observed to have a higher eGFR as compared to females ( $73.58 \pm 22.67$  vs  $55.59 \pm 13.5$ ). 43% of the study population had  $eGFR < 60$  ml/1.73m<sup>2</sup>. Awareness regarding the need for regular monitoring of blood pressure and blood glucose is low in our population

**Keywords:** Systemic Hypertension, Diabetes, Chronic Kidney Disease

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**BACKGROUND**

Diabetes mellitus has become a global health problem of epidemic proportions which is expected to increase in the near future <sup>1,2</sup>. Patients with diabetes mellitus have an increased risk of developing hypertension (HTN). Hence diabetes mellitus (DM) and arterial hypertension often coexist. The prevalence of hypertension in diabetic patients is almost two times that of the non-diabetic population. The presence of hypertension in a patient with diabetes causes an increase in major cardiovascular complications, mostly including myocardial infarction, ischemic stroke and congestive heart failure .Diabetes is also independently associated with the development of , microvascular complications, such as neuropathy, retinopathy, nephropathy<sup>1,2,3,4,5</sup>.

Insulin resistance/ hyperinsulinemia play an important role in the pathogenesis of hypertension in people with a genetic predisposition .Chronic hyperglycemia causes progressive renal damage through glycosylation of glomerular proteins. Insulin resistance/hyperinsulinemia also causes hypertension by reduced atrial natriuretic peptide activity which causes sodium retention and in turn causes volume expansion and hypertension<sup>6,7</sup>

Systemic hypertension and diabetes are major risk factors for the development of chronic kidney disease. CKD).<sup>8</sup>Early detection and treatment of kidney disease will prevent the progression of kidney disease. Detection of proteinuria and renal function assessment by estimating the GFR of subjects are the most commonly followed methods for assessing the kidney function.<sup>9</sup> The Indian population has a wide diversity in terms of the rural urban divide, diet followed, patient and population education and awareness of lifestyle disorders such as diabetes and hypertension. But in Kerala the rural urban divide is not observed with

improvement in the education and economic status of the population. There are a few studies reported from South India regarding the prevalence of hypertension (CURES-52 study 20% prevalence).<sup>10</sup> The current study was aimed to estimate the prevalence of systemic hypertension , diabetes mellitus and proteinuria and GFR status in a population in Ernakulam .

The current study was undertaken to estimate the prevalence of systemic hypertension, diabetes mellitus and asymptomatic proteinuria in the study population in Kottayam district at Athirampuzha (a semi urban area with a population of 35,000) and Aymanam (a rural area with a population of 32,000).

The study also intended to estimate the GFR by the MDRD formula and Cockcroft and Gault formula and estimate the change in eGFR associated with age and body mass Index (BMI). The study was also aimed at assessing the awareness of the population regarding hypertension and diabetes

**METHODOLOGY**

519 subjects were screened using a questionnaire which chronicled the population demographics, education, occupation, diet, salt intake, smoking and alcohol intake habits, physical activity, past medical history, current treatment. Biochemistry included urine analysis (leukocytes, nitrates, glucose, Proteins, specific gravity, creatinine), serum Creatinine (Jaffe’s method), Hemoglobin, fasting blood glucose, albuminuria (estimated by dipstick method). The awareness questionnaire was filled chronicling the response of the subjects in the form. (Table 1). The body mass index and body surface areas were calculated from the demographic data using standard formulae (Table 2).

**Table 1 : Awareness Questionnaire**

<p>Are you aware of:</p> <ol style="list-style-type: none"> <li>1. The need for checking blood pressure even if asyymptomatic after 30 years of age ( Y/N)</li> <li>2. Stage called prehypertensive ( Y/N)</li> <li>3. Annual blood sugar estimation is necessary after the age of 40 ( Y/N)</li> <li>4. Treatment is continuous and there is no cure( Y/N)</li> <li>5. Uncontrolled BP and diabetes will lead to irreversible kidney damage( Y/N)</li> <li>6. If diabetes or high blood pressure are present how often do you check the blood sugar / B P</li> </ol>
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**Table 2: Standard formulae**

BMI= weight in kg / Height in cms 2
Body surface = $\sqrt{\text{Height ( cms) X weight (kg) /3600}}$
MDRD = GFR ( ml /min/1.73m2)= $186 \times (\text{Scr})^{-1.154} \times (\text{Age})^{-0.203}$ in males x ( 0.742 in females)
Cockcroft –Gault formula= $(140 - \text{age} \times \text{weight in kg} / \text{S. Creatinine in mg\%} \times 72 ) \times 0.85$ ( for females)

**Statistical analysis:** Statistical analysis was done by using SPSS version 11.0. Precision was calculated as standard deviation (SD) of the difference. The accuracy of each equation was calculated as proportion (%) of patients with estimated GFR within 30% of measured gold standard GFR. The level of significance was set at p<0.05.

**Observations:** 519 respondents were enrolled in the study. The mean age of the patients was 53.72±13.99 years. The mean age and distribution of males and females included in the study was comparable (53.10 ±14.74 years [49.3%] and 54.3 ±13.21 years [50.7%] respectively). The highest distribution of subjects was in the age group of 41-60 years (48.16 %). (Table 3)

**Table 3**

Age group	Number of patients	Percentage
<30	21	4.7
31-40	80	15.41
41-50	127	24.47
51-60	123	23.69
61-70	103	19.65
>70	65	12.52

The highest number of hypertensive patients was observed in the age group of 60 -69 years ( 24.3%) while in the age group of 40 to 60 years the prevalence of hypertension was 26.4% .( Fig 1). The highest prevalence of diabetes was observed in patients > 70 years of age (30%) followed by patients in the age group of 40 -49 years (22%) (Fig 2). Dipstick positive proteinuria was observed in 124 subjects (23.9%). Significant proteinuria (>

300/24 hours) was observed in 0.9% patients .3 patients in the study population had diabetic nephropathy and 1 patient had undergone renal biopsy which was suggestive of IgA nephropathy. The eGFR appeared comparable by both the MDRD formula and Cockcroft & Gault formula but there was a wide variability observed which contributed to the high standard deviation (Table 4).

**Table 4**

Sex	Number of subjects	%	MDRD GFR ( Mean± SD)	Cockroft & Gault formula ( Mean ±SD)
Male	256	49.3	67.5±20.5	66.71±24.9
Female	263	50.7	55.04±14.5	55.17±15.41
	N=519	100	61.2±18.2	60.17%±19.12

In the normal subjects who were non hypertensive and non-diabetic the mean eGFR was 64.49±20.52. 43% of these normal subjects had eGFR <60ml/1.73m<sup>2</sup>. Of the study population 266 patients (51.2%) had eGFR < 60 ml/1.73m<sup>2</sup> while 110( 57%) had e GFR > 60 ml/1.73/m<sup>2</sup>. eGFR was observed to have a negative correlation with age and BMI ( Fig 2 and Fig 3).eGFR showed a

significant reduction in prehypertensive and hypertensive patients as compared to normotensive subjects .(57.56±6.62 vs 63.69; p< 0.05). eGFR decreased significantly in subjects with dipstick positive proteinuria as compared to dipstick negative subjects ( 61.8±19.0 vs 70.48±13.73; p<0.05). No change in MDRD GFR was observed

in diabetes patients as compared to normal subjects (60.58±17.67 and 61.3±19.01).

Subject response to the awareness questionnaire indicated that 69.3% subjects were unaware that regular monitoring of blood pressure and blood glucose is essential for the prevention of chronic kidney disease.

## DISCUSSION

The prevalence of hypertension in our study population was observed to be 13.9% which is comparable to the reported prevalence in CURES study (52%). The pre-hypertensives constituted 26.8% in our study population. This is an important group of subjects where patient education, awareness and lifestyle interventions can play a major role in the prevention of hypertension, diabetes and the related complications in the future. The prevalence of diabetes was 17.6% in our study. Microalbuminuria was reported in 24% of our subjects. In the current study males were observed

to have a higher eGFR as compared to females (73.58 ±22.67 vs 55.59±13.5). 43% of the study population had eGFR < 60 ml/1.73m<sup>2</sup>. The high variability observed with the Cockcroft and Gault formula, it cannot substitute the MDRD formula for eGFR calculation inspite of its ease of use .eGFR was negatively correlated with age and BMI and blood pressure. Diabetes did not show any correlation with eGFR perhaps due to hyperfiltration and hyperfunction.

## Conclusions

The eGFR in our population was found to be lower than the Western population. Awareness regarding the need for regular monitoring of blood pressure and blood glucose is low in our population. MDRD is a better method for estimating the eGFR.

## Limitations of our study

The small size of the population is the main limitation of our study. Secondly it was not a door to door survey. GFR was not compared to the gold standard

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