ORIGINAL RESEARCH

To investigate the significance of electrocardiographic and echocardiographic findings in patients with chronic kidney disease, specifically focusing on their lipid profile

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ABSTRACT

Aim: To investigate the significance of electrocardiographic and echocardiographic findings in patients with chronic kidney disease, specifically focusing on their lipid profile. **Material and Methods:** This research comprised 100 individuals who were diagnosed with chronic kidney disease. The diagnosis was made based on a combination of their medical history, clinical symptoms, compromised renal function tests, and abdominal ultrasonography. A comprehensive clinical history and physical examination were conducted, and the results was documented. Every patient in the research had biochemical testing such as complete blood count (CBC), renal function tests, lipid profile, and ultrasonographic examination of the abdomen. These tests were conducted to establish the existence of end-stage renal illness and evaluate the echocardiographic findings of the heart. **Results:** LVH was detected in 41% of the individuals, whereas ST changes were seen in 24% of the subjects in the electrocardiogram (ECG) analysis conducted in our research. LVH (left ventricular hypertrophy) and DDF (diastolic dysfunction) were the most prevalent abnormalities detected in 46% and 43% of the patients, respectively, according to the ECHO diagnoses. The present research reveals that the most prevalent cardiac abnormality among the Echo findings is left ventricular hypertrophy (LVH), which is seen in 46% of patients. This is followed by left ventricular diastolic dysfunction, which is detected in 43% of patients, and left ventricular systolic dysfunction, which is present in 29% of patients. In our research, the average triglyceride level was significantly higher in chronic kidney disease (CKD) patients on hemodialysis compared to CKD patients not undergoing hemodialysis, specifically measuring at 166.11 ± 13.54. The average VLDL level was significantly greater in CKD patients on hemodialysis compared to CKD patients not undergoing hemodialysis, specifically at a mean value of 32.21 + 3.43. **Conclusion:** Hemodialysis efficiently decreases the buildup of nitrogenous waste products, but it does not fully treat uremic dyslipidemia. Instead, it may modify the pattern of dyslipidemia, as seen in our work. CKD patients on hemodialysis had elevated levels of triglyceride and VLDL, while experiencing reduced levels of HDL, compared to CKD patients not undergoing hemodialysis.

Keywords: CKD,Electrocardiographic,Echocardiographic, lipid profile

INTRODUCTION

Chronic kidney disease is a widespread issue in public health that is becoming more prevalent. A low glomerular filtration rate is linked to an increased chance of renal failure necessitating dialysis. Additionally, it is connected with cardiovascular disease, hypertension, anemia, and other metabolic problems[1,2]. Over the last ten years, there has been a notable rise in the frequency, occurrence, and complexities of CKD mostly due to the expansion of the National Kidney Foundation Kidney Disease Outcomes Quality Initiative's criteria for CKD. Cardiovascular disease (CVD) is the primary cause of death in those with chronic kidney disease (CKD). The incidence of death caused by cardiovascular complications, particularly in individuals with end stage renal disease (ESRD), has been acknowledged as responsible for approximately 50% of the total mortality rate in these patients. Individuals diagnosed with chronic kidney disease (CKD) have a much higher risk, ranging from 3 to 30 times, of developing cardiovascular disease (CVD) compared to the overall

population[3]. Keith et al conducted a study on 27,998 patients with evidence of CKD. They found that the 5-year mortality rates for CKD stages 2, 3, and 4 were 19.5%, 24.3%, and 45.7% respectively. The proportions of patients with these stages who progressed to ESRD were much lower at 1.1%, 1.3%, and 19.9%. Likewise, cardiovascular disease (CVD) is very prevalent among those undergoing dialysis treatment and is responsible for over half of all fatalities. The mortality rate associated with CVD in this population is 20 to 30 times greater compared to individuals of same age, sex, and race[3].Echocardiography is a well-established technique used to evaluate the function of the left ventricle and right ventricle. LV diastolic dysfunction (LVDD) is a significant contributor to cardiac morbidity in individuals with end-stage renal disease (ESRD). Diastolic dysfunction is seen as the primary malfunction of the left ventricle (LV) and may even occur before the development of left ventricular hypertrophy (LVH)[4].Several variables may modify cardiovascular dynamics in renal failure, such as anemia, hypertension, excessive fluid volume, electrolyte imbalance, edema, and arteriovenous fistulas. Cardiomyopathy in chronic uremia presents as either systolic dysfunction, concentric left ventricular hypertrophy (LVH), or left ventricular dilatation[5,6].An echocardiogram is a medical test that may assess the size and volume of the ventricles of the heart. It is very accurate in detecting hypertrophy, determining whether it is concentric or eccentric, and measuring the strength of the heart's contractions. Furthermore, Doppler-derived approaches may provide detailed data on ventricular relaxation, the dynamics of filling, and the detection of anomalies in the heart valves and the pericardium[7].Left ventricular hypertrophy (LVH) is often seen in chronic kidney disease (CKD) and is strongly linked to a negative prognosis. As a result, it is a significant focus for medical management. The prevalence of left ventricular hypertrophy (LVH) rises as renal function deteriorates progressively[8].Left ventricular systolic dysfunction (LVSD) is a strong predictor of poor outcome in individuals undergoing hemodialysis (HD). Diastolic dysfunction is defined by changes in the relaxation and flexibility of the ventricles, often leading to a subsequent rise in filling pressure as the condition progresses. The subsequent occurrence is often accountable for the symptoms of heart failure, regardless of the underlying etiology. Several small-scale investigations have shown that the prevalence of left ventricular diastolic dysfunction (LVDD) in individuals with chronic kidney disease (CKD) ranges from 50 to 60%.

MATERIAL AND METHODS

Cross-sectional observational research was conducted at the department of medicine. This research comprised 100 individuals who were diagnosed with chronic kidney disease. The diagnosis was made based on a combination of their medical history, clinical symptoms, compromised renal function tests, and abdominal ultrasonography. Written informed permission was acquired from each individual in all situations. A comprehensive clinical history and physical examination were conducted, and the results was documented. Every patient in the research had biochemical testing such as complete blood count (CBC), renal function tests, lipid profile, and ultrasonographic examination of the abdomen. These tests were conducted to establish the existence of end-stage renal illness and evaluate the echocardiographic findings of the heart.

INCLUSION CRITERIA

- All confirmed cases of CKD of age group more than 18yrs.

EXCLUSION CRITERIA

- Age<18years.
- Patients with Renal carcinomas.
- Known cases of IHD.
- Patients who refused to give informed written consent.

RESULTS

Our research included 100 patients with a mean age of 49.24 ± 6.33 years. Among the population under investigation, there were 69 male and 31 females. The male-to-female ratio is 2:23. The predominant clinical sign seen in our research was pallor, with a prevalence of 76%. The most prevalent clinical symptom reported was anorexia, with a prevalence of 84%. This was followed by oliguria, which was reported by 82% of participants, and swelling of the legs, which was reported by 60% of participants. Facial puffiness and dyspnea were reported by 60% and 52% of participants, respectively. In our research, the average hemoglobin level was 7.88 ± 1.77 g/dl, which was somewhat lower in CKD patients undergoing dialysis compared to CKD patients not receiving hemodialysis. Out of the 100 patients that were evaluated, the most prevalent co-morbid condition was hypertension, affecting 85% of the patients. This was followed by diabetes mellitus, which affected 38% of the patients, and obesity, which affected 15% of the patients. LVH was detected in 41% of the individuals, whereas ST changes were seen in 24% of the subjects in the electrocardiogram (ECG) analysis conducted in our research. LVH (left ventricular hypertrophy) and DDF (diastolic dysfunction) were the most prevalent abnormalities detected in 46% and 43% of the patients, respectively, according to the ECHO diagnoses. The present research reveals that the most prevalent cardiac abnormality among the Echo findings is left ventricular hypertrophy (LVH), which is seen in 46% of patients. This is followed by left ventricular diastolic dysfunction, which is detected in 43% of patients, and left ventricular systolic dysfunction, which is present in 29% of patients. In our research, the average triglyceride level was significantly higher in chronic kidney disease (CKD) patients on hemodialysis compared to CKD patients not undergoing hemodialysis, specifically

measuring at 166.11 ± 13.54. The average VLDL level was significantly greater in CKD patients on hemodialysis compared to CKD patients not undergoing hemodialysis, specifically at a mean value of 32.21 + 3.43. The average HDL level was significantly lower in CKD patients on hemodialysis compared to CKD patients not undergoing hemodialysis, specifically measuring at 30.01 ± 3.54. The mean value was somewhat higher in chronic kidney disease (CKD) patients on hemodialysis compared to CKD patients not undergoing hemodialysis (205.66 ± 16.76). The average LDL value was found to be somewhat higher in CKD patients on hemodialysis compared to CKD patients not undergoing hemodialysis, with a mean value of 134.99 ± 7.65. This difference was statistically significant.

Table 1 Gender and age of the patients

	Number	Percentage	P value
Gender			0.12
Male	69	69	
Female	31	31	
Age			0.23
Below 20	4	4	
20-30	10	10	
30-40	11	11	
40-50	20	20	
50-60	31	31	
60-70	15	15	
Above 70	9	9	

Table2: ECG and ECHO

ECG		Number	Percentage
LAOR RA Abnormality	No	82	82
	Yes	18	18
LVH	No	59	59
	Yes	41	41
ST Changes	No	76	76
	Yes	24	24
Tall T Wave	No	91	91
	Yes	9	9
Prolong QTC	No	83	83
	Yes	17	17
ECHO			
LVH	No	54	54
	Yes	46	46
DDF	No	57	57
	Yes	43	43
LV Systolic Dysfunction	No	71	71
	Yes	29	29
Dilated Chambers	No	73	73
	Yes	27	27

Table3: Investigation

		Number	Percentage
Hb	Below Normal	100	100
	Normal	0	0
Serum Urea	<20Mg%	0	0
	20-45Mg%	0	0
	>45mg%	100	100
Total Cholesterol	<150mg/dl	18	18
	>250mg/dl	31	31
Triglyceride	<60mg/dl	1	1
	>150mg/dl	65	65
HDL	>60mg/dl	0	0

	<35mg/dl	79	79
LDL	>130mg/dl	63	63
	<130mg/dl	37	37
VLDL	<12mg/dl	1	1
	>30mg/dl	56	56

Table4: Association between Haemodialysis and Non haemodialysis and ECG/ECHO

		Haemodialysis			
		No=42	**Yes=58**	**Total**	**P Value**
ECG					
La Or Ra Abnormality	No	36	46	82	0.14
	Yes	6	12	18	
LVH	No	24	35	59	0.17
	Yes	18	23	41	
St Changes	No	36	40	76	0.03
	Yes	6	18	24	
Tall T Wave	No	38	53	91	0.22
	Yes	4	5	9	
Prolong QTC	No	38	45	83	0.07
	Yes	4	13	17	
ECHO					
LVH	No	27	27	54	0.04
	Yes	15	31	46	
DDDF	No	27	30	57	0.005
	Yes	15	28	43	
LV Systolic Dysfunction	No	34	37	71	0.07
	Yes	8	21	29	
Dilated Chambers	No	36	37	73	0.03
	Yes	6	21	27	

Table5: Association between Haemodialysis and Non-haemodialysis and Laboratory findings

Laboratory		**Haemodialysis**		**Total**	**P Value**
		No	**Yes**		
Total Cholesterol	<150mg/dl	8	10	18	0.11
	>250mg/dl	10	21	31	
Triglyceride	<60mg/dl	0	1	1	0.14
	>150mg/dl	25	40	65	
HDL	>60mg/dl	00	0	0	0.17
	<35mg/dl	31	48	79	
LDL	<130mg/dl	16	47	63	0.01
	>130mg/dl	25	12	37	
VLDL	<12mg/dl	0	1	1	0.28
	>30mg/dl	22	34	56	

DISCUSSION

Among the 100 patients hospitalized in the renal ward of the medical department, all of them had chronic kidney disease (CKD). Among a total of 100 patients with chronic kidney disease (CKD), 58 were undergoing maintenance hemodialysis whereas the remaining 42 were not receiving hemodialysis treatment. The prevalence of chronic kidney disease is rapidly rising on a global scale, leading to a significant increase in both mortality and morbidity. This highlights the urgent need to address this critical public health issue. The mortality and morbidity associated with chronic kidney disease (CKD), particularly cardiovascular complications, are significantly elevated, reaching up to 5.4 times higher rates compared to the general population with normal estimated glomerular filtration rate (GFR). There is indeed a strong correlation between dyslipidemia and cardiovascular disease. The findings of this research examining the lipid profile in individuals with chronic renal disease indicate that there are notable changes in the lipid profile in both groups. The observations in our investigation took into account the data from ECG and ECHO.Our research included 100 patients with a mean age of 49.24 ± 6.33 years. The majority of patients were between the age range of 50 to 60 years, with a total of 31 individuals. The mean age in our research was similar to that reported by Ajankar et

al[11] (45.92±10.14 years), Manjusha Yadla et al[12] (44.7±12.3 years), and K Rajnikumari et al[13] (45.28 years). The research conducted by Bignotto et al[14] found a slightly higher mean age of 58.5±14.7 years, whereas the study by Sachdeva et al[15] reported a mean age of 58.62±13.7 years.

Among the population under investigation, there were 69 men and 31 females. The male to female ratio is 2:23, which is similar to the ratios found in the following studies: Rajni Kumari and her colleagues [13] The male to female ratio is 2:1, according to Kokkat et al[16]. The male to female ratio is 2:1. Sachdeva and colleagues (Sachdeva et al., [15] The male to female ratio is 3 to 1. Magar and colleagues[17] The male to female ratio is 1.5 to 1.

The predominant clinical sign seen in our research was pallor, with a prevalence of 76%. The most prevalent clinical symptom reported was anorexia, with a prevalence of 84%. This was followed by oliguria, which was reported in 82% of cases, and swelling of the legs, which was reported in 60% of cases. Facial puffiness and dyspnea were identified in 60% and 52% of cases, respectively. Prasad RYS et al[18] reported similar observations. In our research, the average hemoglobin level was 7.88 ± 1.77 g/dl, which was somewhat lower in CKD patients undergoing dialysis compared to CKD patients who were not undergoing hemodialysis. Out of the 100 patients that were evaluated, the most prevalent co-morbid condition was hypertension, affecting 85% of the patients. This was followed by diabetes mellitus, which affected 38% of the patients, and obesity, which affected 15% of the patients. The research conducted by Rajnikumari et al[13] revealed that 86% of CKD patients had hypertension, whereas the study by Ridao et al[19] reported a prevalence of 80%. Similarly, a study conducted by Shafi S et al[20] found that 84.8% of patients with chronic kidney disease (CKD) had hypertension, whereas 7% had diabetes mellitus. ECG and ECHO are often used to assess heart function. LVH was detected in 41% of the individuals, whereas ST changes were seen in 24% of the subjects in the electrocardiogram (ECG) analysis conducted in our research. LVH (left ventricular hypertrophy) and DDF (diastolic dysfunction) were the most prevalent abnormalities detected in 46% and 43% of the patients, respectively, according to the ECHO diagnoses.

The prevailing electrocardiogram abnormality was left ventricular hypertrophy. Left ventricular hypertrophy was seen in 41% of the patients, a prolonged QT interval in 17%, ST segment alterations in 24%, a tall T wave in 9% of the patients, and abnormalities in the left atrium or right atrium (dilated chambers) in 18% of the patients. Echocardiography is a powerful technique for evaluating the alterations in cardiac function and structure caused by CKD. CKD in patients with maintained EF has a significant impact on critical characteristics such as abnormal LV shape, decreased strength of the interventricular septum, and alterations in LV mass index[21]. Prior research has shown that anemia, excessive fluid volume, imbalances in electrolytes, swelling, and high blood pressure are risk factors that modify the likelihood of cardiovascular disease in individuals with chronic kidney disease [22]. The current research reveals that 85% of patients are diagnosed with hypertension, whereas 38% are diagnosed with diabetes mellitus. Research conducted by Tsilonis et al. found that 24% of patients with chronic kidney disease (CKD) who were undergoing hemodialysis had diabetes mellitus, whereas 22% had hypertension. The present research reveals that the most prevalent cardiac abnormality, as shown in Echo results, is left ventricular hypertrophy (LVH), which was detected in 46% of the patients. This is followed by left ventricular diastolic dysfunction, which was observed in 43% of the patients, and left ventricular systolic dysfunction, which was observed in 29% of the patients. In a research done by Shivendra et al.[23], it was shown that 48% of patients with chronic kidney disease (CKD) on maintenance had left ventricular hypertrophy (LVH), 51.42% had diastolic dysfunction, and 28.57% had systolic dysfunction. High definition. Agarwal et al. found that 53.2% of patients with severe CKD had left ventricular diastolic dysfunction, whereas 30% had left ventricular systolic dysfunction. In a separate investigation conducted by Laddha et al. [24], it was shown that 74.3% of patients had left ventricular hypertrophy (LVH), 61.4% had left ventricular diastolic dysfunction, and 24.3% had systolic dysfunction.

In research conducted by Ahmed et al. [25], it was shown that 80% of patients had left ventricular hypertrophy (LVH), 53.3% had left ventricular diastolic dysfunction, and 36.3% had left ventricular systolic dysfunction. Several investigations have shown that all patients undergoing Haemodialysis have LV systolic dysfunction, with a prevalence that is far higher than what was seen in our research and the aforementioned studies. The high proportion observed in these studies may be attributed to the utilization of PET scan for identifying systolic dysfunction. PET scan employs contrast-induced ischemic changes to diagnose ischemia and is considered more effective than echocardiography in determining cardiac dysfunction. Upon comparing the levels of triglyceride and VLDL, it was seen that these values were significantly higher in patients with chronic kidney disease (CKD). However, there was no statistically significant difference between the dialysis and non-dialysis groups, as shown by a p-value greater than 0.05. CKD patients on hemodialysis had a decreased HDL value compared to CKD patients not undergoing hemodialysis. LDL levels were slightly elevated in those with chronic kidney disease (CKD). The observed discrepancy in LDL levels was found to be statistically significant, with a p-value of 0.01.

In our research, the average triglyceride level was significantly higher in chronic kidney disease (CKD)

patients on hemodialysis compared to CKD patients not undergoing hemodialysis, specifically measuring at 166.11 ± 13.54. The average VLDL level was significantly greater in CKD patients on hemodialysis compared to CKD patients not undergoing hemodialysis, specifically at a mean value of 32.21 + 3.43. The average HDL level was significantly lower in CKD patients on hemodialysis compared to CKD patients not undergoing hemodialysis, specifically measuring at 30.01 ± 3.54. The mean value was somewhat elevated in chronic kidney disease (CKD) patients on hemodialysis compared to CKD patients not undergoing hemodialysis (205.66 ± 16.76). The average LDL value was slightly elevated in CKD patients on hemodialysis compared to CKD patients not undergoing hemodialysis, with a mean value of 134.99 ± 7.65. This difference was shown to be statistically significant. These results were in agreement with the studies conducted by Magar S et al[13] and Rajni Kumari et al[14]. Neelesh et al. discovered that CKD patients undergoing regular hemodialysis exhibited elevated levels of total cholesterol, triglyceride, LDL, and VLDL, while experiencing reduced levels of HDL, in comparison to CKD patients undergoing irregular hemodialysis. All of these factors were shown to have a statistically significant impact in his research. When comparing the lipid profile values with the categories of glomerular filtration rate (GFR), it was observed that total cholesterol, triglycerides,LDL, and VLDL all exhibited a gradual increase with each consecutive category. The HDL score exhibited a decrease from G3 to G5, with a little increase in G4.

CONCLUSION

Hemodialysis efficiently decreases the buildup of nitrogenous waste products, but it does not fully treat uremic dyslipidemia. Instead, it may modify the pattern of dyslipidemia, as seen in our work. CKD patients on hemodialysis had elevated levels of triglyceride and VLDL, while experiencing reduced levels of HDL, compared to CKD patients not undergoing hemodialysis. The levels of total cholesterol and LDL were somewhat higher in CKD patients on hemodialysis compared to CKD patients not undergoing hemodialysis. However, this difference was not considered statistically significant (p value >0.05).

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