Research Paper Medical Science

A Study of Echocardiographic Changes in Esrd Patients On Hemodialysis At Tertiary Care Centre Bhopal

SUDHA ALAWE MEDICAL OFFICER DEPARTMENT OF CARDIOLOGY,GMC BHOPAL

DR R.S.MEENA ASSISTANT PROFESSOR DEPARTMENT OF CARDIOLOGY,GMC BHOPAL

DR R.R.BARDE ASSISTANT PROFESSOR DEPARTMENT OF MEDICINE,GMC BHOPAL

ABSTRACT

OBJECTIVES: The objective of this study to assessment and analysis of echocardiographic changes in end stage renal disease patients on maintenance hemodialysis.

MATERIAL AND METHODS this is Prospective study conducted in dialysis unit department of medicine Gandhi medical college Bhopal .we studied 50 patients with end stage renal disease on hemodialysis irrespective of etiology.we collected basic information of patients and performed relevant hematological, biochemical and radiological investigations like Electrocardiography and Echocardiography (2D & M mode). patients was labled as stage 5 CKD(ESRD) when GFR was less than 15 ml/min/1.73m2as per CKD-EPI formula and who were on MHD.

RESULTS: 50 Patients undergoing hemodialysis were included in our study. Of them Echocardiography finding shown LV dilation and diastolic dysfunction in 25(50%), left ventricular hypertrophy (LVH) in 28(56%), systolic dysfunction and pericardial effusion in 14(28%) and 6(12%) patients respectively. RWMA was present in5(10%) and Valvular calcification was seen in 3(6%) patient.

In sub-group of patients with Hb<10 gm%, LVH was present in 24 (77.41% 0 vs 5 (26.31%)in patient group with Hb ≥ 10 gm% (p <0.01). Other Sub Group of Patients with BP > 140/90mmhg, LVH Was Present In 25(65.78 %) vs 4 (33.33 %) in patients group with BP< 140/90 mm hg (p=0.02). In both sub group p value for systolic dysfunction, RWMA & pericardial effusion is statistically not significant.

CONCLUSION: in our studied we concluded that LV diastolic dysfunction and hypertrophy were most common echocardiographic findings.

We also found statistically significant correlation between anemia and presence of LVH and positive correlation between presence of hypertension and LVH.

KEYWORDS : Age, Behavior, Inflammatory bowel disease, Logistic regression

INTRODUCTION:

Chronic kidney disease (CKD) is increasingly being recognized as a global public health problem.[1]. In India alone there are about 55,000 patients on dialysis and this number going at the rate of 10-20%. Each year.[2]. In India, prevalence of CKD is very high, as per data available by various studies, approximate prevalence is around 800/million population.[3,4,5].

Chronic Kidney Disease affects almost every system of the body and results in various functional and structural abnormalities. Among the various causes, infections and cardiovascular causes contribute towards the large proportion of increased morbidity and mortality. Cardiac disease is the major cause of death in dialysis population accounting for 40% of deaths in international registries.[6]In the cardiovascular system, left ventricular hypertrophy (LVH) is the most frequent finding.[7]The prevalence of left ventricular systolic and diastolic dysfunction is less clear. Cardiac disease frequently predates is less clear. Cardiac disease frequently predates the start of dialysis and LVH is common in moderate to severe chronic renal failure. Echocardiography should be performed early in the course of CKD and may be valuable in the monitoring of therapy of these patients.

Recently genetic background of hypertension is gaining importance in pathophysiology of hypertension. G protein coupled and Ca2+ dependent

kinases are responsible for control of blood pressure.[8]Even lots of mutation may cause changes in the receptors, which in turn raise blood pressure.[9]

CKD is risk factor for cardiovascular event and complications increases as CKD progress to end stage renal disease (ESRD).[10]Cardiovascular

(CV) mortality is 10-20 times more common in ESRD patients on renal replacement therapy as compared to general population. One of the major structural cardiac anomalies in patients with CKD is left ventricular hypertrophy (LVH) and is associated with increase the risk for cardiac ischemia, congestive heart failure, as well as a very strong independent predictor of cardiovascular mortality.[11]Majority patients with CKD die due to cardiovascular events before reaching ESRD due to both traditional and nontraditional risk factors.[12] LVH is associated with both diastolic and systolic dysfunction of the left ventricle. LVH is also associated with LV systolic dysfunction, expressed by reduced mid wall systolic fractional shortening, as previously reported in hypertensive patients with cardiac hypertrophy and also in patients with ESRD in whom it is a powerful predictor of worse CV outcome. Hemodialysis is one form of renal replacement therapy, during which metabolic waste products including creatinine, urea, excess water and salt are removed. It also maintained the nutritional status, mental and physical wellbeing if done on regular basis. Noor ul Amin et al had shown that hemodialysis is an effective means of removing metabolic waste products.[13]

In this study we evaluated the cardiovascular abnormalities by performing 2-D

echocardiography in CKD patients on maintenance hemodialysis (MHD)

MATERIAL AND METHODS;

This is Prospective study conducted in dialysis unit department of medicine Gandhi medical college Bhopal .we studied50 patients with end stage renal disease on hemodialysis irrespective of etiology. A person was labeled as stage 5 CKD [ESRD]if his or her GFR was less than 15 ml/1.7 m2 as per CKD-EPI formula and who were on MHD. All patients were clinically evaluated thoroughly and subjected for complete blood count, renal function test, serum cholesterol, calcium and phosphate and 2-D echocardiography. Patient with obvious clinical evidence of coronary artery disease, Valvular heart disease, rheumatic

heart disease, congenital heart disease and primary cardiomyopathies were excluded from the study.

2D-Echocardiography machine[PHILLIPS] was used with 3.5 MHz transducer probe. The M. mode recording perpendicular to the long axis of and through the center of the left ventricle at the papillary muscle level was taken as standard measurements of the systolic and diastolic wall thickness and chamber dimensions. The left ventricular ejection fraction (LVEF) and fractional shortening (FS) were taken as measure of left ventricular systolic dysfunction and ejection fraction <55% was considered as systolic dysfunction. Diastolic function was determined by measuring E/A ratio by special Doppler inflow velocity (E is peak early diastole velocity and A is peak atrial filling velocity of left ventricle across mitral valve). E/A ratio less than 0.75 and more than 1.8 was considered as diastolic dysfunction. LVH was diagnosed when inter ventricular septum thickness or left ventricular posterior wall thickness was ≥12mm. Hypertension was defined as BP ≥ 140/90 mmHg in right arm supine position and anemia was diagnosed with hemoglobin < 13.5 gm/dl in

male and 12.5 gm/dl in female.

STATISTICAL ANALYSIS: All collected data entered into the SPSS V20 Software and analysis has been conducted and using chi square test and fisher exact test has been used to calculate statistically significant value. A 'p value less than 0.05 were considered significant.

RESULTS:

This study included 50 patients of ESRD on MHD Clinical examination, suggested laboratory test and echocardiography were performed in every patient.

TABLE-1 GENDERWISE DISTRIBUTION OF PATIENTS TOTAL NO OF PATIENTS-50

GENDER	NO OF PTs	%
MALE	37	74
FEMALE	13	26

Out of 50 patients, 74% (37) male and 26% (13) were female.

TABLE-2 AGEWISE DISTRIBUTION OF PATIENTS TOTAL NO OF PATIENTS-50

AGE	NO OF PTs	%
18-30	13	26
31-40	9	18
41-50	16	32
51-60	12	24

Maximum patients were in age group between 41-50 yrs. (32%) (TABLE-2)

Mean age of the patients was 41.43 ± 11.48(TABLE-3)

Table 3: Basic laboratory parameters of study population Pa rameters Range Mean±SD

Urea (mg/dl)	43-189	108.14±32.83
Creatinine (mg/.dl)	2.8-10.2	5.52±1.65
Hemoglobin % (gm/dl)	4.2-11.4	7.89±0.96
Calcium (mg/dl)	6.8-13.5	9.87±1.72
Phosphorus (mg/dl)	3.5-12	7.72±2.01
Total cholesterol(mg./dl)	111-268	160.32±27.56
Serum albumin (gm/dl)	2.2-5	3.64±0.53
Age(Years)	18-65	41.43±11.48

Anemia was observed in all patients and hemoglobin of less than 10 gm% was seen in 31 (62%) patient. Echocardiographic parameter analyzed in our study were left ventricular internal diameter in diastole (LVIDd), left ventricular internal diameter in systole (LVIDs). Interventricular septal diameter in systole, E/A ratio, fractional shortening, ejection fraction and size of left atrium,(TABLE-4)

TABLE-4 MEAN ECHOCARDIOGRAPHIC PARAMETER IN ESRD PATIENTS ON MHD

echocardiography parameters	No. of cases	%
Left ventricular hypertrophy	28	56
Ejection fraction (<55%) Systolic dysfunction	14	28
E/A ratio (<0.75 or >1.8) Diastolic dysfunction	25	50
Regional wall motion abnormality	5	10
Pericardial effusion (<10 mm)	6	12
Valvular calcification	3	6

TABLE-5 Hemoglobin level and echocardiographic parameters of study patients

Echocardiographic Findings	HB%				P-VALUE
	<10gm/.dl		≥10gm/dl		
	31	62%	19	38%	
LVH					
Absent	7	22.58	14	73.68	<0.01*
Present	24	77.41	5	26.31	
EF<55%					
Absent	21	67.74	15	78.94	0.09(NS)
Present	10	32.25	4	21.04	
RWMA					
Absent	27	87.09	18	94.73	0.31(NS
Present	4	12.90	1	5.26	
PERICARDIAL EFFUSION					
Absent	28	90.32	15	78.94	0.07(NS)
Present	3	9.67	4	21.05	

Table 6: Association between HTN with LV dysfunction of study patients

Echocardiographic Findings	Hypertension				P-VALUE
	<140/90 mmHg		≥ 140/90 mmHg		
	12	24%	38	76%	
LVH					
Absent	8	66.66	13	34.21	0.02*
Present	4	33.33	25	65.78	
EF<55%					
Absent	10	83.33	26	68.42	0.16(NS)
Present	2	16.66	12	31.57	
RWMA					
Absent	11	91.66	33	86.84	0.44(NS)
Present	1	8.33	5	13.15	
PERICARDIAL EFFUSION					
Absent	11	91.66	32	84.21	0.18(NS)
Present	1	8.33	6	15.78	

DISCUSSION: The detection of echocardiographic abnormalities with subclinical cardiac disease is considered to be an important step for characterization of individual risk for heart failure in the general population as well as in patients of CKD [14].

The common cardiac abnormalities in CKD patients are LVH. Systolic and diastolic dysfunction due to myocardial fibrosis, myocardial calcification and changes in the vascular structured, leading to adverse cardiovascular events.In our study LVH was present in 58%, systolic dysfunction in 28% and diastolic dysfunction in 44% of patients.

Echocardiographic findings in other studies have also observed presence of systolic dysfunction in 20% and diastolic dysfunction in 50% patients[15,16]. Agarwal S. et al had observed diastolic dysfunction in 53.2% and systolic dysfunction in 30%, patients with severe CKD (S.Cr.>6mg %)[17]. we observed pericardial effusion and RWMA in 12%, 10% case respectively. In a study conducted by Laddha M et al. in 2014, reported LVH in 74%, systolic dysfunction in 24.3% diastolic dysfunction in 61.4% and pericardial effusion in 14.35% of ESRD patients on hemodialysis[18].Zoccall C et al. had reported incidence of LVH and systolic dysfunction of 77% and 22% respectively in ESRD population on hemodialysis[19]. Shivendra s et al had observed LVH in 48%, Diastolic dysfunction in 51.42% and systolic dysfunction in 28.57% in CKD Patients on Hemodialysis[20].Valvular calcifications are four times more common in dialysis patients compared to general

population[21].

Majority (76%) patients had hypertension. In hypertensive group LVH was present in 64.47% vs 33.33% in normotensive group. In subgroup of patients with hemoglobin level <10gm%, LVH was seen in 77.41% compared to 26.31% in patients with hemoglobin of ≥10gm% (P<0.01). Parfrey et al. had showed that rise in mean arterial pressure was associated with increased incidence of LVH in ESRD population on hemodialysis [22].Levin et al also reported association between elevated systolic blood pressure and low hemoglobin level with LVH in predialysis patients[23,24]. Data et al observed severity of anemia correlated to LVH in patients with CKD[25].In ESRD patients on dialysis it has been observed that decrease in Hb level of 1 gm% increased LVH by = 50% and mortality by 18-25%.[26] CONCLUSION: Cardiac structural as well as functional abnormalities are common in patients with CKD on MHD, more so in those with hypertension and anemia. LVH is the commonest cardiac abnormality in ESRD patients, followed by diastolic dysfunction. Both conditions are more marked in hypertensive and anemic populations. LVH has got prognostic implications, because this group of ESRD patients will die of diastolic dysfunction or sudden cardiac death.Echocardiography is a cost effective noninvasive diagnostic test which can detect early changes in the cardiac parameters. This is important for risk stratification and early preventive measures. Thus echocardiographic screening of ESRD patients has both therapeutic and prognostic implications. All asymptomatic ESRD patients especially anemic and hypertensive CKD Patients should undergo a routine echocardiographic evaluation. In our study we also observed young adult patients age between 21-30 years (26%). It shows increased prevalence CKD in young adult population. So further Studies required for confirmation.

Limitations of our Study:
small group study.

Impact of hyperlipidemia, secondary hyperparathyroidism, homocysteine levels, and markers of inflammation and duration of MHD were not studied in our patient population.

REFERENCES:

1] National Kidney Foundation KDOQI clinical practice guidelines for chronic kidney disease: evaluation, classification and stratification. Am J Kidney Dis. 2002;39(2 Suppl 1):S1–266

2] Jha, V, et al. Current status of end stage renal disease core in India. Kidney international Supplements (2013), 3, 157-60.

3] Agarwal et al, prevalence of CKD in adults in delhi, India Nephron Dialysis Transplant 2005; 20:1638-1642.

4]. Mani Mk,Prevalence of CRF at the community level Kidney Int 2001,63(suppl 83):S86-S89.

5]. Moni Mk, Experience with a program for prevention of CRF in India, Kidney Int 2005;67(suppl 94):S75-S78.

6] Fassbinder W, Brunner FP, Brynger H et al. Combined report on regular dialysis and transplant in Europe XX1989. Nephrol Dial Transpl 1991; 6(Suppl 1): 5-35.

7] Bullock RE, Hassem AA, Simpson I et al. Cardiac abnormalities and exercise tolerance in patients receiving renal replacement therapy. BMJ 1984; 28: 1479-84.

8] Santulli G. Trimarco B. Iaccarino G (2013) G-protein-coupled receptor kinase 2 and hypertension: molecular insights and pathophysiological mechanisms. High Blood Press Cardiovasc Prev 20. 5-12.

9]. Santulli G, Cipolletta E, Sorriento D, Del Gludice C, Anastasio A, et al. (2012) CaMK4 Gene Deletion Induces Hypertension. J Am Heart Assoc. 1: e001081.

10] Agodoa LY, Eggers PW (1995) renal replacement therapy in the United States Renal Data System. Am J Kidney Dis 25: 119-133.

11]. Parfrey PS, Foley RN, Harnett JD, Kent GM, Murray DC et. al (1996) Outcome and risk factors for left ventricular disorders in chronic uremia. Nephrol Dial Transplant 11: 1277-1285.

12] Foley RN, Parfrey PS, Harnett JD. Kent GM, Martin CJ, et al. (1995) Clinical and echocardiographic disease in patients starting end-stage renal disease therapy. Kidney Int 47: 186-192 13]Noor ul Amin. Raja Tahir Mahmood, M Iavaid Asad, Mudassar Zafar, Asad Mehmood Raja (2014) Evaluating urea and creatinine levels in chronic renal failure pre and post dialysis. Aprospective study JCvD, 2014 in press.

14] Foley RN, Parfrey PS, Harnett JD. Kent GM, Martin CJ, et al. (1995) Clinical andechocardiographic disease in patients starting end-stage renal disease therapy. Kidney Int 47: 186-192.

15]. Mcmurray JV, McDonagh TA, Davle AP, Cleland JG, Francis CM, et al (1998) Should we screen for asymptomatic left ventricular dysfunction to prevent heart failure? Eur Heart 19: 842-846.

16]. Kunz K. Dimitrow Y. Muller S. Chantrel F, Hannedouche T (1998) Uremic cardiomyopathy,. Nephrol Dial Transplant 13 Suppl 4: 39-43.

17]. S. Agarwal, P. Dangri, OP Karla, S Rzjpal (2003) Echocardiographic assessment of cardiac dysfunction in patient of chronic renal failure JIACM 4: 296-303.

18]. Laddha M, V Sachdeva, PM Diggikar, PK Sapathy, AL Kakrani (2014) Echocardiographic assessment of cardiac dysfunction in patients of end stage renal disease on hemodialysis. JAPI 62: 28-32.

19]. Zocall C. Benedetto FA, Mallamaci F. Tripepi G. Giacone G, et al. (2004) Prognostic value of echocardiographic indicators of left ventricular systolic function in asymptomatic dialysis patients. J Am Soc Nephol 15: 1029-1037.

20]. Shivendra S, Doley PK, Pragya P, Shivasankar M, Singh VP, et al. (2014). Echocardiographic Changes in Patients with ESRD on Maintenance Hemodialysis-A Single Centre Study. J Cardiovasc Dis Diagn 2: 165.

21] Lekinen Y. Paana T, Saha H. Groundstroem K. Lehtimaki T, et al (2009) Valvular calcification and its relationship to atherosclerosis in chronic kidney disease,. J Heart Valve Dis 18: 429-438.

22] Parfrey PS. Foley RN (1999) the clinical epidemiology of cardiac disease in chronic renal failure J Am Soc Nephrol JO: 1606-1615.

23] Levin A. Thompson CR, Ethier,m J. Carlisle EJ, Tobe S, et al (1999) left ventricular mass index increase in early renal disease impact of decline in hemoglobin. Am J Kidney Dis: 34 125-134.

24]. Levin A, Singer J, Thompson CR, Ross H. Lew3is M (1996) Prevalent left ventricular hypertrophy in the predialysis population identifying opportunities for intervention. Am J Kidney Dis 27: 347-354.

25]. Data S. Abraham G. Mathew M. Somasundaran H. Muralidharan TR et al (2006) Correlation of anemia, secondary hyperparathyroidism with left ventricular hypertrophy in Chronic Kidney Disease patients. J Assoic Physicians India 54 699-703

26] Harnett JD, Kent GM, Foley RN, Parfrey FS (1995) cardiac function and hematocrit level. Am J Kidney Dis 25-3-7