

Original Research Article

Cardiovascular morbidity and dyslipidemia in chronic kidney disease: a cross-sectional study

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ABSTRACT

Background: CKD is a risk factor for CVD and dyslipidemia is an important co-morbidity associated with both. CKD can lead to variations in lipid profile which can lead to atherosclerosis and thereby increase the risk for CVD. Objective was to analyse the clinical and diagnostic cardiovascular features of CKD patients and the associated variations in their lipid profile.

Methods: This prospective study was conducted from May 2015 to May 2017 among 100 patients attending to Medicine department with documented biochemical and sonographic evidence of chronic kidney disease. The included participants were subjected to routine blood investigations including lipid profile and cardiovascular evaluation which included electrocardiography (ECG), chest X-ray and M-mode 2-Dimensional echocardiography. Data was recorded in a proforma and the results were analysed statistically.

Results: The study included 100 patients with chronic kidney disease, majority (n=42, 42%) of them belonging to the 40-50 years age group. There was similar (p=0.78) representation of males and females in the study. Significantly (p=0.02) higher number (n=58) of alcoholics were present among the CKD patients. Significantly (p=0.04) higher proportion of patients with CKD had high TG (36%) and low HDL (30%) levels. Majority (58%) had CVD morbidity and Left ventricular hypertrophy was a characteristic feature in majority (n=15%) of the CKD patients as evaluated by ECG and ECHO.

Conclusions: The study documented the association of CVD and dyslipidemia with CKD. It also revealed ECG and ECHO changes in CKD patients which can be useful predictors in determining the progression of the CVD complications in CKD.

Keywords: Chronic Kidney disease, Cardio-vascular disease, Dyslipidemia

INTRODUCTION

Chronic Kidney disease (CKD) is classified by the National Kidney Foundation as “the highest risk” factor for cardiovascular disease (CVD) regardless of the influence of other traditional CVD risk factors like diabetes, hypertension, obesity, dyslipidemia, smoking, etc.¹ A population-based survey which was conducted in two major cities in India viz: Delhi and Chennai, called

“Center for Cardio-metabolic Risk Reduction in South Asia surveillance (CARRS) study” showed that the overall prevalence of CKD was 7.5% (6.6% in Chennai and 8.1% in Delhi).²

Mortality due to CVD in CKD in developing countries is approximately 15 times higher than CKD seen in the other causes. It is also evident from the data showing 40-50% of all deaths in End Stage Renal Disease (ESRD) patients

were due to CVD.³ Dyslipidemia is another ally in the relationship between CKD and CVD. CKD does not influence the production rate of lipids in anyway, but it leads to down regulation of the LDL-and lipoprotein lipase receptors along with delaying the catabolism of triglyceride rich lipoproteins leading to increased triglycerides and lower HDL levels without much alteration in cholesterol and LDL.⁴

The data connecting CKD, CVD and dyslipidemia and the cardiovascular morbidity pattern is sparsely available in India and is scope of this study. The present study aimed at analysing the clinical and diagnostic cardiovascular features of CKD patients and obtains a relationship with their lipid profile.

METHODS

This prospective study was conducted in Sri Venkateshwarra Medical College Hospital and Research Centre, Ariyur, Puducherry, from May 2015 to May 2017 among 100 patients admitted with documented biochemical and sonographic evidence of chronic kidney disease. Initially an Institutional Ethics Committee approval was obtained before the start of the study. All the patients included in the study were explained in their own local language about the nature of investigations to be conducted on them and its safety was reassured before taking a written informed consent from each participant. Patients with previous documented congenital cardiovascular diseases and critically ill subjects were excluded from the study.

A detailed history about the cardiovascular symptoms and risk factors like smoking, alcohol, hypertension, diabetes, dyslipidemia and usage of oral contraceptive pills were recorded in a proforma followed by detailed clinical cardiovascular examination. The patients were then subjected to routine blood investigations including lipid profile and cardiovascular evaluation which included electrocardiography (ECG), chest X-ray and M-mode 2-dimensional echocardiography.

Statistical analysis

Data entry and analysis was done using SPSS version 19. The data was presented descriptively as proportions and percentages. Mean comparison was done using Student t-test and categorical variables were associated using chi-square test. A p-value of 0.05 was fixed as level of significance within 95% confidence limits.

RESULTS

The study included 100 patients with chronic kidney disease, majority (n=42, 42%) of them belonging to the 40-50 years age group (Table 1).

There was similar (p=0.78) representation of males and females in the study. Significantly (p=0.02) higher

number (n=58) of alcoholics were present among the CKD patients. Majority of the participants were newly diagnosed to have cardio-vascular diseases (n=65) and were anaemic (n=68) (p<0.001).

Table 1: Clinico-demographic profile of study participants (N=100).

Demographic variable	Number(%)	P-value*
Age group (in years)		
< 40 years	41 (41)	<0.001
40-50 years	42 (42)	
>60 years	17 (17)	
Gender		
Male	51 (51)	0.78
Female	49 (49)	
Alcoholism		
Non-alcoholic	42 (42)	0.02
Alcoholic	58 (58)	
Cardiovascular status		
Previously known CVD	35 (35)	<0.001
Newly diagnosed CVD	65 (65)	
Anaemia		
Present	68 (68)	<0.001
Absent	32 (32)	

*chi-square test

The association of CKD with dyslipidemia as mentioned earlier had significant changes in HDL and Triglyceride levels. Significantly (p=0.04) higher proportion (36%) of patients with CKD had high TG and low HDL (30%) levels (Table 2).

Table 2: Lipid profile variations associated with CKD (TG and HDL) N=100.

Lipid profile variable	Number (%)	P-value*
Serum triglycerides (TG)		
150-199 mg/dl (borderline high)	40 (40)	0.04
200-499 mg/dl (high)	36 (36)	
<150 mg/dl (normal)	24 (24)	
High density lipoprotein (HDL)		
40-60 mg/dl (normal)	43 (43)	0.04
< 40 mg/dl (too low)	30 (30)	
> 60 mg/dl (protective)	27 (27)	
Chylomicron		
Present	52 (52)	0.57
Absent	48 (48)	

*chi-square test

The cardio-vascular status of the CKD patients as evaluated by ECG showed varying cardiovascular morbidity pattern among 58% and ECHO showed morbidity in 28% of the subjects (Table 3).

Left ventricular hypertrophy was a characteristic feature in majority (n=15%) of the CKD patients as evaluated by ECG and ECHO.

DISCUSSION

Chronic Kidney disease (CKD) has been identified as a CVD risk equivalent in the year 2007 by European Society of Cardiology and the European Atherosclerosis Society.⁵ The essential task of CVD risk identification in CKD patients becomes more important as CKD is a common partner with CVD in the sequelae of many chronic diseases including Diabetes and Hypertension. CKD is also a common incident complication among chronic alcoholics, nevertheless to mention the rampant prevalence of alcoholism in Puducherry.

Table 3: Cardiovascular changes in ECG and ECHO among CKD patients.

Cardiovascular changes in ECG and ECHO	Number	(%)*
ECG findings	N=58	
Left ventricular hypertrophy	15	25.9
Right atrial enlargement	15	25.9
Q waves	11	19.0
Left atrial enlargement	11	19.0
Right ventricular hypertrophy	6	10.2
Echo findings	N=28	
Left ventricular dilatation (LVD)	9	32.1
Left atrial dilatation (LAD)	8	28.6
Left ventricular hypertrophy (LVH)	7	25.0
LV diastolic dysfunction	4	14.3

*Percentage indicates column percentage

In the present study, it was identified that there was a significant ($p=0.02$) higher proportion of alcoholics (58%) who were incident with CKD. In a previous study pertaining to development of cerebral haemorrhages among Asian population, it was documented that alcoholism and CKD were major associates. The reason for such association was not clearly demarcated by the authors but there was a proposed atherosclerotic vascular disease related hypertension as a reason for the same.⁶ This delineates that CKD in alcoholics may be associated with changes in lipid composition leading to atherosclerosis. In this study, a keen observation of the derangement in the lipid profile showed that there were a significantly higher number of CKD patients with elevated levels of triglycerides, too low HDL and presence of chylomicrons (Table 2).

There was no significant alteration in LDL and cholesterol. Previous available literature states that Hepatic lipase can hydrolyze triglycerides, HDL and phospholipid in chylomicrons remnants.⁷ In CKD, there is decreased expression of hepatic lipase which leads to accumulation of the atherogenic chylomicrons.^{8,9}

The study identified ECG and ECHO changes (Table 3) in considerable number of patients among whom left ventricular hypertrophy/dilatation followed by right sided heart dilatation which was clear manifestation of excess fluid overload and peripheral vascular resistance due to

improper fluid excretion in CKD. In the ECG study by Mozos et al in 2015 and Shafi et al.^{10,11} recently in 2017, similar results were recorded as changes in CKD patients. These changes cannot be earmarked as specific for CKD but can be used as markers in predicting CVD severity or prognosis in CKD which is a scope for future research.

CONCLUSION

The study documented the association of CVD and dyslipidemia with CKD. It also revealed ECG and ECHO changes in CKD patients which can be useful predictors in determining the progression of the CVD complications in CKD. The study also recommends cardiovascular evaluation of all CKD patients as a routine protocol which would include lipid profile, ECG and ECHO to enunciate tertiary prevention of CKD.

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