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Incidence of Cardiac Valvular Calcification and Its Associated Factors in Chronic Kidney Disease

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Abstract: To study the incidence of cardiac valvular calcification and its associated factors in chronic kidney disease. 153 subjects (78 chronic kidney disease patients, 75 controls with age and sex matched) attending ESIC Hospital, Chennai were utilized for the current study. Patients of stages 3 to 5 with matched controls of age and sex were considered for this study. Cases were classified in to different stages of chronic kidney disease based on estimated Glomerular Filtration Rate which was calculated using Cockcroft-Gault equation using age, body weight, and serum creatinine. Echocardiogram was done for the patient with chronic kidney disease to assess cardiac valvular calcification. 51% of the subjects in the study group were detected as having chronic kidney disease in ultrasonogram. 20% of the patients in the study group were having coronary artery disease compared to 4% in the control group. Cardiac valvular calcification and coronary artery disease are associated with higher incidence in chronic kidney diseases.

Keywords: cardiac**,** diabetes mellitus, hypertension, valvular.

INTRODUCTION

Valvular lesions in Chronic kidney disease (CKD) are acquired and are due to dystrophic calcification. Hypertension leads to the early development of cardiovascular disease in CKD which is the leading cause of increased morbidity and mortality [1]. Cardiac risk in CKD is also increased by the development of valvular lesions. Most of the valvular lesions in CKD are acquired and due to dystrophic calcification. Mitral and aortic valves are commonly involved.

The prevalence of aortic calcification is about 55% and mitral valve involvement is about 39% [2] Coronary artery calcification predisposes CKD patients for cardiovascular related increased mortality. Calcification results in valvular calcification, left ventricular failure and myocardial infarction leading to increased mortality. Peripheral artery calcification is also common in CKD patients [3]. Atherosclerosis commonly involves the larger arteries. Medial thickening and calcification may also involve the smaller elastic arteries. This is termed as Monckeberg calcification or medial calcinosis. Monckeberg calcification is more common in patients with diabetes, kidney disease, and advanced aging [4]. The incidence of coronary artery disease is more in dialysis patients compared to patients not on dialysis.Aortic valve calcification is more common in late stages of CKD and those on chronic dialysis [5].The present study planned to study the incidence of cardiac valvular calcification and its associated factors in chronic kidney disease.

MATERIALS AND METHODS

153 subjects (78 chronic kidney disease patients, 75 controls with age and sex matched) attending ESIC Hospital, Chennai were utilized to study the incidence of cardiac valvular calcification in chronic kidney disease in Chennai population. Patients of stages 3 to 5 with matched controls of age and sex were considered for this study. Cases were classified in to different stages of chronic kidney disease based on estimated Glomerular Filtration Rate (eGFR) which was calculated using Cockcroft-Gault equation using age, body weight, and serum creatinine.Documented elevated renal parameters for more than 3 months,Ultrasonography suggestive of chronic kidney disease and Patients on dialysis for chronic kidney disease were included in the present study whereas Patients with past history of coronary heart disease, unstable angina, myocardial infarction, rheumatic valvular heart disease and congenital heart disease were excluded in our study. Detailed history with clinical examination was done for the individuals with chronic kidney disease and also the control subjects.Echocardiogram was done for the patient with chronic kidney disease to assess cardiac valvular

calcification.The present study was in clearance with human ethical committee, ESIC Hospital, Chennai.

RESULTS

In the present study subjects between the 41-60 years age group were 61% while 19% were aged 61-70 years (Table-1). Majority of the study subjects were males (64%) while the remaining 36% were females (Table-2). We have noted 51% of the subjects in the study group were detected as having chronic kidney disease in ultrasonogram (Table-3) and 20% of the patients in the study group were having coronary artery disease compared to 4% of control group (Table-4). The proportion of calcification between study group and control group by echo cardiogram was statistically significant (Table-5). Most of the valve calcifications in study group were seen with eGFR less than 15 (Table-6). The difference in calcification between patients on dialysis and patients not on dialysis was statistically significant (Table-7). We have noted 69% of the subjects were found to be hypertensive in the study group compared to 11% in the control group (Table-8). In the study group 19% were diabetic compared to 7% in the control group (Table-9). In this study, out of 153 patients valvular calcification was seen in about 14 patients. We have noted valvular calcification was about 17% in study group and is only1% in the control group (non CKD group) and mitral annular calcification was seen in 11 patients and aortic valve calcification was seen in 3 patients (Table-10).

Table-1: Age distribution of the study population (n=153)

Age group	Study group N (%)	Control group N (%)	Total N (%)
21-30 years	0 (0)	5 (6.7)	5 (3.3)
31-40 years	16 (20.5)	9 (12)	25 (16.3)
41-50 years	30 (38.5)	28 (37.3)	58 (37.9)
51-60 years	17 (21.8)	19 (25.3)	36 (23.5)
61-70 years	15 (19.2)	14 (18.7)	29 (19)
Total	78 (51)	75 (49)	153 (100)

Table-2: Gender distribution of the study population (n=153)

Gender	Study group N (%)	Control group N (%)	Total N (%)
Female	29 (37.2)	26 (34.7)	55 (35.9)
Male	49 (62.8)	49 (65.3)	98 (64.1)
Total	78 (51)	75 (49)	153 (100)

Table-3: Distribution of the study population according to USG findings (n=153)

USG findings	Study group N (%)	Control group N (%)	Total N (%)
Chronic kidney disease	78 (100)	0 (0)	78 (51)
No abnormality	0 (0)	75 (100)	75 (49)
Total	78 (51)	75 (49)	153 (100)

Table-4: Distribution of the study population according to coronary artery disease (n=153)

Coronary artery disease	Study group N (%)	Control group N (%)	Total N (%)
Present	20 (25.6)	4 (5.3)	24 (15.7)
Absent	58 (74.4)	71 (94.7)	129 (84.3)
Total	78 (51)	75 (49)	153 (100)

Table-5: Distribution of calcification in echocardiogram among population (n=153)

Echocardiogram	Frequency	Percent
Aortic calcification	3	2.0
Mitral annular calcification	11	7.2
No calcification	139	90.8
Total	153	100.0

Table-6: Cardiac valvular calcification and e GFR levels in the study group (n=78)

GFR group	Calcification	No calcification	Total
30-59	0 (0%)	3 (100%)	3 (100%)
15-29	3 (11.1%)	24 (88.9%)	27 (100%)
<15	10 (20.8%)	38 (79.2%)	48 (100%)
Total	13 (16.7%)	65 (83.3%)	78 (100%)

Table-7: Cardiac Valvular Calcification and Dialysis association in the study group (n=78)

Dialysis	Calcification	No calcification	Total
Dialysis	8 (53.3%)	7 (46.7%)	15 (100%)
No dialysis	5 (7.9%)	58 (92.1%)	63 (100%)
Total	13 (16.7%)	65 (83.3%)	78 (100%)

Table-8: Distribution of the study population according to Hypertension (n=153)

Hypertension	Study group N (%)	Control group N (%)	Total N (%)
Present	69 (88.5)	11 (14.7)	80 (52.3)
Absent	9 (11.5)	64 (85.3)	73 (47.7)
Total	78 (51)	75 (49)	153 (100)

Table-9: Distribution of the study population according to type-2 diabetes mellitus (n=153)

Diabetes mellitus	Study group N (%)	Control group N (%)	Total N (%)
Present	19 (24.4)	7 (9.3)	26 (17)
Absent	59 (75.6)	68 (90.7)	127 (83)
Total	78 (51)	75 (49)	153 (100)

Table-10: Distribution of the study population according to calcification in echocardiogram (n=153)

Echocardiogram	Frequency	Percent
Aortic calcification	3	2.0
Mitral annular calcification	11	7.2
No calcification	139	90.8
Total	153	100.0

DISCUSSION

Majority of the patients with cardiac valvular calcification were found to be hypertensive with high incidence [6, 7]. Hypertension is a major risk factor for CKD. The systolic hypertension in elderly program, have established a strong relationship between hypertension and rate of decline in kidney function and development of kidney failure [1]. Increased arterial calcification in coronary, renal and iliac arteries in CKD patients on dialysis compared to non-dialysis patients. Recent studies revealed increased coronary artery calcification in diabetic CKD patients not on dialysis. Nearly 50 to 60% of patients on haemodialysis have coronary artery calcification. Diabetic nephropathy is the most common cause and found to be 32% among CKD patients with at least one valvular calcification [8]. Diabetes is also a prominent risk factor for mitral annular calcification in CKD. About 47% of patients with valvular calcification were found to be diabetic indicating highly significance and in agreement with previous literature [7]. The incidence of coronary artery calcification was 1.4% in non-diabetic non-CKD patients and is about 3.5% in non-diabetic CKD patients. Valvular calcification is strongly associated with coronary artery disease and hence increased cardiovascular mortality in CKD [9]. Significantly high incidence of valvular calcification in CKD patients was found in the present study in agreement with previous studies [10].

CONCLUSION

Current study reports that cardiac valvular calcification and coronary artery disease are associated with higher incidence in chronic kidney diseases.

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REFERENCES

1. Miller PL, Rennke HG, Meyer TW. Glomerular hypertrophy accelerates hypertensive glomerular injury in rats. American Journal of Physiology-Renal Physiology. 1991 Sep 1;261(3):F459-65.
2. Amaresan MS. cardiovascular disease in chronic kidney diease. Indian Journal of Nephrology. 2005;15:1-7.

3. Shanahan CM, Crouthamel MH, Kapustin A, Giachelli CM. Arterial calcification in chronic kidney disease: key roles for calcium and phosphate. Circulation research. 2011 Sep 2;109(6):697-711.
4. Boon A, Cheriex E, Lodder J, Kessels F. Cardiac valve calcification: characteristics of patients with calcification of the mitral annulus or aortic valve. Heart. 1997 Nov 1;78(5):472-4.
5. Kasper D, Fauci A, Hauser S, Longo D, Jameson J, Loscalzo J. Harrison's principles of internal medicine, 19e.
6. Fox CS, Larson MG, Vasan RS, Guo CY, Parise H, Levy D, Leip EP, O'Donnell CJ, D'Agostino RB, Benjamin EJ. Cross-sectional association of kidney function with valvular and annular calcification: the Framingham heart study. Journal of the American Society of Nephrology. 2006 Jan 1;17(2):521-7.
7. Leskinen Y, Paana T, Saha H, Groundstroem K, Lehtimäki T, Kilpinen S, Huhtala H, Airaksinen J. Valvular calcification and its relationship to atherosclerosis in chronic kidney disease. J Heart Valve Dis. 2009 Jul 1;18(4):429-38.
8. Merjanian R, Budoff M, Adler S, Berman N, Mehrotra R. Coronary artery, aortic wall, and valvular calcification in nondialyzed individuals with type 2 diabetes and renal disease. Kidney international. 2003 Jul 1;64(1):263-71.
9. Fox E, Harkins D, Taylor H, McMullan M, Han H, Samdarshi T, Garrison R, Skelton T. Epidemiology of mitral annular calcification and its predictive value for coronary events in African Americans: the Jackson Cohort of the Atherosclerotic Risk in Communities Study. American heart journal. 2004 Dec 1;148(6):979-84.
10. Donciu MD, Tasmoc A, Dumea R, Hogas S, Voroneanu L, Siriopol MD, Covic A. A cross-sectional study regarding the impact of end-stage renal disease on quality of life. Rev Med Chir Soc Med Nat Iasi. 2013;117(4):908-15.