



MEAN LEFT ATRIAL VOLUME INDEX IN PATIENTS ON REGULAR HEMODIALYSIS

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Author's Contribution

MMS: Conducted study and presented at regional audit, and wrote the article, QAS: Helped in conduction of study, wrote, audit and reviewed the article as a whole and consultants in charge of the audit and gave frequent advice, corrections and did the proof reading, NG: Tables, Helped in Re-arranged data and figures and also Helped in analysis of data corrected article, AM: Consultants Incharge of the audit and gave frequent advice, corrections and did the proof reading also.

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ABSTRACT

OBJECTIVE: To find mean left atrial volume index in patients on regular hemodialysis

MATERIAL AND METHODS: It was a cross-sectional survey carried out in Cardiology Department of Shaikh Zayed Hospital in Lahore over a period of six months from February 6, 2018 to August 5, 2018. 80 patients on regular Haemodialysis and meeting the inclusion criteria were enrolled. Echocardiography of each patient was carried out by senior consultant in left lateral position. Parameters including left atrial volume were recorded. The data was stratified for age, gender and duration of maintenance of hemodialysis. Paired t-test was applied to compare the mean left atrial volume index to see the significant difference.

RESULTS: In our study, out of 80 cases, mean age was calculated as 42.81 ± 10.03 years, 45(56.25%) were male and 35(43.75%) were females, mean duration of hemodialysis was calculated as 2.8 ± 1.09 years. Mean left atrial volume index was 36.39 ± 3.78 ml/m².

CONCLUSION: In patients of advanced renal disease and on regular Hemodialysis have high mean left left atrial volume index.

KEY WORDS: advanced Renal Disease, Hemodialysis, Mean Left Atrial Volume and Index.

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INTRODUCTION

Chronic/ Advanced Kidney Disease (CKD) is quite prevalent in patients with hypertension and diabetes mellitus.¹ Usually, it goes unnoticed and neglected until it presents with advanced diseases and patients require renal replacement therapy in the form of hemodialysis.²⁻³ Development of advanced renal disease itself predisposes the individuals to cardiovascular morbidity and worse prognosis.⁴

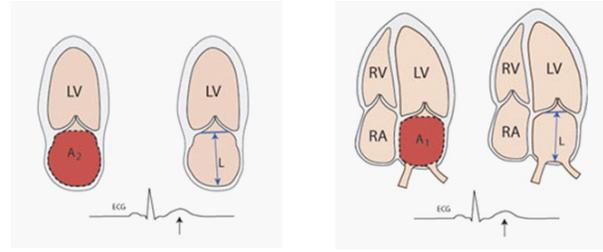
Renal replacement therapy includes hemodialysis, peritoneal dialysis or renal transplant etc. During hemodialysis waste products of metabolism in body are removed from the circulation thereby maintaining general well being of the patients.⁵ Patients on maintenance dialysis develop both systolic and diastolic left ventricular dysfunction. Diastolic LV dysfunction may be asymptomatic and go un-noticed. The LV diastolic dysfunction can be assessed by measuring Left atrial (LA) volume index (LAVI). Increase in LAVI measurement is an indicator of development of LV diastolic dysfunction.⁶

A previous study⁷ revealed LAVI to be 34.4 ±20.9 (ml/m²) in hemodialysis (HD) patients. On the other hand, a local study⁸ recorded left Atrium volume index as 40.46±8.23(ml/m²). These findings are significantly different with the previous international studies. The rationale of this study is to record left atrial volume index in advanced renal disease cases undergoing hemodialysis so that the difference in local and international studies may be confirmed. The results of our study will add in local data which will be helpful for nephrologists and cardiologists as well.

METHODOLOGY

It was a cross-sectional survey. The study was conducted in Cardiology Department, Shaikh Zayed Hospital, Lahore from February 6, 2018 to August 5, 2018. A total of 80 patients fulfilling inclusion criteria (Ages 18-60 years, both male and female, with ERSD cases and on hemodialysis for at least three months) were enrolled. Patients with pre-existing malignancy and those with valvular or congenital heart disease (on history and medical record) were excluded.

End stage Renal Disease was defined as patients with GFR<30m³/kg/ and having thrice weekly hemodialysis for at least 3 months. LAVI was calculated in apical four-chamber and two-chamber views using the biplane area-length method. Normal LAVI was taken as 16-28 ml/m². At end systole, the measurements were recorded and linked with body surface area.



$$LA\ Volume = \frac{8}{3\pi} * \frac{A_1 * A_2}{L} = (0.85) * \frac{A_1 * A_2}{L}$$

$$LAVI = \frac{LA\ Volume}{BSA}$$

Reference Ranges & Partition Values for LA Volume Index (mL/m²)

	LAVI (mL/m ²)
Reference Range	16-28
Mildly Abnormal	29-33
Moderately Abnormal	34-39
Severely Abnormal	≥ 40

The potential effect modifiers that might alter the results of the study were excluded as mentioned in the exclusion criteria. 2-D, M mode and color Doppler studies were performed in the left lateral decubitus position, using 3.5 MHz transducer by the researcher under supervision of senior consultant was used. The measure of left atrial volume was done as per operational definition. Demographic data and mean left atrial volume was recorded.

The data was analysed using SPSS version 25.0, Mean±S.D of variables like age, left atrial volume and duration of hemodialysis was calculated recorded. Frequency and percentage of variables like gender were calculated. The data stratification was done for variables like gender, age and duration of maintenance of hemodialysis to control the effect modifiers. To compare the mean left atrial volume index paired t-test was used to see the significant difference. A <0.05 p-value was taken as significant.

RESULTS:

A total of 80 cases were included to find mean left atrial volume index in end stage renal cases on long term hemodialysis. Gender distribution of the patients showed that 45(56.25%) were male and 35(43.75%) were females (Table-1). Age distribution of the patients was done, it showed that 16(20%) were between 18-30 years of age whereas 64(80%) were between 31-60 years of age, Mean±S.D was calculated as 42.81 ± 10.03 years (Table-2).

Mean duration of hemodialysis was calculated



Table-1: Gender Distribution

Gender	Frequencies	Percentages
Male	45	56.25
Female	35	43.75
Total	80	100.0

Table-2: Age Distribution

Age Groups	Frequencies	Percentages
18-30 years	16	20.0
31-60 years	64	80.0
Total	80	100.0

Table-3: Stratification for mean left atrial volume index with regards to age

Left atrial volume (ml/m ²)	Agegroups	Mean	SD	p-value
	18-30 years	36.06	2.89	0.70
	31-60 years	36.47	3.99	

Table-4: Stratification for mean left atrial volume index with regards to gender

Left atrial volume (ml/m ²)	Gender	Mean	SD	p-value
	Male	36.44	4.26	0.88
	Female	36.31	3.13	

Table-5: Stratification for mean left atrial volume index with regards to duration of hemodialysis

Left atrial volume (ml/m ²)	Duration of hemodialysis	Mean	SD	p-value
	1-3 years	36.20	3.72	0.46
	>3 years	36.90	4.00	

as 2.8±1.09 years. Mean left atrial volume index was calculated as 36.39±3.78 ml/m². Stratification for mean duration of left atrial volume with regards to age shows that 36.06±2.89 ml/m² in age group between 18-30 years and 36.47±3.99 ml/m² in age group of 31-60 years, p value was 0.70 (Table-3).

Stratification for mean left atrial volume index with regards to gender showed that it was 36.44±4.26 ml/m² in males and 36.31±3.13 ml/m² in females, p-value was 0.88 (Table-4). Stratification for mean left atrial volume index with regards to duration of hemodialysis showed that it was 36.20±3.72 ml/m² in 1-3 years duration of dialysis and 36.90±4.00 ml/m² in cases with >3 years of duration of dialysis, p-value was 0.46

(Table-5).

DISCUSSION:

Cardiovascular disease (CVD) is very common in patients with advanced renal disease. It is associated with increased mortality as well.⁹ A simple and inexpensive tool to detect involvement of cardiovascular system in patients with advanced renal disease is echocardiography which is easily available and can detect abnormalities including systolic and diastolic LV dysfunction in a very short time.¹⁰ Left ventricular ejection fraction, left ventricular mass index (LVMI), and LV chamber volume index are three important parameters measured on echocardiography. These parameters are helpful in risk stratifying the patients on renal replacement treatment and also in long term follow-up. An enlargement of left atrium (LA) is an important index for predicting poor outcomes.¹¹

The reason to conduct this study was to record LAVI in ESRD cases undergoing hemodialysis so that the difference in local and international studies may be confirmed. The results of our study will add in local data which will be helpful for nephrologists and cardiologists as well. In our study, out of 80 cases, 16(20%) were between 18-30 years of age whereas 64(80%) were between 31-60 years of age, mean age was calculated as 42.81±10.03 years, 45(56.25%) were male and 35(43.75%) were females, mean duration of hemodialysis was calculated as 2.8±1.09 years. Mean duration of left atrial volume was calculated as 36.39±3.78 ml/m².

The findings of our study are comparable with a previous study⁷ revealed 34.4±20.9 (ml/m²) in hemodialysis (HD) patients. On the other hand, another local study⁸ recorded left Atrium as 40.46±8.23mm, our findings are near to this study. Another study by Giovanni Tripepi and colleagues,¹² recorded LA volume in hemodialysis cases as 38.6±17.9 ml/m², which is near to our findings.

Seung Jun Kim and others¹³ have reported indicators for diastolic dysfunction of LV which included LAVI. LA volume index may be an important parameter for determination of mortality in patients with advanced renal disease. The data also concluded increased morbidity in patients with enlarged LA as compared to patients without enlarged LA. They concluded that greater the value of LAVI greater the chances of deterioration of renal disease in patients on hemodialysis.

Studies done in the past showed that there is left ventricular hypertrophy in patients with advanced



renal disease. This hypertrophy may lead to enlargement of LA and LAVI. This was also noticed in our study that LAVI was on the higher side in patients with advanced renal disease.¹⁴ Increase in LAVI and presence of LVH are associated with abnormality in electrical conduction and may prove fatal for patients with renal disease and on hemodialysis. LAVI and LVH are directly linked with the presence of systolic and diastolic LV dysfunction. This may affect the survival of renal disease patients.¹⁴⁻¹⁵

On the other hand, LA size has been reported to be an important parameter in determination of worsening of diastolic dysfunction. Although

this parameter is affected by the diastolic filling of LV.¹⁶ Moller et al¹⁷ reported that LAVI is important to Doppler parameter for diastolic function which predicts long term survival in patients with renal disease and acute myocardial infarction. In summary, our study was limited to record LA volume only and we did not correlate it with patients' outcome being the limitation of our study. However, in coming trials, it may be related with the patients' outcome.

CONCLUSION:

In patients of advanced renal disease and on regular Hemodialysis have high mean left left atrial volume index.

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