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Left Ventricular Geometrical and Functional Changes in Patients with ESRD on Hemodialysis Programme

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Abstract: (ESRD) is considered that increase cardiac morbidity, which be a primary factor of increased mortality for patients with ESRD; cardiovascular complications of ESRD account for approximately 40% of deaths in these patients. The aim of this study is to assess the structural and functional changes of the left ventricle in patients with End Stage Renal Disease (ESRD) on haemodialysis. Chronic kidney disease (CKD) patients on hemodialysis experience higher rates of cardiac morbidity and mortality, with almost 40% of deaths resulting from cardiovascular complications. This study compared 50 CKD patients on hemodialysis with 50 healthy subjects from hospitals in Baghdad, Iraq, from 15th March 2021 to 18th May 2022. Echocardiography was used to evaluate left ventricular mass index, volume, and ejection fraction. Additionally, clinical and biochemical assessments were conducted for all participants. The patients were categorised into four groups according to echocardiographic abnormalities: left ventricular hypertrophy (58%), left ventricular dilatation (20%), systolic dysfunction (20%), and normal echocardiogram (22%). Left ventricular disorders were significantly linked with hypertension, high serum creatinine, low haemoglobin, and long-term renal failure. Most of the patients with ESRD had abnormal echocardiographic abnormalities, and most findings were LVH, aggressive control of blood pressure, and anemia. Creatinine can help to prevent these abnormalities.

Keywords: Haemoglobin, Hemodialysis, hypertrophy, and echocardiogram.

INTRODUCTION

Cardiovascular problems are the leading cause of mortality in individuals having (ESRD), accounting for 40% of deaths [Levy, D. *et al*., 1994-Muiesan, M. L. *et al*., 2004]. Systolic and diastolic dysfunction are the most frequent circulatory abnormalities associated with greater mortality and morbidity in ESRD patients [Ganau, A. *et al*., 1992-Park, S. K. *et al*., 2019]. Furthermore, cardiac anomalies can be caused by uremia [Mominadam, S. *et al*., 2008; Ritz, E, 2009], retention of fluid, chronic volume overload, pressure overload, renal anemia, high-flow arteriovenous shunting, as well as hyperparathyroidism. Furthermore, left ventricular hypertrophy (LVH) represents an adaptable response to an increase in cardiac effort caused by volume or pressure overload [Martin, L. C. *et al*., 2004; Ibernon, M. *et al*., 2011; MacRae, J. M. *et al*., 2006; Di Lullo, L. *et al*., 2015; Ravera, M. *et al*., 2013].

PATIENTS AND METHODS

The paper presents findings on the geometric and functional alterations of the left ventricle (LV) of (ESRD) patients who are receiving hemodialysis. The study reveals a connection between hypertension, high serum creatinine, low hemoglobin levels, and prolonged renal failure with symptoms of left ventricular disorders. Furthermore, it underscores the significance of managing blood pressure, anemia, and serum creatinine levels effectively to avert such irregularities. The paper compares the duration and severity of renal failure with echocardiographic abnormalities, indicating that LV systolic dysfunction arises in chronic renal failure's later stages. Furthermore, the study includes precise measurements and parameters employed in echocardiography for assessing LV dimensions and function. The study comprised 50 patients diagnosed with end-stage renal disease (ESRD) through hemodialysis from hospitals in Baghdad, Iraq, from 15th March 2021 to 18th May 2022. The American Society of Echocardiography (ASE) guidelines were followed during conducting echocardiography tests on the patients. The obtained measurements consisted of left ventricular mass index, left ventricular volume, and ejection fraction.

Additionally, patients underwent clinical and biochemical assessments, encompassing body weight, height, blood pressure, hemoglobin, serum creatinine levels, and length of renal failure. The participants were segregated into four categories

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on the grounds of their echocardiographic abnormalities: left ventricular hypertrophy, left ventricular dilatation, systolic dysfunction, and a normal echocardiogram. The participants were segregated into four categories on the grounds of their echocardiographic abnormalities: left ventricular hypertrophy, left ventricular dilatation, systolic dysfunction, and a normal echocardiogram. Our findings show that hypertension, high serum creatinine, low hemoglobin levels, and long-term renal failure are significantly linked with indications of left ventricular disorders. The participants were segregated into four categories on the grounds of their echocardiographic abnormalities: left ventricular hypertrophy, left ventricular dilatation, systolic dysfunction, and a normal echocardiogram.

RESULTS

Table 1: Distribution of clinical health characteristics based on age and sex

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
<40-year-old	2	9.09	4	14.29	6	12
40–49-year-old	3	13.64	5	17.86	8	16
50–59-year-old	7	31.82	5	17.86	12	24
≥ 60-year-old	10	45.45	14	50.00	24	48
Total	22	100.00	28	100.00	50	100
Range	21-72		25-75		21-75	
Mean ± SD	48 ± 29.2		53.1± 26.4		55 ± 22.1	

Table 2: Clinical and biochemical characteristics sample.

Parameter	Mean ± SD
Age	55 ± 22.1 year
Sex	22/28
Hb	7.8 ± 2.4 g/dl
S. creatinine	8.2 ± 3.1 mg/dl
Systolic B. p	148±21.7 mmHg
Diastolic B.p.	95.7±22.6 mmHg.
Duration of renal failure	2.6±0.9 year

Table 3: Patients' Distribution according to their echocardiographic findings

Type of abnormality	No.	%
Group I: Normal Echocardiography	11	22
Group II: Systolic Dysfunction	10	20
Group III: Left Ventricular Hypertrophy	29	58
Group IV: Left Ventricular Dilatation	14	28

Table 4: Determination comparison of various parameters between ESRD patients with systolic dysfunction and a control group

Parameter	ESRD patients with systolic dysfunction	Control Group	P-value
Age	53.1±16.2	50.3±12.3	< 0.05
Gender (M/F)	7/3	15/25	<0.05
Systolic blood pressure	152.7 ± 21.7 mm Hg	122.6 ± 18.7 mm Hg	< 0.05
Diastolic blood pressure	93.8 ± 22.6 mm Hg	75.6 ± 14.3 mm Hg	< 0.05
Haemoglobin	7.5±2.6	9.1 ±3.2	< 0.05
S. creatinine	9.3 ± 1.2	8.2 ± 2.1	< 0.05
Duration of renal failure	2.6 ± 1.3 years	1.5±0.7	<0.05
Ejection Fraction	50.6 ± 3.7%	59.4 ± 6	< 0.05

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Table 5: Comparison of various parameters between ESRD patients with LVH (left ventricular hypertrophy) and a control group

Parameter	ESRD patients with LVH	Control Group	P-value
Age	56.4±1.2	50.3±12.3	< 0.05
Gender (M/F)	17/12	7/14	<0.05
Systolic blood pressure	145.7 ± 21.7 mm Hg	122.6 ± 18.7 mm Hg	< 0.05
Diastolic blood pressure	99.8 ± 22.6 mm Hg	75.6 ± 14.3 mm Hg	< 0.05
Hemoglobin	7.7±1.6	9.1± 3.2	< 0.05
S. creatinine	9.78 ± 1.2	8.2 ± 2.1	< 0.05
Duration of renal failure	3.1 ± 1.7 years	1.5± 0.7	<0.05
Left Ventricular Mass Index	177.5 ± 40.2	104.8 ± 23.9	< 0.05

Table 6: Shows the comparison of various parameters between patients with end-stage renal disease (ESRD) and left ventricular (LV) dilatation and a control group

Parameter	ESRD patients with LV dilatation	Control Group	P-value
Age	52.6±1.2	50.3±12.3	< 0.05
Gender (M/F)	10/4	26/10	Not significant
Systolic blood pressure	146.7 ± 21.7 mm Hg	122.6 ± 18.7 mm Hg	< 0.05
Diastolic blood pressure	93.7 ± 22.6 mm Hg	75.6 ± 14.3 mm Hg	< 0.05
Hemoglobin	6.08±2.86	9.1± 3.2	< 0.05
S. creatinine	8.5 ± 0.8	8.2 ± 2.1	Not significant
Duration of renal failure	3.4 ± 1.5 years	1.5± 0.7	< 0.05
Left ventricular volume	127.3 ± 30.4	61.5 ± 20.8	< 0.05

DISCUSSION

End-stage renal disease (ESRD) is known to be associated with increased cardiac morbidity, which is considered a major cause of increased mortality in ESRD patients. 52 Cardiovascular complications of ESRD account for approximately 40% of deaths in ESRD patients. Additionally, the study enrolled 50 individuals with ESRD undergoing hemodialysis and 50 healthy subjects. Also, echocardiographic examinations have identified several abnormalities in patients with end-stage renal disease (ESRD), such as left ventricular hypertrophy (LVH), left ventricular dilatation, systolic dysfunction, and a normal echocardiogram. Among these, LVH was the most prevalent, observed in 58% of ESRD patients. Systolic dysfunction was present in 20% of ESRD patients, indicated by a lower ejection fraction in comparison to those with a normal echocardiogram [London, G. M. *et al*., 2001-Paoletti, E. *et al*., 2016]. The study found significant associations between left ventricular disorders and hypertension, high serum creatinine levels, low hemoglobin levels [Oh, K. H], and prolonged renal failure. The study uncovered associations between systolic dysfunction and left ventricular hypertrophy with older age, male gender, higher systolic and diastolic blood pressure, lower hemoglobin levels, higher serum creatinine levels, and longer duration of renal failure. The study determined that the majority of ESRD patients exhibited abnormal echocardiographic results. This finding emphasises the need for rigorous management of blood pressure, anaemia, and serum creatinine levels to prevent such abnormalities.

CONCLUSION

Most of the patients with ESRD had abnormal echocardiographic abnormalities, and most findings were LVH, aggressive control of blood pressure, and anemia. Creatinine can help to prevent these abnormalities.

REFERENCES

1. Levy, D., Salomon, M., D'agostino, R. B., Belanger, A. J. & Kannel, W. B. "Prognostic implications of baseline electrocardiographic features and their serial changes in subjects with left ventricular hypertrophy." Circulation 90 (1994): 1786–1793.
2. Muiesan, M. L., Salvetti, M., Rizzoni, D., Castellano, M., Donato, F. & Agabiti-Rosei, E. "Association of change in left ventricular mass with prognosis during long-term antihypertensive treatment." Journal of Hypertension 13 (1995): 1091–1095.
3. Klingbeil, A. U., Schneider, M., Martus, P., Messerli, F. H. & Schmieder, R. E. "A meta-analysis of the effects of treatment on left ventricular mass in essential hypertension."

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American Journal of Medicine 115 (2003): 41–46.
4. Muiesan, M. L., Salvetti, M., Monteduro, C., Bonzi, B., Paini, A. and Viola, S, *et al*. "Left ventricular concentric geometry during treatment adversely affects cardiovascular prognosis in hypertensive patients." Hypertension 43 (2004): 731–738.
5. Ganau, A., Devereux, R. B., Roman, M. J., De Simone, G., Pickering, T. G. and Saba, P. S, *et al*. "Patterns of left ventricular hypertrophy and geometric remodeling in essential hypertension." Journal of the American College of Cardiology 19 (1992): 1550–1558.
6. Koren, M. J., Devereux, R. B., Casale, P. N., Savage, D. D., & Laragh, J. H. "Relation of left ventricular mass and geometry to morbidity and mortality in uncomplicated essential hypertension." Annals of Internal Medicine 114 (1991): 345–352.
7. Verma, A., Meris, A., Skali, H., Ghali, J. K., Arnold, J. M. and Bourgoun, M, *et al*. "Prognostic implications of left ventricular mass and geometry following myocardial infarction: the VALIANT (VALsartan in acute myocardial iNfarcTion) echocardiographic study." JACC Cardiovascular Imaging 1 (2008): 582–591.
8. Lang, R. M., Bierig, M., Devereux, R. B., Flachskampf, F. A., Foster, E. and Pellikka, P. A, *et al*. "Recommendations for chamber quantification: a report from the American Society of Echocardiography's guidelines and standards committee and the chamber quantification writing group, developed in conjunction with the European Association of Echocardiography, a branch of the European Society of Cardiology." Journal of the American Society of Echocardiography 18 (2005): 1440–1463.
9. Park, M., Hsu, C. Y., Li, Y., Mishra, R. K., Keane, M. and Rosas, S. E, *et al*. "Associations between kidney function and subclinical cardiac abnormalities in CKD." Journal of the American Society of Nephrology 23 (2012): 1725–1734.
10. Park, S. K., Jung, J. Y., Kang, J. G., Chung, P. W. & Ryoo, J. H. "Mildly decreased renal function and its relation to left ventricular geometry change." Circulation Journal 83 (2019): 2236–2241.
11. Mominadam, S., Ozkahya, M., Kayikcioglu, M., Toz, H., Asci, G. and Duman, S, *et al*. "Interdialytic blood pressure obtained by ambulatory blood pressure measurement and left ventricular structure in hypertensive hemodialysis patients." Hemodialysis International 12 (2008): 322–327.
12. Ritz, E. "Left ventricular hypertrophy in renal disease: beyond preload and afterload." Kidney International 75 (2009): 771–773.
13. Martin, L. C., Franco, R. J., Gavras, I., Matsubara, B. B., Garcia, S. and Caramori, J. T, *et al*. "Association between hypervolemia and ventricular hypertrophy in hemodialysis patients." American Journal of Hypertension 17 (2004): 1163–1169.
14. Ibernon, M., Moreso, F., Ruiz-Majoral, A., Sarrias, X., Sarrias, M. and Grinyó, J. M, *et al*. "Contribution of anemia and hypertension to left ventricular hypertrophy during the initial two years after renal transplantation." Transplantation Proceedings 43 (2011): 2199–2204.
15. MacRae, J. M., Levin, A., & Belenkie, I. "The cardiovascular effects of arteriovenous fistulas in chronic kidney disease: a cause for concern?" Seminars in Dialysis 19 (2006): 349–352.
16. Di Lullo, L., Gorini, A., Russo, D., Santoboni, A., & Ronco, C. "Left ventricular hypertrophy in chronic kidney disease patients: from pathophysiology to treatment." Cardiorenal Medicine 5 (2015): 254–266.
17. Ravera, M., Noberasco, G., Signori, A., Re, M., Filippi, A. and Cannavo, R, *et al*. "Left-ventricular hypertrophy and renal outcome in hypertensive patients in primary care." American Journal of Hypertension 26 (2013): 700–707.
18. London, G. M., Pannier, B., Guerin, A. P., Blacher, J., Marchais, S. J. and Darne, B, *et al*. "Alterations of left ventricular hypertrophy in and survival of patients receiving hemodialysis: follow-up of an interventional study." Journal of the American Society of Nephrology 12 (2001): 2759–2767.
19. Zoccali, C., Benedetto, F. A., Mallamaci, F., Tripepi, G., Giacone, G. and Stancanelli, B, *et al*. "Left ventricular mass monitoring in the follow-up of dialysis patients: prognostic value of left ventricular hypertrophy progression." Kidney International 65 (2004): 1492–1498.
20. Krane, V., Winkler, K., Drechsler, C., Lilienthal, J., März, W., & Wanner, C. "Effect of atorvastatin on inflammation and outcome in patients with type 2 diabetes mellitus on hemodialysis." Kidney International 74 (2008): 1461–1467.

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21. Paoletti, E., De Nicola, L., Gabbai, F. B., Chiodini, P., Ravera, M. and Pieracci, L, *et al*. "Associations of left ventricular hypertrophy and geometry with adverse outcomes in patients with CKD and hypertension." Clinical Journal of the American Society of Nephrology 11 (2016): 271–279.
22. Oh, K. H., Park, S. K., Park, H. C., Chin, H. J., Chae, D. W. and Choi, K. H, *et al*. "KNOW-CKD (KoreaN cohort study for Outcome in patients With Chronic Kidney Disease): design and methods." BMC Nephrology 15 (2014): 80.

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