

A CLINICAL STUDY OF CARDIOVASCULAR ABNORMALITIES IN PATIENTS WITH CHRONIC RENAL FAILURE AT VIMS HOSPITAL, BELLARY.Huggi Vishwanath¹, Uma Maheshwari², Basanthkumar H. S³, Venugopal K⁴, Bharathraj M. Y⁵**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: BACKGROUND: Chronic Renal Failure (CRF) is one of the common conditions which a physician comes across in day to day practice. Chronic Renal Failure affects every aspect of the lives of the patients who suffer it and involves all systems of body & results in various abnormalities. Today, cardiovascular complications are a major clinical problem in uremic patients accounting for 44% of all deaths in this population. Left Ventricular Hypertrophy (LVH) is a major Echocardiographic finding in Chronic Renal Failure (CRF). Prevalence of LVH increases with decline of renal function. Left ventricular hypertrophy is an independent predictor of survival, present in approximately 70% of patients at the initiation of dialysis. **MATERIALS AND METHODS:** The data for this study was collected from the one hundred subjects fulfilling the inclusion /exclusion criteria admitted and patients visiting OPD and patients undergoing dialysis in dialysis unit of VIMS Hospital during the period from Jan 2010 To June 2011. **RESULTS:** LVH is a major echocardiographic finding in uremic patients. In the present study, 12 (17%) patients of mild, 18(26%) patients of moderate and 39(57%) patients of severe Chronic Renal Failure group had Left Ventricular Hypertrophy. In the present study, the most common cause of CRF in the Severe CRF group was Diabetes plus Hypertension in 47% followed by Diabetes alone in 33% as compared to Moderate CRF group where in Diabetes plus Hypertension accounted for 47%, followed by Diabetes in 47%, whereas in Mild CRF group Diabetes was the cause 38%, followed by Diabetes plus Hypertension in 33% of cases. Pericardial effusion was seen in 25% of cases (15 cases had mild and 10 cases had moderate pericardial effusion. **CONCLUSIONS:** The high prevalence of Left ventricular hypertrophy in these populations on echocardiography implies that these patients require detailed cardiovascular evaluation despite absence of symptoms and control of hypertension, anemia should be considered in earlier stages.

KEYWORDS: Chronic renal failure, Left ventricular hypertrophy, 2D echocardiography, Uremia.

INTRODUCTION: Chronic Renal Failure (CRF) is one of the common conditions which a physician comes across in day to day practice. Chronic Renal Failure affects every aspect of the lives of the patients and involves all systems of body & results in various abnormalities.^{1,2,3} End stage renal disease and cardiac disease seem to be inextricably linked. Of various causes, infection and cardiovascular events contribute towards large proportion of increased morbidity and mortality.²

As early as 1827 Richard Bright drew attention to the common presence of left ventricular hypertrophy and thickening of the aortic wall in patients with end stage renal disease.^{4,5}

Today, cardiovascular complications are a major clinical problem in uremic patients accounting for 44% of all deaths in this population.^{4,6,7,8,9,10,11} Death from cardiac causes is 10- 20

times more common in patients with renal failure than in matched segments of the general population.

Left Ventricular Hypertrophy (LVH) is a major Echocardiographic finding in Chronic Renal Failure (CRF).^{1,3,12,13} Prevalence of LVH increases with decline of renal function.³ Left ventricular hypertrophy is an independent predictor of survival, present in approximately 70% of patients at the initiation of dialysis.^{3,5,14} Echocardiography should be performed early in the course of CRF and may be valuable in the monitoring of therapy of these patients.³ Data available suggests that age, sex, hypertension, anaemia are significantly associated with LVH and they are independent risk factors.

MATERIALS AND METHODS:

Source of Data: The data for this study was collected from the one hundred subjects fulfilling the inclusion /exclusion criteria admitted and patients visiting OPD and patients undergoing dialysis in dialysis unit of VIMS Hospital during the period from Jan 2010 To June 2011.

Inclusion Criteria: The study population consists of patients with mild, moderate and severe Chronic Renal Failure attending the hospital. Where in^{1, 2}

1. Mild Chronic Renal Failure - includes patients with Serum creatinine 1.5-3 mg/dl.
2. Moderate Chronic Renal Failure –includes patients with Serum creatinine values 3.0-6.0 mg/dl.
3. Severe Chronic Renal Failure - includes patients with Serum creatinine value > 6 mg/dl.

Underlying cause of CRF:

1. Chronic glomerulonephritis
2. Hypertensive nephropathy
3. Diabetic nephropathy
4. Chronic tubulointerstitial disease
5. Autosomal dominant polycystic kidney disease and others causes if any.

Exclusion Criteria:

1. Patients with other cardiac disorder such as valvular heart disease, congenital heart disease.
2. All pediatric cases of chronic renal failure.

METHODS: The following set of investigations was asked for in the patients included in the study.

1. Complete Haemogram
2. Renal function tests
3. Liver function test
4. Urine analysis & culture (if required)
5. Renal ultrasound
6. Lipid profile
7. Serum electrolytes, Serum Calcium, Serum Phosphorous
8. Chest radiography
9. Electrocardiography-12 lead
10. 2D Echocardiography

ORIGINAL ARTICLE

Creatinine Clearance is calculated according to the formula derived from Cockcroft-Gault. Cockcroft-Gault equation:

$$\text{CrCl} = \frac{\{140 - \text{Age (yrs)}\} \times \text{Weights (Kgs)}}{\text{For Males Plasma Creatinine} \times 72}$$

For Males Plasma Creatinine X 72

$$\text{CrCl} = \frac{\{140 - \text{Age (yrs)}\} \times \text{Weights (Kgs)} \times 0.85}{\text{For Females Plasma Creatinine} \times 72}$$

For Females Plasma Creatinine X 72

Normal values of Creatinine Clearance: Men- 90-139ml/min, women - 80-135ml/min.

RESULTS: The present study the Age variation was from 31 to 80 years. Majority of patients were in the age group of 61-70 years that included 40 patients (40%). Study group consisted of 67% males and 33% females. In the present study, combined Diabetes and hypertension was the leading cause of chronic renal failure in 44 patients (44%), followed by Diabetes in 39 patients (39%), hypertension in 13 patients (13%). Adult Polycystic Kidney Disease (APKD) in 2 patients (2%), Chronic glomerulonephritis in 1 patient (1%) and obstructive pathology in 1 patient (1%) respectively [GRAPH-1]. The range of serum creatinine level in the present study was between 1.5 - 20.8 mg/dl. However, 80 patients (80%) were equally distributed in moderate and severe CRF group (i.e., 40% in each group) and remaining 20% were in the Mild CRF group [GRAPH-2]. In the present study, out of the 100 patients with CRF, 69 patients (69%) had Left ventricular hypertrophy and 31 patients (31%) had no signs of left ventricular hypertrophy. Out of the 100 patients with CRF, 69 patients (69%) had Left Ventricular Hypertrophy (48% concentric and 21% eccentric LVH), diastolic dysfunction was seen in 42 patients (42%) and systolic dysfunction in 20 patients (20%) and 31 patients (31%) had normal echo.

Statistically significant difference was found in the mean blood urea (mg/dl) of patients with severe, moderate and mild CRF ($P < 0.001$). Patients with severe CRF were found to have a higher mean blood urea level compared to patients with moderate and mild CRF and the mean difference between them was found to be statistically significant ($P < 0.001$). However, the mean difference between patients with moderate and mild CRF were not statistically significant ($P > 0.05$).

Higher mean Serum creatinine was found in patients of severe CRF category followed by moderate and mild categories. The difference in mean Serum creatinine between each group was found to be statistically significant ($P < 0.05$). The mean creatinine clearance (ml/min) was found to be higher in mild category followed by moderate and severe categories. The difference in mean creatinine clearance between each group was found to be statistically significant ($P < 0.001$).

Haemoglobin (gm%) was found to be higher in patients belonging to mild CRF category followed by moderate and severe categories respectively [GRAPH-4]. The mean difference in haemoglobin between mild and severe category as well as between moderate and severe category was found to be statistically significant ($P < 0.001$). But the mean difference in haemoglobin between mild and moderate categories was not statistically significant ($P > 0.05$).

Higher mean Total Cholesterol levels were found in severe CRF category of patients followed by mild and moderate categories respectively. But the difference in mean Total Cholesterol levels between the groups was not statistically significant ($P > 0.05$). Higher mean Triglycerides levels were found in mild CRF category of patients followed by moderate and severe categories respectively. But the difference in mean Triglycerides levels between the groups was not statistically significant ($P > 0.05$). Patients in the mild category of CRF had higher LDL followed by moderate and severe

ORIGINAL ARTICLE

categories. The mean LDL difference between mild and severe category as well as moderate and severe category were found to be statistically significant ($P < 0.05$). However, the mean difference in LDL was not statistically significant between mild and moderate category of CRF ($P > 0.05$). The mean HDL was found to be higher in patients with mild CRF compared to patients with severe and moderate CRF. The difference in mean CRF between mild and severe categories as well as mild and moderate categories were found to be statistically significant ($P < 0.05$). No significant difference was observed between severe and moderate category of CRF ($P > 0.05$).

Higher mean Serum Potassium (mEq/l) was found in patients with moderate CRF followed by patients with severe and mild CRF categories. But the difference in mean Serum Potassium was not statistically significant between any of the categories ($P > 0.05$) Higher mean Serum Calcium (mg/dl) was found in patients with mild CRF followed by patients with moderate and severe CRF categories. But the difference in mean Serum Calcium was not statistically significant between any of the categories ($P > 0.05$) Patients in moderate category of CRF recorded higher mean Serum Phosphorus (mg/dl) followed by mild and severe categories respectively. The difference in mean Serum Phosphorus was found to be statistically significant between moderate and severe categories ($P < 0.01$). However, no statistically significant difference was noticed between mild and severe as well as mild and moderate categories ($P > 0.05$).

No statistically significant difference was found between the different severity of CRF levels with respect to age ($P > 0.05$), SBP ($P > 0.05$) and DBP ($P > 0.05$).

DISCUSSION: Left ventricular hypertrophy is the single strongest independent predictor of adverse cardiovascular events. LVH is a major echocardiographic finding in uremic patients. In the present study, 12(17%) patients of mild, 18(26%) patients of moderate and 39(57%) patients of severe Chronic Renal Failure group had Left Ventricular Hypertrophy. SA Kale et al conducted prospective study includes 161 patients of end stage renal disease entering hemodialysis programme between 1-6-97 to 31-12-99. Patients were evaluated for left ventricular disease manifesting as systolic dysfunction, left ventricular hypertrophy & left ventricular dilatation on echocardiography after 4 to 12 weeks of initiating haemodialysis. Patients of ischemic heart disease, valvular heart disease & pericardial effusion were excluded. The mean age of this group of patients was 40.57 ± 11.71 years and 129 were men. Left ventricular disease was common & encountered in 105(65.2%) patients. Only 56(34.8%) had normal echocardiogram. We observed systolic dysfunction in 24(14.9%), left ventricular hypertrophy in 88(54.7%) & left ventricular dilatation in 42(26.1%) patients. Hypertension, older age, male sex, anemia, hypoalbuminemia and hypocalcaemia were found to be significantly associated with manifestations of left ventricular disorders. Patients of end stage renal disease with diabetes had higher frequency of systolic dysfunction (37.8%) as compared to non-diabetic patients (8.06%). It is concluded that left ventricular disorders are common in end stage renal disease patients entering haemodialysis programme and aggressive control of hypertension and anaemia can help to prevent these disorders.¹⁵ In HD patients additional risk factors were: levels phosphorus ($p < 0.0001$), product CaxP ($p < 0.0001$) and interdialytic weight gain ($p < 0.05$). Risk factors for concentric remodeling were age ($p < 0.05$), duration of predialysis hypertension ($p < 0.04$), creatinine plasma level ($p < 0.05$), anaemia ($p < 0.005$).⁴

Ifeoma I et al conducted study on 100 consecutive patients with CKD who were attending the medical outpatient and renal clinics of University of Nigeria Teaching Hospital, Enugu, who satisfied

ORIGINAL ARTICLE

the inclusion criteria were screened for the study Left ventricular hypertrophy (LVH), defined in absolute terms as left ventricular mass index .134 g/m² in men and .110 g/m² in women was present in 95.5% of patients and 6.7% of controls. The most prevalent type of LVH was eccentric hypertrophy, which was found in 54.6%, while concentric was seen in 40.9%. Hypertension was present in 85.2% of the patients. The predominant causes of CKD were chronic glomerulonephritis (43.2%), hypertension (25%), and diabetes mellitus (14.8%). All the patients studied had advanced CKD, either stage 4 or 5 of the Kidney Disease Outcome Quality Initiative classification of CKD. Stepwise method of multiple linear regressions identified mean arterial pressure (32%), haemoglobin concentration (22%), male sex (17%), and creatinine clearance (24%) as predictors of LVH in CKD.¹¹ The prevalence of left ventricular hypertrophy (LVH) along with systolic dysfunction in severe CRF group was 30%, which was significantly higher than mild/moderate CRF group (3.3%). The prevalence of LVH along with diastolic dysfunction in severe CRF group was 53.2%, which was significantly higher than mild/moderate CRF group (30%).³

Manes MT et al conducted study to estimate the impact and prevalence of left ventricular geometric alterations and systolic and diastolic dysfunction in haemodialysis patients, as well as the relationship with cardiac troponin as a marker of myocardial damage on 31 patients (pts.), 19 males and 12 females, age 58.1±/16.4 (26 on haemodialysis, 5 on peritoneal dialysis) and 31 healthy normal controls were enrolled. Eccentric hypertrophy was the most frequent pattern (n=17; 55%), followed by normal cardiac geometry (n=7; 23%), and concentric hypertrophy (n=5; 16%). Only 6% of pts. (n=2) showed concentric remodelling. Systolic dysfunction was present in terms of endocardial parameters in 3 pts (9%) (Fractional shortening <25%, EF<50%), but in terms of midwall myocardial shortening in 51% (n=16). Diastolic dysfunction was present in 87% (n=27) with a pattern of impaired relaxation (in 5 without left ventricular hypertrophy). E/A was negatively correlated with age (r=-0.41, p=0.02); DTE was positively correlated with posterior wall thickness (r=0.36, p=0.05) and interventricular septum thickness (r=0.45, p=0.01); cardiac troponin was positively correlated with age (r=0.50, p=0.00), left ventricular mass (r=0.41, p=0.02), posterior wall thickness (r=0.41; p=0.02) and interventricular septum thickness (r=0.39, p=0.03) but not with diastolic dysfunction parameters. No significant difference was found in terms of duration of dialysis between patients with normal left ventricular geometry and those with left ventricular hypertrophy, but a significant difference in age was found (p=0.03). Pts with diastolic dysfunction had more frequent hypotensive episodes during dialysis (p<0.01).¹⁶

In the present study, the most common cause of CRF in the Severe CRF group was Diabetes plus Hypertension in 47% followed by Diabetes alone in 33% as compared to Moderate CRF group where in Diabetes plus Hypertension accounted for 47%, followed by Diabetes in 47%, whereas in Mild CRF group Diabetes was the cause 38%, followed by Diabetes plus Hypertension in 33% of cases.

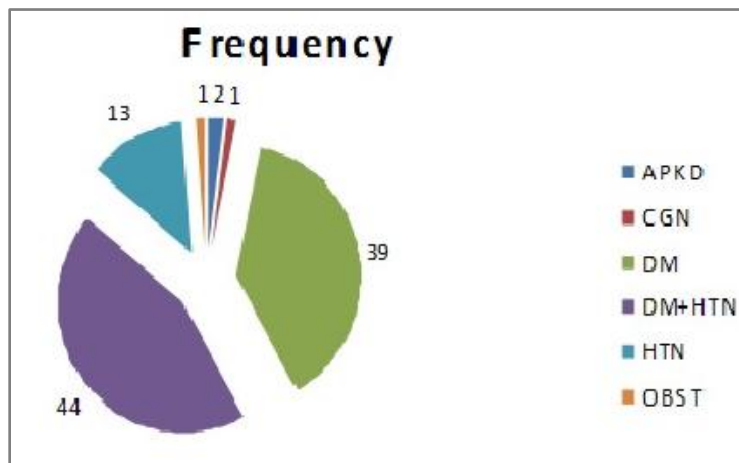
S Adibul Hasan Rizvi, K Manzoor conducted study on 874 patients. The mean age of the patients were 47.4 ± 14.9 years with a range of 17-85 years. There were 506 (57.8%) male patients and 368 (42.2%) female patients with M: F ratio of 1.3: 1. The majority of our patients, (66%) were beyond 40 years of age. The breakdown of the origin of referrals was 651(74%) urban 233 (26%) rural population. The etiology of CRF. The largest group comprised those patients in whom the cause was unknown. Diabetes mellitus and hypertension were the next two commonest causes. Obstruction (including both due to stone disease and due to lower tract pathology) was the fourth commonest

ORIGINAL ARTICLE

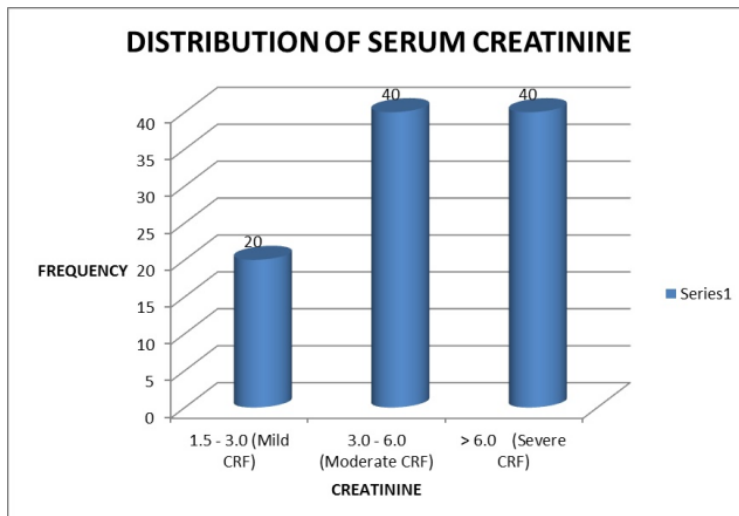
cause. The two most common known causes of CRF in males were diabetes mellitus in 113(22.3%) and hypertension in 92(18.1%) patients respectively. Among females CRF was related to hypertension in 79(21.8%) patients and to diabetes mellitus in 59 (16.3%) patients.¹⁷

CONCLUSION: The present study shows that patients with chronic renal failure have higher left ventricular mass index and higher prevalence of left ventricular hypertrophy (LVH), which is more marked in patients with severe renal failure.

The high prevalence of Left ventricular hypertrophy in these populations on echocardiography implies that these patients require detailed cardiovascular evaluation despite absence of symptoms, and also that various efforts aimed at prevention and control of left ventricular hypertrophy should be started early during the course of renal insufficiency, such as effective control of hypertension, anaemia.

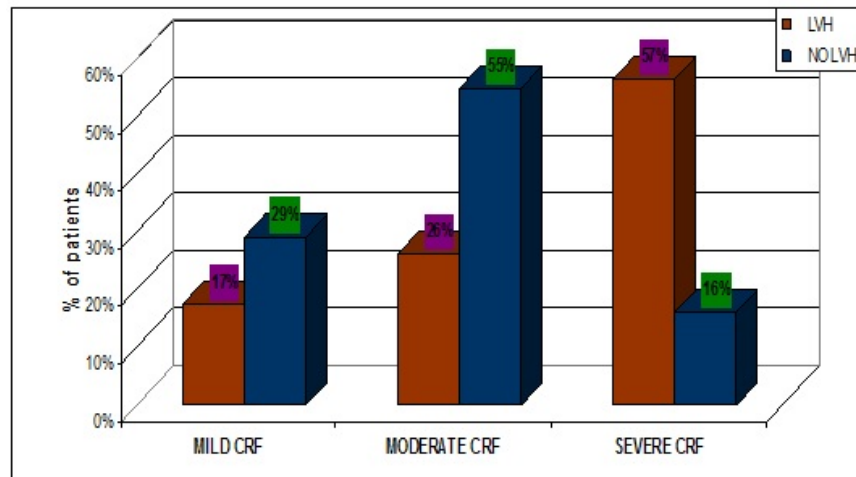


GRAPH 1

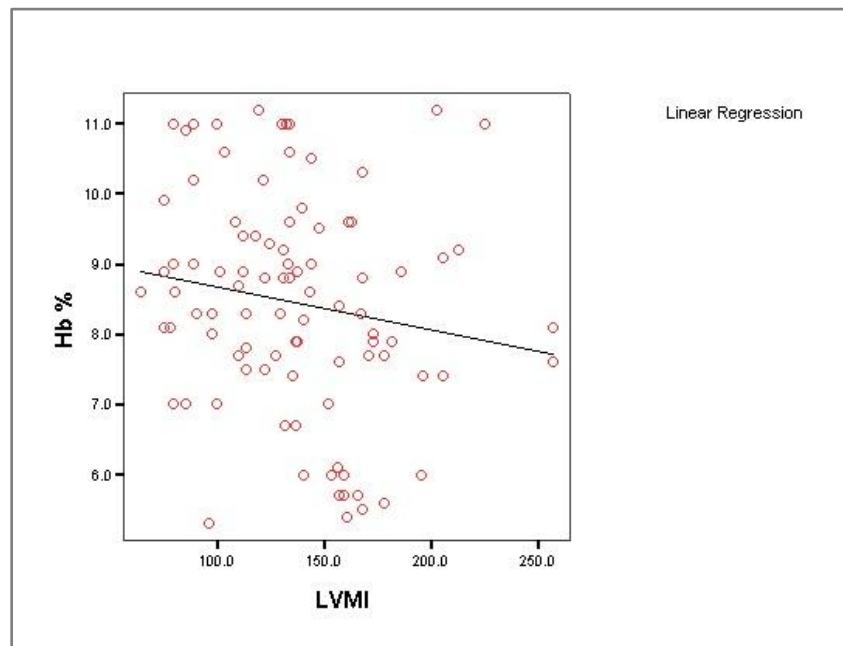


GRAPH 2

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GRAPH 3



GRAPH 4

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ORIGINAL ARTICLE

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