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Left Atrial Volume Index in Patients with Acute St Elevation Myocardial Infarction and Its Association with Short-Term Clinical Outcome

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Abstract
Introduction: *Coronary artery disease has been a significant health problem, and is responsible for about one-third or more of all deaths in individuals over age 35, although mortality rates worldwide have declined over the past four decades. Survivors of a first acute myocardial infarction (MI) face a substantial risk of further cardiovascular events, including death, recurrent MI, heart failure, arrhythmias, angina, and stroke.*
Materials and Methods: *All the patients who satisfy the inclusion criteria were included in the study after taking the written informed consent. Diagnosis of acute myocardial infarction was made as per the Universal Definition of Myocardial Infarction Criteria for Acute Myocardial Infarction. Detailed clinical history was obtained from all the patients. History of risk factors for coronary artery disease including diabetes, hypertension, smoking, alcoholism and family history of CAD were obtained. All patients were subjected to complete clinical examination including pulse rate, blood pressure measurement, completer cardiovascular examination, examination of chest. Standard 12 lead electrocardiogram was taken for all patients using MIND RAY BENEHEART R12 ECG machine to define the diagnosis and identify arrhythmias like sinus tachycardia, sinus bradycardia, atrial fibrillation, atrial flutter, ventricular fibrillation if any. All patients received appropriate treatment as per the institutional guidelines. No alteration in management strategy was done for the purpose of study. Anthropometric measurements including height and weight were obtained to calculate body surface area using Medscape mobile application. Du bois method was used to calculate body surface area. (BSA = 0.007184 * Height 0.725 * weight 0.425)*
Results: *Sinus tachycardia was noted in 22 % of total patients. Ventricular tachycardia was observed in 13 % of patients during their hospital stay. 36 % of total patients had congestive heart failure. 4.4 % of total study group suffered death during follow up period. 3.3% of total study population had re MI. 4% of study population got readmitted during the study population.*
Conclusion: *Present study concludes that in patients with acute STEMI admitted at KGH, Visakhapatnam, LAVI was significantly high in patients with increased BMI. No significant correlation of LAVI was noted with LV systolic function as determined by ejection fraction. Among various diastolic parameters measured, LAVI showed positive correlation only with E/e' ratio (P = 0.034), and weak negative correlation with IVRT (P = 0.067). Patients with LAVI $\geq$ 22 ml/m2 had significantly higher incidence of heart failure during the 3 month follow up period as compared to those with LAVI $\leq$ 22 ml/m2. (P=0.009).*
Key Words: *Coronary artery disease, MI, LAVI, IVRT.*

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I. Introduction

Coronary artery disease has been a significant health problem, and is responsible for about one-third or more of all deaths in individuals over age 35, although mortality rates worldwide have declined over the past four decades. Survivors of a first acute myocardial infarction (MI) face a substantial risk of further cardiovascular events, including death, recurrent MI, heart failure, arrhythmias, angina, and stroke.[1]

Across the broad spectrum of patients with acute myocardial infarction (MI), short-term (in-hospital or 30-day) mortality has been decreasing over the past 30 years, concomitantly with the increasing use of reperfusion strategies and proven preventative therapies such as beta blockers, aspirin, and statins. Present 30-day mortality rate of patients with STEMI is between 2.5 and 10 percent in reports. Similar to short-term outcomes, long-term mortality rates after myocardial infarction have declined significantly during the past 30 years due to reperfusion and preventative strategies.[2]

Echocardiography early post-MI provides prognostic information and may help guide therapy. The 2013 ACC/AHA ST elevation MI guideline provides a strong recommendation for evaluation of LVEF as one of the strongest predictors of survival. LV diastolic dysfunction demonstrated by a restrictive mitral filling pattern is an independent predictor of mortality after acute MI. other findings on echocardiography that have been demonstrated to influence prognosis include Left atrial enlargement, Right ventricular dysfunction, and Longitudinal strain.[3]

Multiple Doppler echocardiographic variables may be used to assess left ventricular (LV) diastolic function. However, these variables reflect the beat-to-beat interaction of LV filling pressures and ventricular compliance, making them sensitive to rapid alternations in ventricular preload and after load. Despite these limitations, Doppler indices of diastolic function have been shown to predict morbidity and mortality in patients with acute myocardial infarction.[4]

The left atrium (LA) plays a major role in left ventricle (LV) performance. LA function is a surrogate marker of LV diastolic dysfunction. During ventricular diastole, the left atrium is directly exposed to LV pressures through the open mitral valve. LA size is therefore largely determined by the same factors that influence diastolic LV filling. It is, however, a more stable indicator, reflecting the duration and severity of diastolic dysfunction. LA volume index is a predictor of mortality after AMI, even after adjustment for conventional indices of systolic and diastolic function. and values of 32.0 mL/m2 or more have been associated with a poor prognosis.

In addition, there are cases in which LAVI already shows an increase on admission due to the rise of LVEDP, but LVEDP would decrease with appropriate treatments and LAVI declines. On the other hand, there are also cases in which LAVI is not increased on admission, while diastolic dysfunction induced by left ventricular remodeling progresses with a marked increase in LAVI. Therefore, the importance of the degree of changes in LAVI values (delta LAVI) and its effect on clinical outcome of patient from admission to discharge and up to 3 months was determined in the present study.[5]

II. Aims And Objectives Of The Study

1. To measure various echocardiographic parameters to assess diastolic function in patients with acute myocardial infarction.
2. To measure LA volume index by echocardiography in patients with acute STEMI at the time of admission and after 3months.
3. To follow up those patients for 3 months to re-assess the diastolic function and LAVI
4. To identify various short term outcomes in those patients.
5. To determine the relationship of LAVI with those clinical outcomes.

III. Materials And Methods

Study design: Hospital based Observational Study
Study Population: All patients of acute myocardial infarction admitted at department of cardiology, KGH.
Study period: May 2017- December 2018.
Inclusion criteria: All patients of age 20 years and above, presenting with first episode of acute STEMI, admitted in department of Cardiology, KGH, Visakhapatnam were included in present study.
Exclusion criteria:
All patients of acute myocardial infarction attending the dept. of cardiology, KGH who satisfy the following criteria were excluded from the study.

- Age < 20,
- Re-MI
- Post CABG status
- Congenital heart disease
- Previous history of heart failure
- Known Atrial flutter / fibrillation
- Known Valvular heart disease
- Known Cardiomyopathy
- Chronic kidney disease

All the patients who satisfy the inclusion criteria were included in the study after taking the written informed consent. Diagnosis of acute myocardial infarction was made as per the Universal Definition of Myocardial Infarction Criteria for Acute Myocardial Infarction. Detailed clinical history was obtained from all the patients. History of risk factors for coronary artery disease including diabetes, hypertension, smoking, alcoholism and family history of CAD were obtained. All patients were subjected to complete clinical examination including pulse rate, blood pressure measurement, completer cardiovascular examination,

examination of chest. Standard 12 lead electrocardiogram was taken for all patients using MIND RAY BENEHEART R12 ECG machine to define the diagnosis and identify arrhythmias like sinus tachycardia, sinus bradycardia, atrial fibrillation, atrial flutter, ventricular fibrillation if any. All patients received appropriate treatment as per the institutional guidelines. No alteration in management strategy was done for the purpose of study. Anthropometric measurements including height and weight were obtained to calculate body surface area using Medscape mobile application. Du bois method was used to calculate body surface area. (BSA = 0.007184 * Height 0.725 * weight 0.425)

Echocardiographic assessment:

All patients were subjected to detailed transthorasic echocardiac examination by trained sonologists within 24 hours of admission as per the ASE guidelines, using echo machine ESOATE MYLAB 40 and reviewed by staff cardiologists with advanced training in echo-cardiography.

LV systolic function was assessed by measuring Ejection fraction using m-mode echocardiography by acquiring linear internal measurements of the LV in the parasternal long-axis view perpendicular to the LV long axis measured at the level of the mitral valve leaflet tips. Linear measurements of left ventricular wall and cavity were obtained.

LV diastolic function was assessed using Doppler echo cardiography to measure trans-mitral flow and pulmonary venous flow pattern, tissue Doppler imaging, and left atrial volume index.

Mitral flow velocity variables were recorded from the apical four-chamber view with pulsed wave (PW) Doppler by placing a 1- to 2-mm sample volume between the mitral leaflet tips at their narrowest point, which was visualized with two-dimensional echocardiography at end expiration during normal breathing. The Doppler gain and filter settings were optimised, with sweep speed at 50 to 100 mm/sec and the spectral Doppler baseline one third to halfway up on the monitor display. Variables measured included peak mitral flow velocity in early diastole (E wave) and during atrial contraction (A wave), mitral deceleration time (DT), the duration of mitral A wave velocity (Adur) (sample volume at the mitral annulus level), and isovolumetric relaxation time (IVRT).

Pulmonary vein (PV) flow velocity of right upper PV was obtained from the apical four-chamber view with PW Doppler. To properly obtain the pulmonary vein flow with Doppler, the sample volume was placed approximately 1 to 2 cm into the pulmonary vein, with sample size adjusted to 3 to 4 mm, Doppler filter set to 200 Hz, and sweep speed adjusted to 50 to 100 mm/sec. The tri-phasic flow from the PV to the LA was recorded to measure variables which included peak systiolic flow velocity (S), peak diastolic flow velocity (D), S/D ratio, reverse flow at atrial contraction (Ar) velocity and Ar duration.

Using tissue Doppler imaging, mitral annular velocities were recorded from the apical four-chamber view at a sweep speed of 50 to 100 mm/sec, at end expiration by placing a 5- to 6-mm sample volume over the lateral and medial portion of the mitral annulus to cover the longitudinal excursion of the mitral annulus in both systole and diastole. The velocity scale was set at about 20 cm/sec above and below the zero-velocity baseline, and the angulation between the ultrasound beam and the plane of cardiac motion was minimized. The variables obtained included peak velocity of mitral annulus movement during early filling (e'), an average of septal and lateral annular peak velocity calculated, and E/e' ratio.

The anteroposterior diameter of the left atrium was measured in the parasternal long-axis view perpendicular to the aortic root long axis, and measured at the level of the aortic sinuses by using the leading-edge to leading edge convention using m mode echo-cardiography.

Left atrial area was measured in four-chamber apical view, at end-systole, on the frame just prior to mitral valve opening by tracing the LA inner border, excluding the area under the mitral valve annulus and the inlet of the pulmonary veins.

LA volume was measured by Simpsons method using the disk summation technique. Measurements were based on tracings of the blood-tissue interface of left atrium excluding atrial appendage and pulmonary veins in apical four- and two-chamber views. At the mitral valve level, the contour was closed by connecting the two opposite sections of the mitral annulus with a straight line. 2-Dimensional echocardiography was used to assess regional wall motion abnormality, left ventricular thrombus, pericardial effusion and ventricular septal defects if any. Pulse and continuous wave Doppler was used to assess aortic and pulmonary flow velocities. Color Doppler was used to identify any valvular regurgitations, ventricular septal defects.

During their hospital stay, each patient was continuously monitored for complications, and treated as per institutional guidelines. Arrhythmias like sinus tachycardia, sinus bradycardia and atrio-ventricular block were diagnosed based on appropriate ECG criteria. Brugada criteria were used to diagnose ventricular tachycardia by ECG. Arrhythmias once diagnosed were treated as per the guidelines.

Outcomes that were studies were congestive heart failure, re myocardial infarction, re-admission and death. Framingham criteria were used to define cases of congestive heart failure. Any re admission during the

first 3 months following initial admission was recorded. Death due to any cause during the follow up period was noted.

Review echo-cardiography was done before discharge between day 5 to 7 obtaining all the parameters. The patient was followed up for 3 months and repeat echocardiographic examination was done between day 90-120 taking all the parameters. Any new complications like heart failure, re infarction, arrhythmias, death noted.

All the data collected was tabulated on a structured proforma and statistically analyzed using SPSS version 22. Statistical analysis for means was done using student t-test and for proportions chi-square test was used. P value $\leq$ 0.05 was considered as statistically significant.

IV. Results

Total number of patients included in present study – 90

Base line characteristics of study population:

Age distribution:

Mean age of presentation: 56.87 $\pm$10.9 years

Youngest patient aged 25 years.

Oldest patient aged 75 years.

Maximum number of patients were in 5th decade

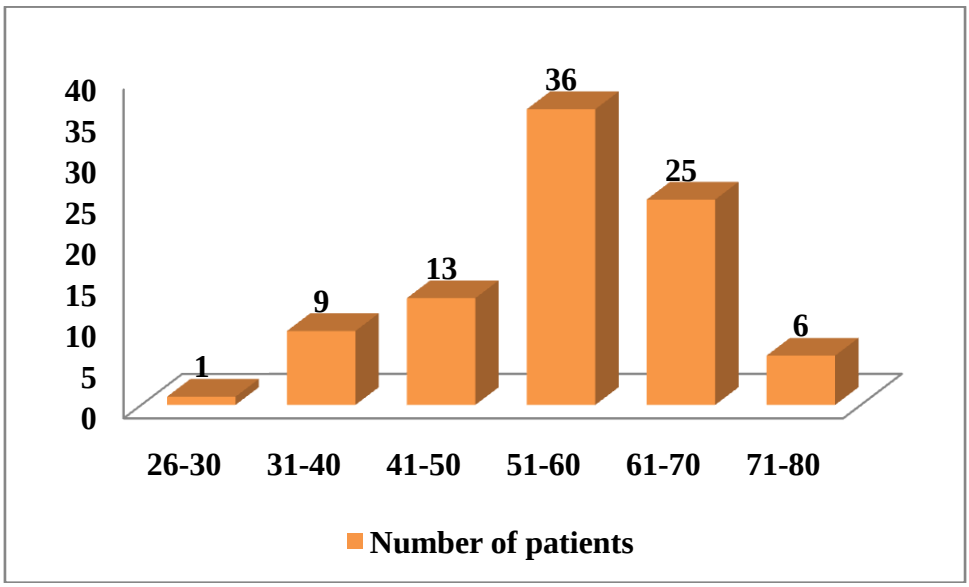

Figure 1: bar diagram showing age distribution of study population

Gender distribution:

Number of male patients – 63

Number of female patients – 27

Male: female ratio = 2.3:1

Male patients (n= 63) out-numbered female patients (n=27)

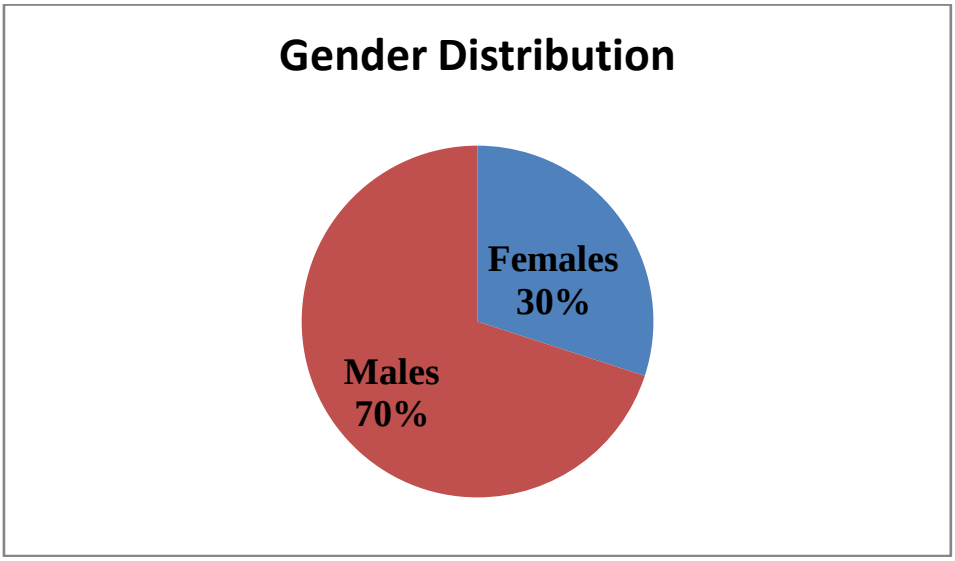

Figure 2: Pie diagram showing gender distribution of total study population

Baseline characteristics of Study Population (n=90)	
Age (years)	56.87 +10.9
Male : female ratio	2.3:1
Hypertensives	41 (45.5%)
Diabetics	43 (47.7%)
Smokers	29 (32.2%)
obese	37 (41.1%)
Mean Body Surface Area	1.73 (0.15) m2
Mean BMI	29.53 + 4.52 Kg/m2
Number of Anterior MI patients	64 (71.1%)
Number of Inferior MI patients	26 (28.8 %)
Number of patients thrombolysed	59 (65.5 %)

Table 1: Base line characteristics of study population

45.5 % of patients had hypertension
47.7 % of patients had diabetes
32.2 % of patients were smokers
41.1 % of total study population was obese and 46.6 % were overweight
Majority of patients (71.1%) were suffered with anterior STEMI, rest (28.8%) with inferior STEMI.
65.5% of patients were thrombolysed.

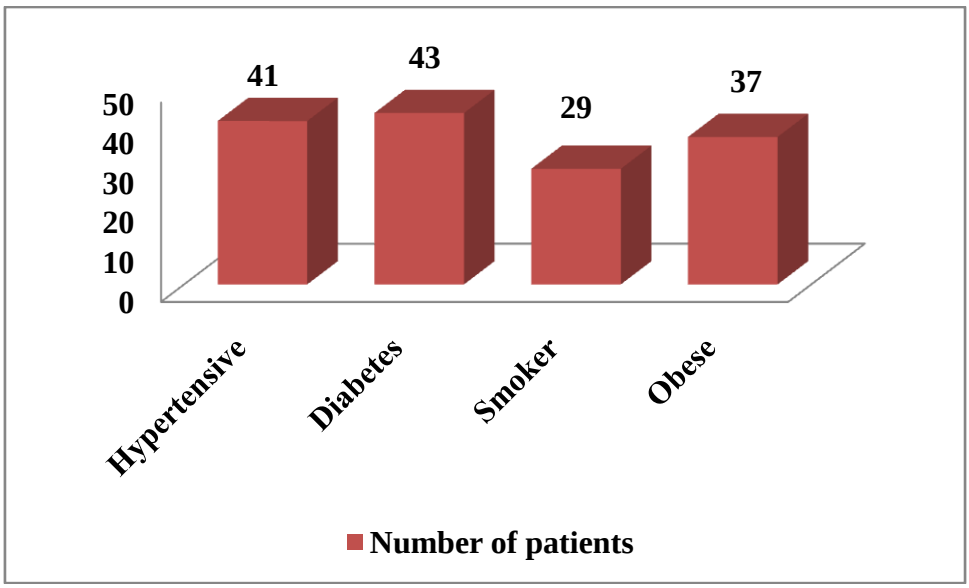

Figure 3: Bar diagram showing prevalence of risk factors in total study population

There was no significant difference in mean LAVI between anterior and inferior wall STEMI.

	Mean LAVI (ml/m2)	P
AWMI (n=64)	21.83 + 4.40	0.96
IWMI (n=26)	21.88 + 4.49	

Table 3: mean LAVI in anterior and inferior MI

Parameter	**(n=90)**
Mean EF (%)	49.4 + 11.56
Mean E/A ratio	1.29 + 0.59
Mean E/e' ratio	8.35 + 2.40
Mean IVRT (ms)	82.7 + 17.1
Mean E-DT (ms)	196 + 51.6
Mean AR – A duration (ms)	14.1 + 31.5
Mean LA diameter (cm)	3.6 + 0.54
Mean LA area (cm2)	22.4 + 6.61
Mean LA volume (ml)	37.10 + 6.58
Mean LAVI (ml/m2)	21.83 + 4.40

Table 4: baseline echocardiographic characteristics of study population

Correlation between BMI & LAVI:

There is no significant correlation between BMI & LAVI

Correlation between BMI & LAVI Correlation between systolic function and LAVI:

There was no significant correlation between systolic function determined by EF and LAVI

Correlation between severity of diastolic dysfunction and LAVI:

There was no significant correlation noted between LAVI and severity of diastolic dysfunction as determined by E/e' ratio.

Comparison of LAVI in anterior wall STEMI and Inferior wall STEMI:

There was no significant difference in LAVI between anterior vs inferior STEMI (P=0.96)

Outcomes of total populations (n=90):

- Sinus tachycardia was noted in 22 % of total patients.
- Ventricular tachycardia was observed in 13 % of patients during their hospital stay.
- 36 % of total patients had congestive heart failure.
- 4.4 % of total study group suffered death during follow up period.
- 3.3% of total study population had re MI.
- 4% of study population got readmitted during the study population.

Outcome	**Number of patients (%)**
Sinus tachycardia	20 (22%)
Ventricular tachycardia	12 (13%)
CHF	33 (36%)
Deaths	4 (4.4%)
Re MI	3 (3.3%)
Re Admission	4 (4%)

Table 5: outcomes of study population

COMPARISON BETWEEN TWO GROUPS LAVI <22 ml/m2.and LAVI > 22 ml/m2.:

The study group was classified into two groups based on LAVI, as those with LAVI < 22 ml/m2., and > 22 ml/m2.

There was no statistically significant difference in age of presentation between two groups.

Male patients out-numbered females in both groups.

There was no significant difference in the presence of risk factors between two groups.

Mean BMI was significantly higher in patients with LAVI > 22 ml/m2 than those with LAVI < 22 ml/m2.

Parameter	LAVI < 22ml/ m2	LAVI > 22 ml/ m2	P value
Number of patients	49 (54%)	41 (46%)	
Age (yrs)	56.4 + 10.9	57.4 + 11.1	0.67
Male : female ratio	3:1	1.73:1	
Hypertensives	18 (36.7%)	23 (56.1%)	0.07
Diabetics	22 (44.9%)	21 (51.2%)	0.5
Smokers	15 (30.6%)	14 (34.1%)	0.72
Obese	21 (42.8%)	16 (39.0%)	0.71
Mean Body Surface Area * (m2)	1.79 + 0.14	1.67 + 0.13	0.0001
Mean BMI * (Kg/m2)	21.83 + 4.40	25.39 + 4.71	0.0004
Number of Anterior MI patients	36 (73.5%)	28 (68.3%)	0.59
Number of Inferior MI patients	13 (26.5 %)	13 (31.7 %)	0.58
Number of patients thrombolysed	32 (65.3 %)	27 (65.8 %)	

Table 6: showing difference between two groups in base line characteristics

Difference in echocardiographic features between the two groups:

There was no significant difference ejection fraction, mean E/A ratio, mean IVRT, mean DT between two groups.

Mean E/e' ration was significantly higher (p=0.034) in group with LAVI >22 ml/m2. as compared to those with LAVI < 22 ml/m2..

	LAVI <22 ml/m2 (N = 49)	LAVI >22 ml/m2 (N = 41)	P value
Mean EF	49.67 + 11.67	49.1 + 11.6	0.817
Mean E/A ratio	1.22 + 0.56	1.37 + 1.37	0.227
Mean E/e' ratio *	7.86 + 2.24	8.93 + 8.93	0.034
Mean IVRT *	85.79 + 19.2	79.17 + 79.17	0.067
Mean E-DT	190.5 + 50.8	204.6 + 52.1	0.198

Table 7: Difference in echocardiographic characteristics of two groups

Difference in outcome between two groups:

There were significantly higher number of patients with CHF in LAVI $\geq$ 22 ml/m2. group (51.2%) as compared to group with LAVI < 22 ml/m2. (24.5%).

There was no significant difference in occurrence of arrhythmias between two groups.

There was no significant difference in mortality rate, occurrence of Re-MI and readmission rates between two groups.

OUTCOME	LAVI <22 ml/m2 (N = 49)	LAVI >22 ml/m2 (N = 41)	P value
CHF*	12 (24.5 %)	21 (51.2 %)	0.009
Sinus tachycardia	12 (24.5 %)	8 (19.5 %)	0.572
Ventricular tachycardia	7 (14.3 %)	5 (12 %)	0.771
Deaths	2 (4.1 %)	2 (4.8 %)	0.855
Re MI	1 (2 %)	2 (4.8 %)	0.455
Re Admission	3 (6 %)	1 (2.4 %)	0.398

Table 8: Difference in outcomes of two groups

	LAVI (ml/sqm)	P
Mean LAVI in patients with CHF (N= 33)	22.45 + 4.1	
Mean LAVI in patients without CHF (N = 57)	21.47 + 4.53	0.31

Table 9: Mean LAVI in patients with and without CHF

There was no significant difference in mean LAVI in patients with and without CHF.

V. Discussion

This study has been conducted to demonstrate that LAVI is a predictor of in hospital events and short term outcome after first acute STEMI.

Total study population were classified into two groups- one with LAVI <22 ml/m2 and second group with LAVI ≥ 22 ml/m2. Other previous similar studies have classified their study population into two groups with cut off LAVI 34 ml/m2 which is value of +2SD of normal reference value.[6]

In the present study, mean age of presentation of patients with acute STEMI was 56.87 ± 10.9 years. Maximum number of patients was in 5th decade. There was no statistically significant difference in age of presentation between two groups. In the present study, male: female ratio of study population was 2.3:1, and Male patients out-numbered females in both groups. These base line characteristics of the patients were similar to those of other similar studies mentioned in here.[7]

In the present study, 45.5% of study population had hypertension. 47.7 % of patients had diabetes. 32.2% of patients were smokers. 41.1% of total study population were obese and 46.6% were overweight. There was no significant difference in the presence of risk factors between two groups. In a study by Jose Alves Secundo Junior et al, Increased LAVI was observed in 45% of study population, and was associated with older age, higher body mass index, hypertension.[8]

When body mass index and LAVI were analyzed, we found no significant correlation between the two. But the mean BMI was significantly higher (P=0.0004) in patients with LAVI ≥ 22 ml/m2 (21.83 + 4.40 Kg/m2) than those with LAVI ≤ 22 ml/m2 (25.39 + 4.71 Kg/m2).[9]

In the present study, majority of patients (71.1%) were suffered with anterior STEMI and rest (28.8%) with inferior STEMI. 65.5% of patients were thrombolysed, and rest were not thrombolysed for the reason that they presented late.[10]

Echocardiographic parameters:

The mean ejection fraction of study population in present study was 49.4 ± 11.56%. There is no statistically significant difference in EF between two groups (49.67 % vs 49.1% (p=0.81)). When the relation between systolic function as measured by ejection fraction and LAVI was analyzed, we found no association between those two.

When the relation between diastolic dysfunction and LAVI was analyzed, we noted no significant correlation between LAVI and severity of diastolic dysfunction as determined by E/e' ratio. But the mean E/e' ratio was significantly higher in group with LAVI ≥ 22 ml/m2, (7.86 % vs 8.93 %, p = 0.034). Other diastolic parameters like E/A ratio, IVRT, E-DT, didn't show significant difference between groups.

There was no significant difference in the mean LAVI of patients with anterior STEMI and inferior STEMI (P=0.96).

Maheshwari et al, found a strong correlation between LAVI and increasing LV dysfunction in elderly patients and those with anterior wall infarction.(72) In a study by Jose Alves Secundo Junior et al, Regarding echocardiographic characteristics, patients with increased LAVI had lower ejection fraction and more severe diastolic dysfunction as compared with those with normal LAVI. (71)

Outcomes: Deteriorating diastolic function is associated with increased LV diastolic pressure, dyspnea, fatigue, and reduced exercise tolerance. Furthermore, LV pressure overload causes myocyte stretch and reduced myocardial energy production, eventually leading to ventricular remodeling, neuro-hormonal activation, and elevated pulmonary venous pressure. All of these factors would be expected to adversely affect outcome.

Arrhythmias and LAVI: In the present study, Sinus tachycardia (22%) and ventricular tachycardia (13%) were the arrhythmias that were observed during their hospital stay. There was no significant difference in presence of arrhythmias between the two groups. Those patients having atrial fibrillation were excluded from study, as AF can be both a cause and effect of elevated LAVI.

Heart failure and LAVI: In the present study, 36% of total study population had congestive heart failure. Group with LAVI ≥22 ml/m2 (42.8%) had significantly higher number of patients with heart failure as compared to the group with LAVI < 22 ml/m2 (51.2%) 42.8%, (p=0.009). but there was no significant difference in mean LAVI of patients with and without CHF.

In a study by Jose Alves Secundo Junior et al, acute pulmonary edema was more frequent in patients with increased LAVI (14.1% vs. 4.3%, p = 0.024). (71) In a study by Roy Beinart et al, from Israel, who followed cases for 5 years, Left atrial volume index > 32 ml/m2 was found in 63 patients (19%) who had a higher incidence of congestive heart failure on admission (24% vs. 12%, p = 0.01), a higher incidence of mitral regurgitation, increased LV dimensions, and reduced LV ejection fraction when compared with patients with LAVI < 32 ml/m2. Their five-year mortality rate was 34.5% versus 14.2% (p = 0.001).

In a study by Avinash shivaraj et al, who studied, Echocardiographic predictors of early in- hospital heart failure during first ST-elevation myocardial infarction, the mean LAVI in patients with HF killip >II was

28.96 and those without HF was 22.55 which was statistically significant (p 0.01).(74), Souza et al did not observe any significant result between HF and LAVI.

Re MI, Re admission rates and LAVI: In the present study, 3.3% of total study population had re MI during the follow up period of 3 months. Re MI rate was higher in group with LAVI $\geq$ 22 ml/m2 though it was not statistically significant. In the present study, 4% of study population has got readmitted during the study period with no significant difference between with two groups.

Mortality and LAVI: In the present study, 4.4% of total study population had suffered with death during follow up period. Mortality rate was higher in group with LAVI $\geq$ 22 ml/m2 though it was not statistically significant.

In a study by Jacob Et al, in a mean follow up period of 15 months, the mortality rate was increased in those patients with LAVI > 32 ml/m2.(76) In a study by Eiren sakaguchi et al, major cardiac events were significantly higher in patients with LAVI > 32 ml/m2 as compared to those with LAVI < 32 ml/ m2.

In a study by Jose Alves Secundo Junior et al, the occurrence of combined outcome for MACE was higher (p = 0.001) in the group with increased LAVI (26%) as compared to the normal LAVI group (7%) [RR (95% CI) = 3.46 (1.54-7.73) vs. 0.80 (0.69-0.92)]. After Cox regression, increased LAVI increased the probability of MACE (HR = 3.08, 95% CI = 1.28-7.40, p = 0.012). Patients with LAVI > 32 mL/m² had worse prognosis regarding in-hospital outcome. In addition, they had a higher number of major cardiovascular events in the 365-day follow-up, in which the occurrence of stroke was important.

In a study by Rezvani Seheli et al, (n=100), with a mean follow up period of 9 months, mortality was significantly higher (p=0.001) in patients of acute myocardial infarction, with LAVI >32 ml/m2.

In a study by Nicolas Lamblin et al, (n= 246) who studied consequences of left atrial remodeling after first myocardial infarction, for 1 year, found that Patients with high LA volumes at baseline had higher LV volumes, decreased LV systolic function, increased E/Ea and Patients with higher LA volumes at baseline were at higher risk of cardiovascular death or re-hospitalization for heart failure during follow-up (P = 0.015).

VI. Conclusion

Present study concludes that in patients with acute STEMI admitted at KGH, Visakhapatnam, LAVI was significantly high in patients with increased BMI. No significant correlation of LAVI was noted with LV systolic function as determined by ejection fraction. Among various diastolic parameters measured, LAVI showed positive correlation only with E/e' ratio (P = 0.034), and weak negative correlation with IVRT (P = 0.067). Patients with LAVI $\geq$ 22 ml/m2 had significantly higher incidence of heart failure during the 3 month follow up period as compared to those with LAVI $\leq$ 22 ml/m2. (P=0.009). There was no significant difference in other outcomes like arrhythmias, re admission, re-MI and mortality between the two groups.

References

[1]. Rosamond W, Flegal K, Furie K, et al. Heart disease and stroke statistics--2008 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2008; 117:e25.
[2]. Nichols M, Townsend N, Scarborough P, Rayner M. Cardiovascular disease in Europe 2014: epidemiological update. Eur Heart J 2014; 35:2950.
[3]. Benjamin EJ, Virani SS, Callaway CW, et al. Heart Disease and Stroke Statistics-2018 Update: A Report From the American Heart Association. Circulation 2018; 137:e67.
[4]. Rogers WJ, Frederick PD, Stoehr E, et al. Trends in presenting characteristics and hospital mortality among patients with ST elevation and non-ST elevation myocardial infarction in the National Registry of Myocardial Infarction from 1990 to 2006. Am Heart J 2008; 156:1026.
[5]. Gibson CM, Pride YB, Frederick PD, et al. Trends in reperfusion strategies, door-to-needle and door-to-balloon times, and in-hospital mortality among patients with ST-segment elevation myocardial infarction enrolled in the National Registry of Myocardial Infarction from 1990 to 2006. Am Heart J 2008; 156:1035.
[6]. Rosamond WD, Chambless LE, Heiss G, et al. Twenty-two-year trends in incidence of myocardial infarction, coronary heart disease mortality, and case fatality in 4 US communities, 1987-2008. Circulation 2012; 125:1848. Jernberg T, Johanson P, Held C, et al. Association between adoption of evidence-based treatment and survival for patients with ST-elevation myocardial infarction. JAMA 2011; 305:1677.
[7]. O'Gara PT, et al. American College of Emergency Physicians, Society for Cardiovascular Angiography and Interventions, 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2013; 61:e78.
[8]. Møller JE, Whalley GA, et al. Meta-Analysis Research Group in Echocardiography (MeRGE) AMI Collaborators, Independent prognostic importance of a restrictive left ventricular filling pattern after myocardial infarction: an individual patient meta-analysis: Meta-Analysis Research Group in Echocardiography acute myocardial infarction. Circulation 2008; 117:2591.
[9]. Moller JE, Hillis GS, Oh JK, et al. Left atrial volume: a powerful predictor of survival after acute myocardial infarction. Circulation 2003; 107:2207.
[10]. Zornoff LA, Skali H, Pfeffer MA, et al. Right ventricular dysfunction and risk of heart failure and mortality after myocardial infarction. J Am Coll Cardiol 2002; 39:1450.