Original Research Article Journal of College of Medical Sciences-Nepal, Vol-13, No 2, Apr-June 017

ISSN: 2091-0657 (Print); 2091-0673 (Online)
Open Access

Cardiovascular complications in end stage renal disease in a tertiary hospital in Nepal

Rajesh Panjiyar[1], Rajeev Sharma[2], Shankar Laudari[1], Madhu Gupta[1], Madhav Ghimire[3], Pawina Subedi[1], Gagnapatnam Subramanyam[1]

[1]Department of Cardiology,[2]Department of Internal Medicine, [3]Department of Nephrology, College of Medical Sciences-Teaching Hospital, Bharatpur, Chitwan, Nepal

Correspondence
Dr. Shankar Laudari
MD, DM Cardiology
Department of Cardiology
College of Medical Sciences-Teaching Hospital
Bharatpur-10,Chitwan,Nepal

Email:
lshankar2@hotmail.com

ORCID ID:
http://orcid.org/0000-0002-6742-5631

DOI: http://dx.doi.org/10.3126/jcmsn.v13i2.17310

Article received: 14th May 2017
Article accepted: 27th June 2017

ABSTRACT

Background & Objectives: The cardiovascular complications including morbidity and mortality remains alarmingly high in all stages of chronic kidney disease. Although patients with chronic kidney disease share many of the similar risk factors for cardiovascular disease as the general population, there are a number of uremia related risk factors, such as anemia and alterations in calcium/phosphorus metabolism that also play a role in promoting cardiovascular disease. The objective of the study was to study the cardiovascular complications in end stage renal disease patients on maintenance hemodialysis. **Materials & Methods:** It is a hospital based cross-sectional observational study conducted at College of Medical Science - teaching Hospital. Hundred patients (n=100) with a diagnosis of end stage renal disease (irrespective of the underlying cause), and those who were on hemodialysis support were studied over a period of one year. **Results:** One hundred end stage renal disease patients were analyzed. Cardiovascular disease was present in 74% (n=74). the mean age of the patient who had cardiovascular disease was 59.36+14.337 years. The three major causes of end stage renal disease in the study population were hypertension (35%) followed by diabetes (31%) and chronic glomerulonephritis (14%). On electrocardiogram, left ventricular hypertrophy was a major finding 64% (n=64) followed by arrhythmias 30% (n=30). On echocardiography, left ventricular hypertrophy was found in 49% (n=49) followed by left ventricular diastolic dysfunction 38% (n=38). On subgroup analysis, left ventricular hypertrophy was found statistically significant with calcium and phosphorus product > 55 mg2/dl2 (p=0.01). Similarly left ventricular systolic dysfunction, regional wall motion abnormalities and st-t changes was found statistically significant with anemia; p=0.006, p=0.0004 and p=0.02 respectively. **Conclusion:** Prevalence of cardiovascular complications were common in end stage renal disease patients receiving maintenance hemodialysis. Anemia, calcium and phosphorus product > 55 mg2/dl2 were their independent risk factors.

Key words: Cardiovascular Disease; End Stage Renal Disease; Left Ventricular Hypertrophy

Citation: Panjiyar R, Sharma R, Laudari S, Gutpa M, Ghimire M, Subedi P, Subramanyam G. Cardiovascular complications in end stage renal disease in a tertiary hospital in Nepal. JCMS Nepal. 2017;13 (2):279-83.

INTRODUCTION

Cardiovascular disease (CVD) morbidity and mortality remains alarmingly high in all stages of chronic kidney disease (CKD).[1] CVD often begins before end-stage renal disease (ESRD), and patients with reduced kidney function are more likely to die of CVD than to develop ESRD. Death from cardiac causes is 10 to 20 times more common in patients with renal failure than in matched segments of general population.[2]

Three pathological forms of CVD should be considered in patients with CKD: alterations in cardiac geometry, including left ventricular hypertrophy, atherosclerosis, and arteriosclerosis. LVH is an independent predictor of survival, present in approximately 70% of patients at the initiation of dialysis.[3] Congestive heart failure (CHF) accounts for 20 to 30 % of the mortality occurred in ESRD. Data available suggests that age, sex, HTN and anaemia are significantly associated with LVH and they are independent risk factors for cardiovascular disease (CVD).[4]

MATERIALS AND METHODS

This study was a hospital based cross-sectional observational study done in 100 patients from October 2014 to October 2015. We included patients with end stage renal disease; irrespective of underlying causes.ESRD is defined as irreversible loss in eGFR< 15 ml/min/1.73m2 and patients on maintenance hemodialysis for minimum of 1 month duration. Patients with a pre-existing cardiac disorder such as valvular heart disease, congenital heart disease, all cases of CKD of age <16 years were excluded. All subjects underwent various investigations such as hemoglobin, renal function tests, urine analysis, electrolytes, renal ultrasound, and 12-lead electrocardiography. All patients also underwent 2D echocardiography for the diagnosis and confirmation of cardiovascular diseases. We used simple descriptive statistics and t-tests. P-value less than 0.05 was considered statistically significant. Ethical clearance was taken from the Ethical Review Board (ERB) at College of Medical Sciences-Teaching Hospital.

RESULTS

Patients were grouped into two groups: First, ESRD group representing all patients receiving maintenance hemodialysis under study and second, cardiovascular disease (CVD) group representing ESRD patients receiving maintenance hemodialysis with cardiovascular disease. (Figure 1)

During the study period, out of 100 ESRD patients receiving maintenance hemodialysis, 74 patients (74%) had cardiovascular involvement and 26 patients(26%) had no CVD. The majority of the patients in the ESRD group were males 57% (n=57). Out of them, 55.4% (n=41) had CVD .

In the present study, hypertension was the leading cause of ESRD in 35 patients (35%), followed by diabetes in 31% and chronic glomerulonephritis in 14% patients as shown above in Figure 2.

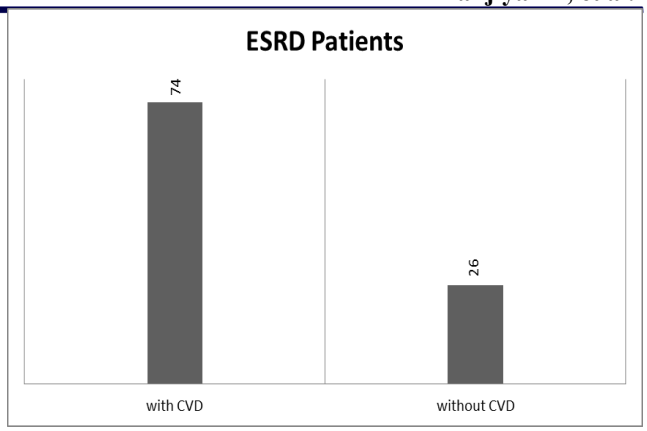

Figure 1 (n=100): Bar diagram showing prevalence of cardiovascular disease in ESRD patients receiving maintenance hemodialysis

In the present study, out of the 100 patients with ESRD, 64 patients (64%) had left ventricular hypertrophy with or without strain pattern, 30 patients (30%) had arrhythmias, 15 patients (15%) had ST-T changes. Low voltage complexes in five patients (5%) and the rest 22 patients (22%) had normal ECG findings as illustrated in Figure 3. Among 30 patients with arrhythmia, sinus tachycardia was found in 24 patients (60%) followed by atrial fibrillation in five patients (16.67%). Wide qrs complex tachycardia was observed in five patients (16.67%) and sinus bradycardia in 6.66% (n=2). In 15 patients of ST-T changes, ST elevation was seen in four patients (26.66%), ST depression was seen in three patients (20%), tall T waves was seen in four patients (26.66%) and T inversion was seen in four patients (26.66%).

In the present study, 49 patients (49%) had left ventricular hypertrophy, diastolic dysfunction was

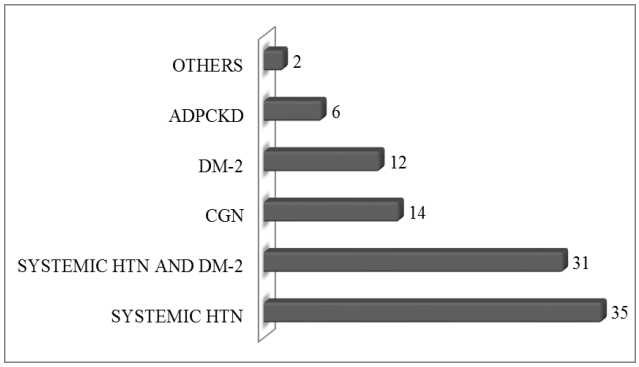

Figure 2 (n=100): Etiology of ESRD in ESRD group patients:

(Note: HTN: systemic hypertension; DM-2: type 2 diabetes mellitus; CGN: chronic glomerulonephritis; ADPCKD: autosomal dominant polycystic kidney disease. Others etiology included obstructive cause)

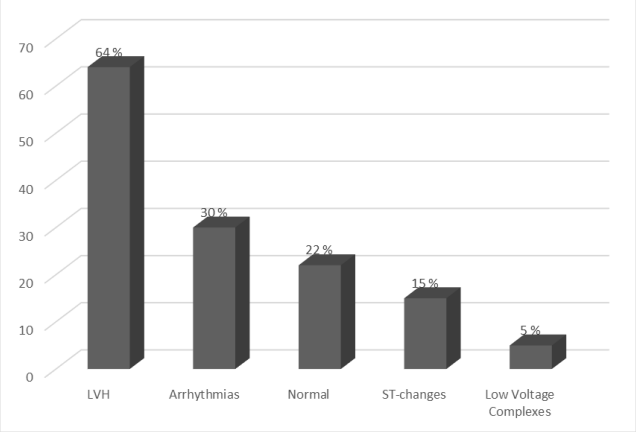

Figure 3 (n=100): Electrocardiographic changes in ESRD patients
(Note: LVH= Left ventricular hypertrophy)

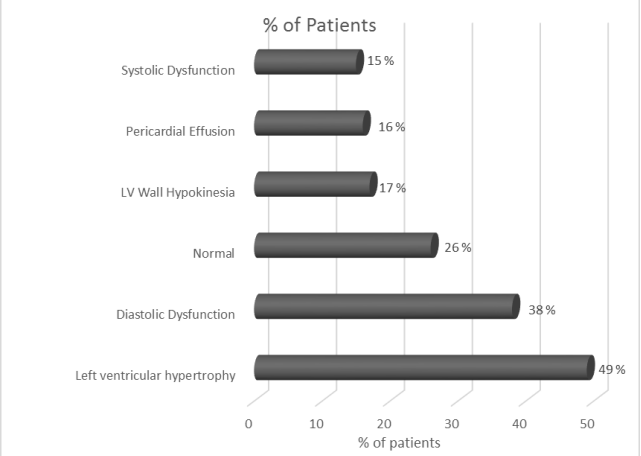

Figure 4 (n=100): Echocardiographic findings in ESRD patients

Table 1: Etiological comparison of various cardiovascular abnormalities

Etiology	LVH n (%)	LVDD n (%)	LVSD n (%)	PE n (%)	RMWA n (%)
HTN	19 (38.78)	13 (38.24)	5 (33.33)	5 (71.43)	6 (37.50)
HTN and DM-2	16 (32.65)	13 (38.24)	5 (33.33)	2 (28.57)	4 (25)
CGN	8 (16.33)	5 (14.71)	1 (6.67)	0 (0)	2 (12.50)
ADPCKD	3 (6.12)	0 (0)	1 (6.67)	0 (0)	0 (0)
DM-2	2 (4.08)	3 (8.81)	2 (13.33)	0 (0)	3 (18.75)
OTHERS	1 (2.04)	0 (0)	1 (6.67)	0 (0)	1 (6.25)
Total	49 (100)	34 (100)	15 (100)	7 (100)	16 (100)

(HTN: systemic hypertension; DM-2: type 2 DM; CGN: chronic glomerulonephritis; ADPCKD: autosomal dominant polycystic kidney disease; LVH: left ventricular hypertrophy; LVSD: left ventricular systolic dysfunction; LVDD: left ventricular diastolic dysfunction; PE: pericardial effusion; RWMA: regional wall motion abnormalities; freq: frequency)

seen in 38 patients (38%), lv wall hypokinesia (RWMA) was seen in 17 patients (17%) out of which eight male and six female patients had segmental regional wall motion abnormalities (82.35 %, n=14) where as global dysfunction was seen in one male and two female patient (17.65%, n=3) and systolic dysfunction in 15 patients (15%), pericardial effusion in 16 patients (16%), and 26 patients (26%) had normal echo findings. This is shown below in Figure 4.

The comparison of etiologies of various cardiovascular abnormalities revealed systemic hypertension as the leading cause of cardiovascular complication; 38.78% (n=19), 38.24% (n=13), 33.33% (n=5), 71.43% (n=5) and 37.50% (n=6) respectively in LVH, LVDD, LVSD, PE and RWMA. Systemic HTN and type 2 DM accounted for 32.65% (n=16), 38.24% (n=13), 33.33% (n=5), 28.57% (n=2) and 25% (n=4), respectively in LVH, LVDD, LVSD, PE and RWMA. Chronic glomerulonephritis was found in 16.33% (n=8) LVH, 14.71% (n=5) LVDD, 6.67% (n=1) LVSD and 12.50% (n=2) RWMA patients. 6.12% (n=3) LVH and 6.67% (n=1) LVSD patients had ADPCKD. Type 2 DM accounted for 4.08% (n=2), 8.81% (n=3), 13.33% (n=2) and 18.75% (n=3) of LVH, LVDD, LVSD and RWMA respectively. 2.04% (n=1) LVH, 6.67% (n=1) LVSD and 6.25% (n=1) RWMA patients had obstructive (others) as an etiological factor as illustrated in Table 1.

Out of 100 patients on hemodialysis, 81 patients were on regular schedule for hemodialysis. Remaining 14 patients were irregular probably due to lack of transportation facilities and financial reasons. Three patients (n=3;3%) expired during this study, the causes of death being septicemia

(n=1), refractory pulmonary edema (n=1) and sudden cardiac death (n=1).

DISCUSSION

Premature cardiovascular disease is a significant cause of morbidity and mortality among patients with CKD.5 In the present study the prevalence of cardiovascular complications was found to be of 74% among patients receiving maintenance hemodialysis which is similar to the study by Parfrey et al[6] where 77% of the patient had a cardiovascular complications among dialysis patients. Cheung et al,[7] in the HEMO study also found high prevalence of cardiovascular disease i.e. 80% of patients had cardiac diseases, that is consistent with our study. In the present study, 49 patients (49%) had left ventricular hypertrophy. Diastolic dysfunction was seen in 38 patients (38%), LV wall hypokinesia in 17 patients (17%), systolic dysfunction in 15 patients (15%) and pericardial effusion in 16 patients (16%). In another study by Parfrey et al,[4] left ventricular disease was present in 85% of patients who started dialysis treatment. A total of 16% of patients had systolic dysfunction, 41% concentric left ventricular hypertrophy, 28% left ventricular dilatation and only 16% had normal cardiac findings on echocardiography which has similar findings as our study.

In our study pericardial effusion (PE) was found in 16 (16%) patients associated with chronic kidney disease. Frommer et al,[8] has reported an incidence of pericardial effusion in 18 out of 50 (36%) patients. Gupta et al,[9] reported an incidence of 8.8% in patients on maintenance hemodialysis. In this study 30 patients had arrhythmias, among which 18 patients (60%) had sinus tachycardia and five patients (16.67%) had atrial fibrillation. Epidemiology of arrhythmia in dialysis patients in the 2006 United States Renal Data System (USDRS) database,[10] the incidence of cardiac arrhythmias was 62 per thousand patient-years at risk, for all US dialysis patients between 1999 and 2001. Approximately 14% of HD patients have chronic AF, and a study showed a 27% prevalence of AF (paroxysmal, persistent or permanent) in long -term HD patients.[11]

Hence as mentioned in the various studies above, cardiovascular involvement in patients with ESRD receiving maintenance hemodialysis is quite common and LVH is most frequent finding observed in the same group of patients. Similar findings were observed in our study.

CONCLUSION

Our study demonstrates the high prevalence of cardiovascular disease in end stage renal disease patients on hemodialysis, accounting up to 74% of the cases and left ventricular hypertrophy being the most common cardiovascular manifestation in our study, accounting up to 49% cases.

LIMITATION

This study involved the patients from a single hemodialysis center. Thus, there might be some selection bias related to community characteristics and the result cannot be generalized to the overall ESRD population. Further large scale cohort or interventional studies are necessary to elucidate whether CVD screening by echocardiography contributes to improvement in function and survival among dialysis patients.

Conflict of interest: The authors do not have any conflict of interest including financial in publication of this article.

ACKNOWLEDGEMENT:

We would like to sincerely thank all the involved patients in this study with out whom it would have not been possible. Also, we would appreciate all the staffs of department of Nephrology and Cardiology for their co-operation in collection of data and taking care of the patients.

REFERENCES

1. Bargman JM, Skorecki K. Chronic kidney disease. In: Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J, editors. Harrison's principles of internal medicine. 19th ed. New York: McGraw Hill Education; 2015:1811-21.
2. Sarnak MJ, Levey AS. Cardiovascular disease and chronic renal disease: a new paradigm. Am J Kidney Dis. 2000;35:117-31. https://doi.org/10.1016/S0272-6386(00)70239-3
3. Amann K, Rychlik I, Miltenberger-Milteny G, Ritz E. Left ventricular hypertrophy in renal failure. Kidney Int. 1998;68:78-85. https://doi.org/10.1046/j.1523-1755.1998.06818.x
4. Parfrey P, Foley R, Harnett J, Kent G, Murray D, Barre P. Outcome and risk factors for left ventricular disorders in chronic uraemia. Nephrol Dial Transplant. 1996;11:1277-85. https://doi.org/10.1093/ndt/11.7.1328. PMID: 8672023.
5. Girndt M, Seibert E. Premature cardiovascular disease in chronic renal failure: a model for an advanced ageing process. Exp Gerontol. 2010;45:797-800. https://doi.org/10.1016/j.exger.2010.04.003. PMID: 20399263.
6. Parfrey PS, Harnett JD, Barre P. The natural history of myocardial disease in dialysis patients. J Am Soc Nephrol. 1991;2:2-12. PMID: 1832984.
7. Cheung AK, Sarnak MJ, Yan G, Berkoben M, Heyka R, Kaufman A, et al. Cardiac diseases in maintenance hemodialysis patients: results of the HEMO study. Kidney

Int. 2004;65:2380-9. https://doi.org/10.1111/j.1523-1755.2004.00657.x. PMID: 15149351.
8. Frommer J, Young J, Ayus J. Asymptomatic pericardial effusion in uremic patients: effect of long-term dialysis. Nephron. 1985;39:296-301. https://doi.org/10.1159/000183393. PMID: 3982575.
9. Gupta A, Malhotra K, Dash S. Late pericarditis in patients on maintenance haemodialysis. J Assoc Physicians India. 1986;34:857-9. PMID: 3584041.
10. US Renal Data System, USRDS 2010. Annual data report: atlas of chronic kidney disease and end-stage renal disease in the United States. National Institute of Health, National Institute of Diabetes and Digestive and Kidney Diseases. Bethesda; 2010.
11. Genovesi S, Vincenti A, Rossi E, Pogliani D, Acquistapace I, Stella A, et al. Atrial fibrillation and morbidity and mortality in a cohort of long-term hemodialysis patients. Am J Kidney Dis. 2008;51(2):255-62. https://doi.org/10.1053/j.ajkd.2007.10.034. PMID: 18215703.