

# Study of left ventricular functions in asymptomatic obese individuals with 2D echo cardiography

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## Abstract

**Background:** Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems. Obesity increases adverse cardiac events in many ways. These may be indirectly mediated through risk factors associated with metabolic syndrome like dyslipidemia, hypertension, and glucose intolerance, or effects from sleep disorders associated with obesity. **Aims and objectives:** To study of Left ventricular functions in asymptomatic obese individuals with 2 D echo cardiography. **Materials and method:** In the present cross sectional Descriptive study total 50 cases with body mass index more than 30 were included. Detailed history of each patient was recorded on the prestructured proforma. Clinical examination was done and relevant investigations were done. All the patients were subjected to resting 12 lead electro-cardiography. 2D Echo study was performed in all patients with special attention to the left ventricular function. The collected data was entered in Microsoft excel and was analyzed and presented with appropriate graphs and tables. **Results:** Out of 50 asymptomatic obese individuals maximum, (36%) were between 41-50 years of age. Female predominance was observed. 62% were females and 38% were males. Maximum obese individuals (60%) were in Class I obesity while 32% were in class II and 8% were in Class III. 23 (46%) subjects had hypertension. 24 (48%) had dyslipidemia and 18 (36%) had smoking as a risk factor for coronary artery disease. It was seen that maximum patients (36%) had normal ECG, low voltage complexes were commonest abnormal finding found in 20% of the subjects. Left ventricular hypertrophy was seen in 16% individuals. T wave inversion was seen in 12% obese individuals. ST-flattening and left axis deviation was seen in 8% individuals each. In the present study 54% subjects had normal 2D-Echocardiograph. Left ventricular hypertrophy was found in 32% subjects, diastolic dysfunction was found in 10% subjects and Left ventricular hypertrophy+diastolic dysfunction was found in 4% subjects. **Conclusion:** Thus we conclude that Obesity was more common in middle age group i.e. between 41-60 years of age. Among the asymptomatic obese individuals on 2 D echo cardiography the Left ventricular hypertrophy was found in 32% subjects while Left ventricular hypertrophy with diastolic dysfunction was found in 4% subjects.

**Key words:** Asymptomatic obese individuals, 2 D echo cardiography, Left ventricular functions

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## INTRODUCTION

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems.<sup>1</sup> People are considered obese when their body mass index (BMI)<sup>2</sup>, a measurement obtained by dividing a person's weight in kilograms by the square of the person's height in metres, exceeds 30 kg/m<sup>2</sup>. Obesity is one of the important risk factor for coronary artery disease. Obesity increases adverse cardiac events in many ways. These may be indirectly mediated

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through risk factors associated with metabolic syndrome like dyslipidemia, hypertension, and glucose intolerance, or effects from sleep disorders associated with obesity. Metabolic syndrome is associated with central or abdominal obesity, with the distribution of fat predominantly in the abdominal viscera rather than the extremities. Waist circumference or waist-hip ratio are useful ways of assessing this type of fat distribution and increased values attribute additional cardiovascular risk. In abdominal obesity, there is an increase in the level of various inflammatory markers as well as the occurrence of a prothrombotic state.<sup>3,4</sup> Many adipokines and other chemical mediators like tumor necrosis factor- $\alpha$ , interleukin-6 plasminogen activator inhibitor-1, resistin, lipoprotein lipase, acylation stimulating protein, cholesteryl ester transport protein, retinal binding protein, estrogens, leptin, angiotensinogen, and insulin-like growth factor-1 are present in increased concentrations in obese patients. These have various adverse effects on the cardiovascular system by creating a pro-inflammatory and prothrombotic state as well as causing endothelial damage and vascular hypertrophy.<sup>5,6</sup>

## MATERIALS AND METHOD

The present cross sectional Descriptive study was conducted in the department of Medicine of tertiary care institute with the aim to study the Left ventricular functions in asymptomatic obese individuals with 2 D echo cardiography.

Total 50 cases were selected by using below mentioned inclusion and exclusion criteria.

### Inclusion criteria

- Individuals with body mass index more than 30 are included.
- Age > 18 years and of either sex
- Patients with or without history of hypertension are included in the study.

### Exclusion criteria

- Patients with known ischemic heart disease
- Patients with known diabetes mellitus.

Detailed history of each patient was recorded on the prestructured proforma.

Clinical examination was done and relevant investigations were done. Body weight was determined with subjects wearing light clothes and no shoes or socks, using a weighing balance. Height was determined using a wall mounted, flexible and non expansible measuring tape with subjects in standing position and feet together. Body mass index (BMI)<sup>7</sup> was calculated using the expression weight in kg/ height in m<sup>2</sup>.

All the patients were subjected to resting 12 lead electro-cardiography. 2D Echo study was performed in all patients with special attention to the left ventricular

function. The collected data was entered in Microsoft excel and was analyzed and presented with appropriate graphs and tables.

## RESULTS

**Table 1:** Distribution according to age and sex

	No of patients	Percentage
Age	18-30	10
	31-40	10
	41-50	18
	51-60	12
Sex	Male	19
	Female	31
<b>Total</b>	<b>50</b>	<b>100%</b>

In the study out of 50 asymptomatic obese individuals maximum, 18 (36%) were between 41-50 years of age. 12 out of 50 i.e. 24% were between 51-60 years of age. In the present study female predominance was observed. 62% were females and 38% were males.

**Table 2:** Distribution according to Class of obesity and Risk factor

	No of patients	Percentage
Class of obesity	Class I	30
	Class II	16
	Class III	4
Risk factor	Hypertension	23
	Dyslipidemia	24
	Smoking	18
<b>Total</b>	<b>50</b>	<b>100%</b>

Maximum obese individuals (60%) were in Class I obesity while 32% were in class II and 8% were in Class III. In present study out of 50 subjects 23 (46%) had hypertension. 24 (48%) had dyslipidemia and 18 (36%) had smoking as a risk factor for coronary artery disease.

**Table 3:** ECG findings in obese individuals

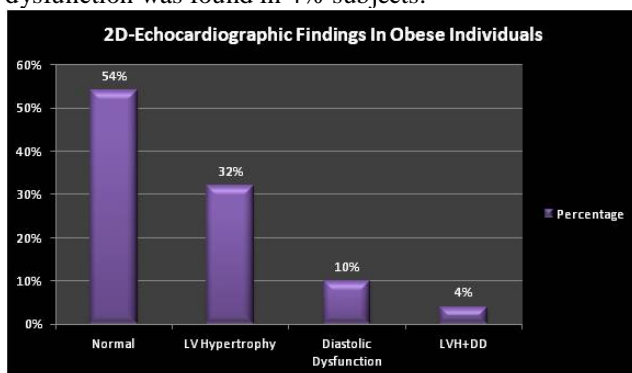
ECG Finding	No of patients	Percentage
Normal	18	36%
Low Voltage Complexes	10	20%
Left Ventricular Hypertrophy	8	16%
T Wave Inversion	6	12%
ST –Flattening	4	8%
Left Axis Deviation	4	8%

It was seen that maximum patients (36%) had normal ECG, low voltage complexes were commonest abnormal finding found in 20% of the subjects. Left ventricular hypertrophy was seen in 16% individuals. T wave inversion was seen in 12% obese individuals. ST-flattening and left axis deviation was seen in 8% individuals each.

**Table 4:** 2D-Echocardiographic Findings In Obese Individuals

2D-Echo Findings	No of Obese Individuals	Percentage
Normal	27	54%
LV Hypertrophy	16	32%
Diastolic Dysfunction	5	10%
LVH+DD	2	4%

In the present study 54% subjects had normal 2D-Echocardiograph. Left ventricular hypertrophy was found in 32% subjects, diastolic dysfunction was found in 10% subjects and Left ventricular hypertrophy+diastolic dysfunction was found in 4% subjects.

**Figure 1:** 2D Echocardiographic Findings In Obese individuals

## DISCUSSION

The present study was conducted in the department of medicine of tertiary care institute. The aim was to study of Left ventricular functions in asymptomatic obese individuals with 2 D echo cardiography. In the present study maximum number of obese individuals 18 (36%) were in age group 41-50 years. 51 to 60 years was the next common age group which contained 12 (24%) obese individuals. In a study done by Brown CD *et al*<sup>8</sup> they found that proportions at the highest BMI level were largest at ages 40 to 59 years. In present study out of 50 patients 33 were females and 17 were males. In a study done by Brown CD *et al*<sup>8</sup> greater proportions of women than men had BMIs at the extremes of the distribution i.e. > 25. In our study 50 obese individuals were divided into class I, class II and class III obesity according to WHO definition of obesity. Out of 50, 30 individuals (60%) were in class I obesity, 16 (36%) were in class II obesity and 4 (8%) were in class III obesity. In our study of 50 asymptomatic obese individuals 23 were having hypertension. i.e. prevalence of hypertension was 46%. In a study done by Brown CD<sup>47</sup> prevalence of hypertension was 42% in males and 38% in females. In a study done by Troy M.<sup>9</sup> prevalence of hypertension was found to be 58.8% in obese individuals. Thus findings in our study

correlate with findings in these two studies. The relationship between obesity and hypertension is well established in adults. The mechanisms through which obesity directly causes hypertension are still an area of research. Activation of the sympathetic nervous system has been considered to have an important function in the pathogenesis of obesity-related hypertension. The arterial-pressure control mechanism of diuresis and natriuresis, according to the principle of infinite feedback gain, seems to be shifted toward higher blood-pressure levels in obese individuals. During the early phases of obesity, primary sodium retention exists as a result of increase in renal tubular reabsorption. Extracellular-fluid volume is expanded and the kidney-fluid apparatus is re-set to a hypertensive level, consistent with a model of hypertension because of volume overload. Plasma renin activity, angiotensinogen, angiotensin II and aldosterone values display significant increase during obesity. Insulin resistance and inflammation may promote an altered profile of vascular function and consequently hypertension. Leptin and other neuropeptides are possible links between obesity and the development of hypertension. Obesity should be considered as a chronic medical condition, which is likely to require long-term treatment. Understanding of the mechanisms associated with obesity-related hypertension is essential for successful treatment strategies.<sup>10</sup> In the present study out of 50 asymptomatic obese individuals 24 were having deranged lipid profile. i.e. prevalence of dyslipidemia was 46%. In study done by Brown CD<sup>47</sup> prevalence of high blood cholesterol was 22% in men and 27%-30% in women. In a study done by Troy M. Labounty<sup>9</sup>, prevalence of dyslipidemia was 55.8% in obese individuals. So findings in our study correlate with findings in above two studies. Obesity increases cardiovascular risk through risk factors such as increased fasting plasma triglycerides, high LDL cholesterol, low HDL cholesterol, elevated blood glucose and insulin levels and high blood pressure. Novel lipid dependent, metabolic risk factors associated to obesity are the presence of the small dense LDL phenotype, postprandial hyperlipidemia with accumulation of atherogenic remnants and hepatic overproduction of Apo B containing lipoproteins. All these lipid abnormalities are typical features of the metabolic syndrome and may be associated to a pro-inflammatory gradient which in part may originate in the adipose tissue itself and directly affect the endothelium. An important link between obesity, the metabolic syndrome and dyslipidemia, seems to be the development of insulin resistance in peripheral tissues leading to an enhanced hepatic flux of fatty acids from dietary sources, intravascular lipolysis and from adipose tissue resistant to the anti-lipolytic effects of



insulin.<sup>11</sup>In present study of 50 asymptomatic obese individuals 18 were smokers i.e. prevalence of smoking was 36%. In a study done by Troy M. Labounty,<sup>9</sup> prevalence of smoking was 16.8%. In the present study Normal ECG changes were the commonest finding found in our study. Low voltage complexes were seen in 10 individuals and it was most common abnormal ECG finding. Low voltage complexes in obesity can be explained by morphological changes induced by obesity such as (1) displacement of the heart by an elevated diaphragm (2) increased cardiac workload with associated cardiac hypertrophy (3) increased distance between the heart and the recording electrodes induced by the accumulation of adipose tissue in the subcutaneous tissue of the chest wall (and possibly increased epicardial fat) and (4) the potential associated chronic lung disease secondary to the sleep apnea or hypoventilation syndrome.<sup>12</sup>In present study Left ventricular hypertrophy was seen in 8 individuals and it was the next common abnormal finding. All the individuals who had LV hypertrophy on ECG were having hypertension. Out of 8 individuals who had LVH on resting ECG, 6 had positive treadmill test. T wave inversion was seen in 6 individuals. Treadmill test was positive in 2 individuals having t inversion in resting ECG. In present study case left axis deviation was seen in 4 individuals. In our study 27 individuals had normal echo cardiograph. Left ventricular hypertrophy was seen in 16 individuals. Diastolic dysfunction was seen in 5 individuals. 2 individuals were having L V hypertrophy and diastolic dysfunction both. Out of 23 hypertensive obese individuals 14 i.e. 60.86% individuals had L V Hypertrophy on 2DECHO. 2 non hypertensive obese individuals i.e. 7% had L V Hypertrophy on 2DECHO. In a study done by G de Simone,<sup>13</sup> 52% hypertensive obese individuals had Left Ventricular Hypertrophy on 2DECHO. 13% of non hypertensive obese individuals had L V Hypertrophy on 2DECHO. Obesity is associated with increased blood viscosity and might, by increasing the peripheral resistance, contribute to the higher LV wall thicknesses and greater prevalence of concentric hypertrophy in these patients.<sup>14</sup>In present study diastolic dysfunction was seen in 5 (10%) obese individuals. Out of them, 2 had positive treadmill test. In a study done by M. Fischer,<sup>15</sup> prevalence of diastolic dysfunction was 5% in obese individuals and 5% in hypertensive individuals. Hence findings in our study correlate with findings in this study. Left ventricular hypertrophy and diastolic dysfunction both were seen in 2 individuals.

## CONCLUSION

Thus we conclude that Obesity was more common in middle age group i.e. between 41-60 years of age. Among

the asymptomatic obese individuals on 2 D echo cardiography the Left ventricular hypertrophy was found in 32% subjects while Left ventricular hypertrophy with diastolic dysfunction was found in 4% subjects.

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