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Cardiovascular Status in Newly Detected Chronic Kidney Disease Patients

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ABSTRACT

Objective: *Cardiovascular disease is one of the leading causes of morbidity and mortality among chronic kidney disease patients. This study aims to assess the cardiovascular status of newly detected chronic kidney disease patients in northern India.* ***Methods:*** *All the patients who attended renal OPD were reviewed (for one year). Patients with elevated blood urea and serum creatinine levels with confirmed medical renal disease on USG were included in the study. Any history of previous renal disease/failure, rheumatoid arthritis, documented connective tissue disorders, liver disorders, malignancy, pregnancy, hypertension, diabetes mellitus, smoking, were excluded from the current study. Total of 42 newly detected CKD patients was included in the study. Their ECG and echocardiography were performed.* ***Results:*** *ECG analysis revealed no rhythm or ischemic disease but 27 out of the 42 patients (64.29%) showed mild to moderate left ventricular hypertrophy. The echocardiographic examination confirmed the hypertrophy diagnosis in 61.9% of patients.* ***Conclusion:*** *Newly diagnosed CKD patients even without previous history of cardiovascular symptoms may be present with advanced cardiovascular abnormalities. Cardiovascular and kidney diseases may have a common cause and together result in a very poor prognosis. Thus screening, early diagnosis, and treatment of these risk factors must become a priority.*

Keywords: Chronic kidney disease, Cardiovascular disease, Serum, Anemia

INTRODUCTION

Chronic kidney disease (CKD) is an important health issue because of its high morbidity and mortality. The etiology of CKD varies considerably throughout India and its prevalence in different regions ranges from <1% to 13% [1]. Traditionally, health programs for the prevention of chronic diseases mainly focused on hypertension, diabetes mellitus and cardiovascular disease (CVD), however, the increase in the prevalence of chronic kidney disease (CKD) progressing to end-stage renal disease (ESRD) and the consequent financial burden of renal replacement therapy (RRT) in both developed as well as developing nations has highlighted the importance of CKD and its risk factors [2,3]. The diagnosis of renal failure is usually based on serum creatinine alone, which is likely to underestimate the magnitude of CKD. The known risk factors for CKD include diabetes, hypertension, renal stone disease, etc. Diabetes mellitus is the most common cause of CKD constituting approximately 30% of the patients [2].

As the average age is increasing in India, the threat of non-communicable and chronic diseases is also increasing. Cardiovascular disease (CVD) is one of the leading causes of morbidity and mortality among them. CKD is characterized by a progressive and significant reduction in Glomerular filtration rate (GFR). This occurs gradually and the time period of its occurrence may vary from months to several years. Estimates of the increase in CVD risk attributable to CKD range from 10-200 fold depending on the stage of CKD. Between 30% and 45% of patients reaching ESRD (end-stage renal disease), already have advanced cardiovascular complications. DM and HTN are

not only risk factors but also the consequences of CKD [4]. Thus, in order to reduce morbidity and mortality, it is important to know the cardiovascular status of CKD patients since the time of CKD detection.

This study aims to assess the cardiovascular status of newly detected chronic kidney disease patients in northern India.

MATERIALS AND METHODS

After obtaining institutional ethics approval this cross-sectional study was done in collaboration with the Department of Cardiology at government hospital affiliated to JLN medical college, Ajmer. Prior informed consent was obtained from all patients included in the study. Strict inclusion and exclusion criteria were set for the study. Patients with elevated blood urea and serum creatinine levels with confirmed medical renal disease on USG were included in the study. Blood urea estimation was done using diacetyl monoxime (DAM) method, serum creatinine estimation using COBAS auto analyzer and USG whole abdomen was done with special emphasis on kidneys, ureters, prostate (if male) and urinary bladder.

Any history of previous renal disease/failure, surgical cause of CKD, rheumatoid arthritis, documented connective tissue disorders, liver disorders, malignancy, pregnancy, IHD, hypertension, DM, smoking, etc. were excluded from the current study.

We reviewed all the CKD patients which came to OPD for one year and considering the exclusion and inclusion criteria, finally, 42 newly detected CKD patients were included.

Socio-demographic and clinical data were collected. The study patients were subjected to relevant investigations including cardiovascular risk factors assessment, systolic and diastolic blood pressures and 12 lead ECG electrocardiogram (diagnosis of LVH based on Sokolon-Lyon criteria [5]) and echocardiographic data was obtained.

Data was enumerated in Microsoft excel spreadsheet. Mean and the standard deviation was calculated. Analysis of data was done utilizing the software-Epidemiological Information Package 2002 (Epi info 2002) developed by the centers for Disease Control and Prevention-Atlanta, the USA for the World Health Organization.

RESULTS

The mean age of the population was 48.6 ± 10.3 years. Almost 70% of the patients were between 40-60 years of age; of which most of the females were <50 years of age whereas men were >50 years. Given below is the age distribution of the population (Table 1).

Table 1 Age characteristics of the population

Age (years)	Study Group		
	Male	Female	Total (%)
<30	2	0	2 (4.8%)
30-40	3	4	7 (16.7%)
40-50	8	6	14 (33.3%)
50-60	14	1	15 (35.7%)
>60	2	2	4 (9.5%)
Total	29	13	42 (100%)

Diagnosis of CKD was based on the blood urea and serum creatinine levels. Despite having normal blood sugar levels and BMI, the mean values pulse rate, systolic and diastolic BP is much above the normal levels. The mean values are tabulated in Table 2.

Table 2 Cardiovascular and renal vitals of the population

Parameter	Study Group (n=42)	
	Mean ± SD	Range
Heamoglobin (gm/dl)	8.75 ± 1.30	5.2-10.9
Blood Sugar Level (mg/dl)	101.5 ± 15.8	68-126
BMI (kg/m^2)	17.95 ± 2.05	14.2-22.2
Pulse (bpm)	103 ± 7	90-115
Systolic Blood pressure (mmHg)	165.0 ± 23.8	110-240

Diastolic Blood pressure (mmHg)	104.0 ± 13.3	70-140
Blood Urea (mg/dl)	143.0 ± 46.1	68-252
Serum Creatinine (mg/dl)	6.50 ± 2.83	2.2-13.8

ECG analysis revealed no rhythm or ischemic disease but 27 of the 42 patients (64.29%) showed mild to moderate left ventricular hypertrophy (Table 3). The echocardiographic examination confirmed the ECH based hypertrophy diagnosis in 61.9% of patients. Patients were primarily presented with complaints of chest pain, palpitation, dyspnea and sign/symptoms of oliguria, pedal edema.

Table 3 ECG, ECHO and clinical findings of the population

Parameter		Study Group (n=42)	Percentage (%)
ECG	Normal	15	35.71%
	Abnormal (LVH)	27	64.29%
Echocardiographic	Normal	16	38.10%
	Abnormal (LV dysfunction)	26	61.90%
Chest Pain		24	57.14%
Palpitation		20	47.62%
Pedal Edema		38	90.48%
Dyspnoea	Rest	14	33.33%
	Exertion	28	66.67%
Oliguria		40	95.24%

DISCUSSION

Anemia is commonly seen in CKD. Untreated anemia leads to left ventricular hypertrophy which increases the risk of sudden death [6]. Similar observations were made among CKD patient of the present study. It was found that 36 of the 42 CKD (85.7%) patients suffered from anemia. Results of this study show that despite without any previous history of diabetes (current mean BSL 101.5 ± 15.8 mg/dl) and hypertension, tachycardia and hypertension was present at the time of diagnosis of the CKD. It is well known that hypertension is particularly the common cause and consequence of CKD, especially in the elderly. Early development of hypertension during the course of CKD is associated with adverse outcomes due to a rapid loss in renal function and development of cardiovascular diseases [7]. It should be noted that because the death precedes the progression to end-stage renal disease (ESRD), the majority of patients do not progress to advanced stages of CKD [8]. The risk of death as compared to the risk of progression to ESRD is higher in older patients with established CKD. Since our results show that most men and women diagnosed with newly detected CKD are above 40 years of age, the risk of developing cardiovascular risk factors increases. Same is indicated by the results of Table 2 and the development of hypertension without obesity indicates a probable renal cause. Thus early identification of CKD as a major risk factor for cardiovascular morbidity and mortality and the expectation of effective interventions to diminish premature cardiovascular mortality and increasing longevity overall will increase the cohort of patients reaching ESRD [9]. There is evidence in which RAS blockers have shown benefit to the patients as they also lower the blood pressure [9].

CKD at all stages constitutes a major risk factor for ischaemic cardiovascular disease, including occlusive coronary heart disease, cerebrovascular disease and peripheral vascular diseases [10]. The results of our study show no ischemic changes in the ECG of the newly detected CKD patients. It has been shown that increased ischemic diseases are primarily associated with chronic CKD [7]. Haemodialysis causes micro-inflammation that leads to a rise in acute phase reactants thereby contributing to the coronary occlusive phenomena.

Our results indicate that around 65% of patients had LVH. It is known that hypertrophy reduces myocardial tolerance to ischemia and microvascular disease [7]. As the CKD progresses the reactive oxygen species and acute phase reactants cause a decrease in the nitric oxide levels. This limits the vascular dilatation capacity and increases the chances of morbidity and mortality. Left ventricular hypertrophies is among the most ominous risk factors for excess cardiovascular morbidity and mortality in patients with CKD and ESRD and are thought to be related primarily to prolonged hypertension and extracellular fluid volume overload [7].

In the present study, the echocardiographic evaluation revealed that out of the 42 CKD patients only 16 had a normal cardiac function and 26 patients (61.9%) had cardiovascular abnormalities in the form of left ventricular hypertrophy, LV dysfunction, and pericardial effusion.

CONCLUSION

Newly diagnosed CKD patients even without previous history of cardiovascular symptoms may present with advanced cardiovascular abnormalities. Cardiovascular and kidney diseases may have a common cause and together result in a very poor prognosis. Thus screening, early diagnosis, and treatment of these risk factors must become a priority. Physicians must be vigilant to preview cardiovascular disease in patients with newly diagnosed CKD and take appropriate measures to promote healthy living.

Limitations of this study

Hypertension could be the cause or the consequence of CKD and CKD patients with comorbid conditions, though common were not included for this study.

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