



STUDY OF ETIOLOGY, MODE OF DIALYSIS AND CARDIOVASCULAR MORBIDITY AMONG DIALYSIS DEPENDENT CHRONIC KIDNEY DISEASE PATIENTS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Study of etiology, mode of dialysis and cardiovascular morbidity among dialysis dependent chronic kidney disease patients in a tertiary care hospital.

Introduction : Chronic kidney disease leads to many comorbidities that affects patients at all stages of the disease. Complications are due to disease itself as well as the mode of renal replacement therapy. Cardiovascular morbidity and mortality is highest in the dialysis population. Recently there has been found an association between RRT and development of pulmonary hypertension. There is a paucity of data on the incidence and prevalence of pulmonary hypertension in chronic kidney disease in Indian patients.

Objectives : To study the etiology, mode of dialysis and cardiovascular morbidity among dialysis dependent chronic kidney disease patients.

Materials and methods: A cross-sectional study, where a random of 50 dialysis dependent CKD patients, who met the inclusion criteria were evaluated. The parameters like, etiology for CKD, hemoglobin levels, mode and duration of dialysis, 2D Echocardiogram for the presence of cardiovascular abnormality among dialysis dependent patients was studied.

Results : Of the 50 dialysis dependent CKD patients, 47 were on hemodialysis and 3 were on peritoneal dialysis. The etiology for CKD among subjects in my study was diabetes mellitus plus hypertension (50%), hypertension alone (44%), chronic glomerulonephritis (4%), chronic pyelonephritis (2%). All the patients had low hemoglobin levels with mean being 9 gm%. The mean duration of dialysis was 19.32 months. Among the 50 patients, 6 (12%) had concentric LVH, 40 (80%) had pulmonary hypertension and 4 (8%) had normal 2D echo. Patients had significant linear relation between duration of dialysis and severity of PH. Of the 3 patients on PD, 1 had pulmonary hypertension and 2 had LVH.

Conclusion: The mechanisms underlying development of cardiovascular complications in CKD patients especially PH are more complex. This unrecognized complication of maintenance hemodialysis therapy is not uncommon, and perhaps most importantly is associated with reduced survival, therefore best approach to the disease is looking for it. It is important to evaluate for the impact of arteriovenous fistula on the pulmonary artery pressure (PAP) in pre-ESRD period.

KEYWORDS : Chronic Kidney Disease; Hemodialysis; Peritoneal Dialysis; Pulmonary Hypertension; Pulmonary Artery Pressure.

Introduction

Chronic kidney disease (CKD) includes a spectrum of pathophysiologic processes associated with abnormal kidney function and progressive decline in glomerular filtration rate (GFR). There are different stages of CKD which are stratified by both estimated GFR and the degree of albuminuria¹. It is also noted that death rates among dialysis patients have been falling 2–3% per year since 2001 (28% reduction), and in 2012 reached a level comparable to rates reported in 1982. The prevalence and incidence of CKD are increasing worldwide and it is estimated that 20 million Americans have CKD². Most common cause of CKD in Europe and North America is diabetic nephropathy secondary to type 2 diabetes mellitus³. Since CKD increases the mortality and morbidity risks, they have become a major public health problem³. The population of India is more than one billion which is projected to become the major reservoir of chronic diseases like diabetes mellitus and hypertension⁴.

It has been estimated that less than 10% of all Indian ESRD patients receive any meaningful renal replacement therapy (RRT)⁵ and if not dealt at the appropriate time period it increases the cardiovascular mortality. The major structural cardiac anomaly in patients with CKD is left ventricular hypertrophy (LVH) and is associated with increased risk for cardiac ischemia, congestive heart failure, and a strong independent predictor of cardiovascular mortality⁶. Most of them with CKD die due to cardiovascular events before reaching ESRD due to both traditional and nontraditional risk factors. ESRD patients do have myriads of structural and functional cardiac abnormalities that include LVH, low LV function, regional wall motion abnormality, pericardial effusion and valvular calcification. There are various complications enlisted among CKD patients which are due to the disease per se and also due to the mode of RRT⁷. Kidney function can only be partly replaced by maintenance dialysis, which provides only 5–10% of excretory renal

function⁸. Hemodialysis is a form of renal replacement therapy, that relies on the principles of solute diffusion across a semipermeable membrane. Also it maintains the nutritional status, mental and physical well being if done on regular basis⁹.

There is an association found between hemodialysis and the development of pulmonary hypertension (PH) which is estimated to be around 17–56%^{7,10,11}. It is therefore important to detect the presence of cardiovascular complications among patients undergoing hemodialysis, this is because CKD per se has increased cardiovascular morbidity and mortality.

Aims and objectives :

- (1) To study the etiology of CKD among patients attending tertiary care hospital
- (2) To study the prevalence and type of cardiovascular morbidity among dialysis dependent chronic kidney disease patients.
- (3) To look for the factors predisposing to cardiovascular complications among dialysis dependent chronic kidney disease patients.

Materials and methods :

The study was conducted among dialysis dependent chronic kidney disease patients coming to SDM College Of Medical Sciences and Hospital, Dharwad. Dialysis patients included both hemodialysis and peritoneal dialysis respectively

Sample size: 50 dialysis dependent patients

Methods of collecting the data: A cross sectional study where dialysis dependent patients who came to our hospital from 1st March 2017 to 28th Feb 2018 were included. The etiology of CKD was studied. The mode of dialysis and duration of dialysis was documented. The access for haemodialysis was also noted. All the patients had complete hemogram, renal function tests, ultrasound abdomen, chest radiograph and 2D Echocardiogram.

Two dimensional (2D) guided M-mode echocardiogram was performed with digital cardiac ultrasound machine. On dialysis patients it was done in the post-dialysis day as it allowed to control volume state of the patient since it is associated with least intravascular volume. Pulmonary artery systolic pressure was recorded by tricuspid regurgitation jet method.

Based on the pulmonary artery pressure, they were classified into three groups of mild degree(25-35mmhg), moderate (35-50mmhg) severe degree(>50 mmhg).

Inclusion criteria:

- (1) Age more than 18 years
- (2) Dialysis dependent patients

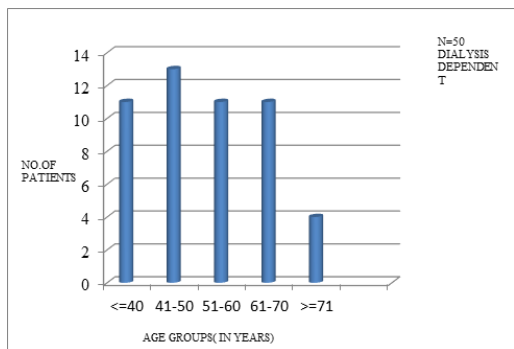
Exclusion criteria:

- (1) Obstructive and restrictive lung disease
- (2) Ischaemic heart disease
- (3) Primary pulmonary hypertension
- (4) Chronic pulmonary thromboembolism
- (5) Acute on chronic kidney disease
- (6) Chronic liver disease
- (7) Smokers

Statistical analysis : Results were analyzed and presented as frequency, percentage, mean and standard deviation. Chi square was used to find an association between variables. p value < 0.05 was taken as statistically significant. Data entry was done using Microsoft Excel and analysis was carried out with the help of Statistical Package for Social Sciences (SPSS Statistics 21).

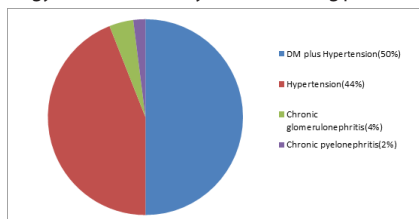
Results

Fig:1 - Age wise distribution of patients among dialysis dependent group



Mean age of the patients among the dialysis group is 53.04 years, with 35 males and 15 females

Fig : 2 - Etiology of chronic kidney disease among patients



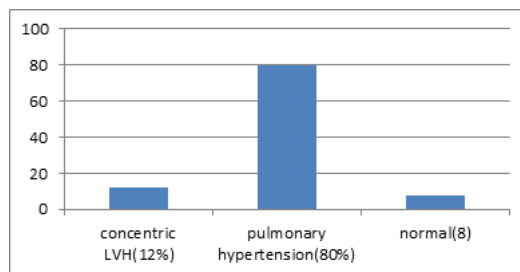
Diabetes mellitus and hypertension is the leading cause of chronic kidney disease patients requiring dialysis among patients attending our hospital.

Table 1 : Mode of dialysis

Mode of dialysis	nos.
Hemodialysis	47
Peritoneal dialysis	3

Among 50 patients, 47 were on hemodialysis and remaining 3 on peritoneal dialysis

Fig 3: cardiovascular morbidity among dialysis patients(N=50):



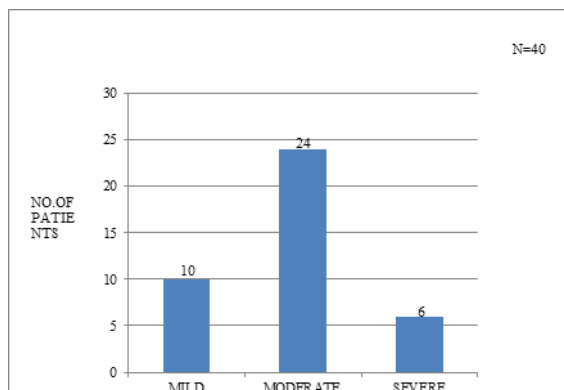
The prevalence of cardiovascular morbidity was 92% in the study and among that pulmonary hypertension was seen in 40 patients(80%) and concentric LVH among 6(12%)patients.4(8%) of them had normal 2DEcho.

Table 2: Mean haemoglobin(Hb) value and concentric LVH:

2 D ECHO FINDING	MEAN HAEMOGLOBIN (gm%)	S.D.
CONCENTRIC LVH	8.74	1.20

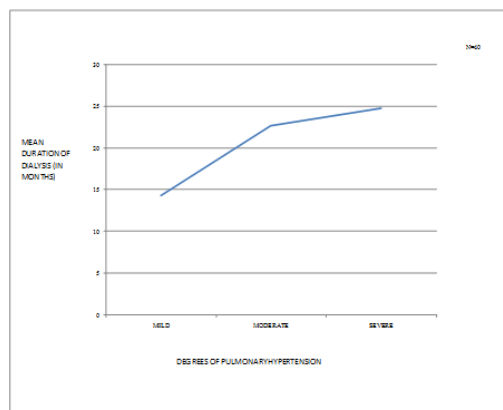
The mean haemoglobin values were lower in patients with concentric LVH

Fig 4 : severity of pulmonary hypertension among 40 dialysis dependent CKD patients



Among 40 patients who had pulmonary hypertension, 10 had mild, 24 had moderate and 6 had severe pulmonary hypertension respectively.

fig 5: duration of dialysis and severity of pulmonary hypertension



Linear correlation between duration of dialysis and severity of pulmonary hypertension was observed in the study.

Discussion:

CV morbidity especially pulmonary hypertension is highly prevalent in end stage renal disease. And many studies have confirmed this. Pathogenesis of PH in this population remains poorly understood. Reported associations include arteriovenous

fistulae, cardiac dysfunction, fluid overload, bone mineral disorder and non-biocompatible dialysis membranes. Due to small numbers and cross-sectional nature of majority of studies no consistent association with any particular risk factor has been demonstrated. In our study, there were total of 50 patients on dialysis. Among them 47 were on hemodialysis and 3 were undergoing CAPD. Patients undergoing hemodialysis had access through arteriovenous fistula(AVF).

The mean age of patients was found to be 53.04 years, and was 60.8 years in the study done by Farid N etal¹³. There were 35 males and 15 females. The etiology of CKD was found that diabetes plus hypertension contributed to 50%, which is comparable to the study done by M.Yigla etal¹² that is 42.5%. Hypertension solely as a cause was found in 44% of patients. Chronic glomerulonephritis and chronic pyelonephritis as an etiology was seen in 4% and 2% that is comparable to the study done Esam H etal¹⁵ and Magady M etal¹⁴. As compared to the last two factors, diabetes mellitus and hypertension ranks the list as common cause of CKD worldwide. Minimum and maximum duration of dialysis is 4 and 72 months.

The mean hemoglobin level was found to be 8.67gm% , this is similar to the observations in the study done by GK Modi etal¹³ that is below 9.1gm% . 2D Echocardiogram was done in all, 4(8%) are within normal limits, 40 (80%) patients had pulmonary hypertension of varying degrees and remaining 6(12%) patients had concentric left ventricular hypertrophy (LVH) whereas in the study done by Singh S etal LVH was seen in 48% patients⁹. Among 40 patients who had pulmonary hypertension, 39(97.5%) were on hemodialysis and 1(2.5%) patient was undergoing CAPD. Such a high prevalence of pulmonary hypertension among hemodialysis patients is found in various studies, one of the study done by P.Patel etal⁷. Mitra M etal¹⁶ found that PH among hemodialysis patients was 51.6%; 40% of patients on HD with A-V fistula had pulmonary hypertension as shown in the study done by Mordechai Y etal¹⁷.

Out of 3 patients undergoing CAPD that was included in my study, 1 patient (33.33%) had pulmonary hypertension, in the study done by Lalathaksha K etal prevalence of PH was 42%. Therefore, as compared with hemodialysis patients, prevalence of PH is much less in CAPD patients which is comparable with study done by P.Pateletal⁷.

Severity of pulmonary hypertension among patients were classified into - 10(25%) having mild pulmonary hypertension, 24(60%) moderate and 6(15%) of them had severe pulmonary hypertension. In my study, it was also found that the mean duration of dialysis in months is directly proportional to the severity of pulmonary hypertension.

LVH is the common cardiac abnormality seen in ESRD patients, this is more marked in anemic populations⁹. In my study, among 100 CKD patients who had concentric LVH on 2 D Echo, their mean hemoglobin level was 8.74gm% which is comparable to the study done by Singh S etal⁹.

All the patients undergoing hemodialysis those were included in my study had AVF access and low hemoglobin levels, which probably could be the reason for high prevalence of PH among these patients; along with other factors like lower hematocrit, serum bicarbonate and higher serum creatinine levels, which is also seen in the study done by Farid N etal¹³.

Conclusion:

Cardiovascular complications are more common in patients with chronic kidney disease and certain complications gets aggravated when they are subjected to long term dialysis. Among those complications, pulmonary hypertension is of more importance. It was found that, hemodialysis patients had high prevalence as compared to peritoneal dialysis(PD), owing to their AVFs and other factors. Also, the prevalence linearly increases with the duration of hemodialysis. So this complication should be anticipated early in

the course of the disease and should be addressed early. Because the long term prognosis and mortality in these patients are directly proportional to the severity of pulmonary hypertension. So do we need to switch to alternate mode of dialysis, like PD should be thought upon; but again its efficacy as compared to hemodialysis is low.

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