

# Clinical Manifestations of Cardiac Disease in Patients with End Stage Renal Disease Under Maintenance Hemodialysis in a Tertiary Level Hospital of Nepal

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## ABSTRACT

**Introduction:** End stage renal disease presents with multiple clinical and systemic manifestations. The aim of the present study was to identify the early cardiac and other morbidities in end stage renal disease (ESRD) patients who were under maintenance hemodialysis. **Methods:** This was an observational, prospective study conducted in fifty established ESRD patients of 20 to 74 years under maintenance hemodialysis in Nephrology unit of Shree Birendra Hospital. Clinical examination, laboratory parameters, electrocardiogram and echocardiography findings were used to identify the morbidities. **Results:** Among all patients enrolled in the study 88.7% had anemia, 64.2 % systolic murmurs, 62.26 % pedal edema, 73.6 % fatiguability, 71.7 % angina, 24.4 % palpitations and 13.2 % had breathlessness on exertion. 62.26% of the patients had hypertension and 13.20 % had diabetes. In the electrocardiogram, prolonged QTc was observed in 10.4%, followed by T wave inversion in 9.4 % and finally low voltage complex comprised 7.6 %. The echocardiogram showed left ventricular diastolic dysfunction in 58.5 %, left ventricular hypertrophy (overall type) 49 % and valvular lesion like mitral regurgitation and tricuspid regurgitation 83 % and 58.5 % respectively. **Conclusion:** Cardiac co-morbidities are common in patients diagnosed with ESRD on maintenance hemodialysis.

**Keywords:** end stage renal diseases; dialysis; echocardiography

## INTRODUCTION

Among the various systemic manifestations, the cardiac involvement is the major cause of death in patients undergoing maintenance hemodialysis, accounting for 40 % of deaths in international registries.<sup>1</sup> When compared to a non-renal cohort age range of 45 to 64 years, the death rate in dialysis cohort of similar age is 3.5 times higher.<sup>2</sup> The prevalence of clinical manifestations of cardiac disease at the initiation of end stage renal disease (ESRD) therapy is high and those manifestations independently predict death in these patients<sup>3,4</sup>.

Greaves et al. has reported various cardiac diseases in patients with end stage renal disease<sup>5</sup>. In the cohort studies done by Linder et al. comprising ninety patients with initial stage of end stage renal disease, it was seen that left ventricular hypertrophy adversely and independently influenced the outcome of the patients<sup>6,7</sup>.

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Though already seen in many studies performed mainly in western population, literature on correlation between ESRD and cardiac morbidities in Nepalese population is scarce. Thus the objective of this study was to observe, evaluate and correlate the clinical, electrocardiogram and the echocardiography findings in patients undergoing maintenance hemodialysis for ESRD.

## METHODS

The study was conducted at Department of Nephrology of Shree Birendra Hospital, Kathmandu from July 2012 to July 2014. Patients who had persistent azotemia in preceding three months and who had minimum six sessions of hemodialysis were included in this study. Patients with evidence of reversible causes of renal insufficiency such as acute renal failure, acute interstitial nephritis, acute glomerulonephritis and patients with pre-existing heart disease were excluded from the study. Similarly patients less than 20 years and more than 70 years of age were excluded.

Anemia was assessed by pallor & hemoglobin level. Jugular venous pressure, pedal edema and murmurs were assessed by standard clinical methods. Blood pressure was recorded on both the standing and lying position. The twelve lead chest ECG was done and two-dimensional echocardiography was used to assess the cardiac function status.

## RESULTS

Male and female constituted 56.6 % and 43.4 % respectively. Most subjects were of 51-60 years age group followed by 41-50 years (table 1). The clinical findings that were most common were pallor, systolic murmur, pedal edema and hypertension (table 2). The commonest electrocardiogram findings were

**Table 1:** Age and sex distribution of participants of the study.

Age (in years)	Male	Female	%
20-30	3	2	9.4
31-40	4	4	15.1
41-50	7	6	24.5
51-60	8	6	26.4
61-70	6	4	18.9
71-80	2	1	5.7
Total	<b>30</b>	<b>23</b>	<b>100</b>

**Table 2:** Findings of general examination. Hypertension was defined as blood pressure more than 140/90 MM Hg

Findings	No.	%
Pallor	47	88.7
Elevated JVP	10	19.2
Pedal edema	33	62.26
Hypertension	<b>Standing</b>	25 47.2
	<b>Lying</b>	29 35.8
Gallop rhythm	8	15.1
Systolic murmur	34	64.2
Pericardial rub	11	20.8

prolonged QTc, cor pulmonale, T wave inversion, low voltage complex and conduction disturbance. (Table 3). The echocardiography findings were left ventricular diastolic dysfunction, left ventricular hypertrophy (overall), pericardial effusion and valvular lesions i.e. mitral and tricuspid regurgitation. We lost seven patients during the study, three due to hyperkalemia, other three due to refractory pulmonary edema and one due to acute myocardial infarction.

**Table 3:** ECG findings

ECG findings	No.	%
Normal	10	18.9
T inversion	5	9.4
Prolonged QTc	6	10.4
Low voltage complex	4	7.6
Conduction disturbance	4	7.6
LAD	3	5.7
Cor Pulmonale	5	9.5
Sinus tachycardia	1	1.9
PVCs	1	1.9
Tall t waves	3	5.7

## DISCUSSION

On general physical examination, pedal edema was observed in 62.26 % , hypertension in 47.2 % on standing position and 35.8 % in lying position and systolic murmur was heard in 64.25 %. Congestive heart failure (CHF) suggested by the presence of gallop rhythm (S3/S4) was seen in 15.1 %. CHF was observed in 31 % of patients at the start of dialysis in the study conducted by Kent G et al<sup>8</sup>. Cheung et al. in his study reported that 80% of patients with chronic kidney disease suffered from various cardiac diseases, out of which CHF constituted forty percent<sup>9</sup>. Findings of our study are also similar to that of Barre P E et al. who found 31 % of cases with cardiac failure at the start of dialysis<sup>10</sup>.

Various studies have reported pericardial effusion in addition to ventricular dysfunction in such patients<sup>11,12</sup>. In the present study, echocardiography showed pericardial effusion in 17 patients (32.1 %). One patient had moderate effusion and the remaining sixteen

had mild effusion. In a study done by Frommer et al<sup>13</sup>. pre-dialysis effusions was present in thirty six percent of patients.

It was seen that left ventricular diastolic dysfunction was more common as compared to left ventricular systolic dysfunction. 58.5% patients had left ventricular diastolic dysfunction whereas only 13.2 % patients had left ventricular systolic dysfunction. Zocalli et al. had found left ventricular systolic dysfunction in 15 % while left ventricular diastolic dysfunction was in 32 % of their subjects<sup>14</sup>.

**Table 4:** Echocardiography findings

Echo findings	No.	%
<b>Left ventricular hypertrophy</b>		
Overall	26	49.1
Concentric	18	33.9
Eccentric	0	0
LV Diastolic dysfunction	31	58.5
LV Systolic dysfunction	7	13.2
Pericardial effusion	17	32.1
Left atrial dilatation	4	7.5
Left ventricular dilatation	4	7.5
All chamber dilatation	2	3.8
Global hypokinesia	1	5.2
Basal septal hypertrophy	1	1.9
<b>Valvular lesions</b>		
Mitral Regurgitation	89	83.1
Aortic Regurgitation	21	39.6
Tricuspid Regurgitation	31	58.5
Pulmonary Regurgitation	2	3.8

Left ventricular hypertrophy (LVH) was diagnosed by ECG in 3 patients (5.7 %). Echocardiography showed LVH of overall type in 26 patients (49.1 %). Left ventricular hypertrophy was observed in 65 % of subjects by Straumann et al<sup>15</sup>. Parfrey PS et al. have also found that the characteristic echocardiography pattern in dialysis patients were a dilated left ventricle with normal systolic function and left ventricular hypertrophy.<sup>16</sup>

Regarding mortality during maintenance hemodialysis, Jungers et al. have shown that cardiovascular disease is the major cause of morbidity and mortality in CKD patients both pre-dialysis and on maintenance dialysis therapy. Cardiovascular mortality is 3 to 20 times higher in ESRD patients than general population of similar age<sup>17</sup>. Similarly, Koch et al. noted that cardiac death was responsible for most fatalities in diabetic mellitus patients with ESRD<sup>20</sup>.

Seven cases reported chest pain and five had ischemic changes in ECG showing T wave inversion in our study. Lisowsky et al. have reported that forty of their cases suffered from coronary artery disease<sup>18</sup>. Chueng et al. have shown that cardiac cause is responsible for 39.4 % of all the deaths and of which ischemic heart disease constituted 61.5 %<sup>19</sup>.

## CONCLUSION

In patients undergoing maintenance hemodialysis for ESRD, common clinical findings were pallor, systolic murmur, pedal edema and hypertension. ECG findings were prolonged QTc, Cor Pulmonale, T wave inversion, low voltage complex and conduction disturbance and echo findings were left ventricular diastolic dysfunction, left ventricular hypertrophy (overall), pericardial

effusion and valvular lesions i.e. mitral and tricuspid regurgitation. Total mortality during the period of study was 11.1 %. These findings of Nepalese population were not different from the findings of other populations of the west.

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