

## Original Research Article

# Estimation of left ventricular function in chronic alcoholics

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### ABSTRACT

**Background:** Alcohol abuse is one of the leading causes of millions of deaths, it is also a burden in society. Direct toxicity of ethanol affects cardiac muscle. Acute intoxication shows pathological electrocardiogram changes such as sinus tachycardia in alcohol dependence syndrome, sinus arrhythmias, prolongation of QT interval, ventricular polarising complexes, poor progression of R wave, torsade de pointes. Changes found in echocardiography are alteration in septal and ventricular wall thickness, left atrial dimensions, left ventricle dimension and mass.

**Methods:** Patients attending outpatient and inpatients section in our tertiary care hospital Shri Balaji Vidhyapeeth University were considered in study for a period of two years. Study size was 85 patients, Data were collected regarding proportion of ethanol intake, history of duration, symptoms related to cardiovascular system, blood parameters including thyroid function test, blood sugars are done, body mass index calculated, blood pressure recorded master chart made for statistical verification. The three-dimensional echocardiography in M mode is done by our cardiologist.

**Results:** Echocardiography findings were correlated with duration of intake of alcohol end diastolic volume index (EDVI), End systolic volume index (ESVI), Left ventricle mass index (LVMI) had positive correlation of p-value less than 0.05. when quantity of ethanol intake correlated with echocardiography, Left ventricular inner dimension (LVID), fractional shortening (FS), ejection fraction (EF), posterior wall thickness, E/A ratio has no significance with p value. Abnormality is noted in left ventricle diastolic function and is corresponded to quantity and duration of alcohol. Moderate amount of less than 150grams of ethanol did not showed toxic effects in heart while severe quantity and duration more than ten years of intake showed left ventricle dysfunction.

**Conclusions:** Ethanol consumption in massive amount impair cardiac contractile function. Change in left ventricle volume takes place before the defect in the ventricular filling, which would be a marker for effect of ethanol in heart.

**Keywords:** Alcohol abuse, LV dysfunction, Intoxication

### INTRODUCTION

Alcohol abuse is one of the leading causes of millions of death, it is also a burden in society. Many diseases are attributed as a result of alcoholism including most of the system which includes cirrhosis, internal bleeding in gastrointestinal tract, pancreatitis, nutritional deficits, encephalopathy and so on.<sup>1</sup> Direct toxicity of ethanol affects cardiac muscle. Acute intoxication shows

pathological electrocardiogram changes such as sinus tachycardia in alcohol dependence syndrome, sinus arrhythmias, prolongation of QT interval, ventricular polarising complexes, poor progression of R wave, torsade de pointes. The presence of torsade de pointes usually denotes poor prognosis.<sup>2</sup>

Early changes in electrocardiogram is left atrial enlargement which can be identified by P wave morphology in lead V1.<sup>3,4</sup> Prolonged intake of ethanol

with malnourishment usually shows defects in interventricular conduction.<sup>5,6</sup> Atrial fibrillation in acute intoxication can be reversed in a day with stabilization of hemodynamics.<sup>7</sup> Bradycardia with sinus rhythm usually presents with recurrent syncope resulting from toxic effects of ethanol. Ethanol intoxication is one of the commonest cause of sudden cardiac arrest.<sup>8,9</sup>

Changes found in echocardiography are alteration in septal and ventricular wall thickness, left atrial dimensions, left ventricle dimension and mass.<sup>10-12,39-46</sup> Early picking of changes in three-dimensional echocardiography would benefit the patients as toxin induced cardiomyopathy is reversible.<sup>13</sup> The amount of ethanol consumption is proportional to the changes in echocardiography.<sup>14,15</sup>

Hence the objective of this study is the correlation, significance of Ethanol consumption with cardiac contractile dysfunction, and to determine the echo finding related to early changes in ventricular dysfunction.

## METHODS

### Study type

Observational cross-sectional study.

### Study population

#### Selection criteria

Willing and consented Patients attending as outpatient and inpatients in our hospital Shri Sathya Sai Medical College and Research Institute were considered in study for a period of 2 years from January 2018 to December 2020.

#### Exclusion criteria

They should satisfy age less than sixty years to exclude systemic illness. Duration of ethanol of more than of five years. Average drink of atleast five drinks in a week of more than ninety grams.

It is necessary to exclude valvular heart disease, thyroid diseases, diabetes and systemic hypertension as these pathologies will interfere with atrial and ventricular mass and function.

### Study procedure

Data were collected regarding proportion of ethanol intake, history of duration, symptoms related to cardiovascular system, blood parameters including thyroid function test, blood sugars are done, body mass index calculated, blood pressure recorded master chart made for statistical verification.

## Echocardiography

The three-dimensional echocardiography in M mode is done by our cardiologist. Internal dimension of left ventricle and ejection fraction is measured, doppler ultrasound scan is used to assess diastolic function of left ventricle, peak early diastolic velocity, peak late diastolic velocity, E/A ratio. Ethical approval obtained.

## Statistical analysis

Chi-square test was applied, data were expressed as mean standard deviation. Statistical package for social sciences (SPSS) software 16th version was used for the analysis. P value less than 0.05 was regarded as significant.

## RESULTS

Total of 85 cases were included in my study who were satisfying both inclusion and exclusion criteria, of this one third (38.2%) were consuming ethanol of less than ten years and two third (61.8%) more than ten years (Table 1).

**Table 1: Duration of alcohol.**

Duration of alcohol	Frequency	Percentage
Up to 10 years	33	38.3
10 years above	52	61.8
<b>Total</b>	<b>85</b>	<b>100.0</b>

**Table 2: Amount of ethanol.**

Amount of ethanol	Frequency	Percentage
150 grams and less	46	52.3
150 grams and more	39	47.7
<b>Total</b>	<b>85</b>	<b>100.0</b>

Of which 52.3% devour less than 150 grams of ethanol, 47.7% more than 150 grams of alcohol

### Echocardiography measurements: T test for duration of alcohol

#### Interpretation of Table 3

Echocardiography findings were correlated with duration of intake of alcohol end diastolic volume index (EDVI), End systolic volume index (ESVI), Left ventricle mass index (LVMI) had positive correlation of p value less than 0.05.

When quantity of ethanol intake correlated with echocardiography, Left ventricular inner dimension (LVID), fractional shortening (FS), ejection fraction (EF), posterior wall thickness, E/A ratio has no significance with p value. There is no abnormal variation in E velocity, A velocity and no difference noted in interventricular septum and posterior wall thickness.

**Table 3: Echocardiography measurements: T test for duration of alcohol.**

	Duration of alcohol	N	Mean	SD	P value
<b>Left ventricular inner dimension</b>	1-10 years	55	4.5691	0.33437	0.296
	>10 years	30	4.4900	0.32521	
<b>End diastolic volume index</b>	1-10 years	55	51.2156	6.20346	0.005 (NS)
	>10 years	30	47.3283	5.25204	
<b>End systolic volume index</b>	1-10 years	55	15.1360	1.80679	0.001 (NS)
	>10 years	30	13.8113	1.61938	
<b>Fractional shortening</b>	1-10 years	55	47.3491	54.65109	0.610
	>10 years	30	42.2000	6.48287	
<b>Ejection fraction</b>	1-10 years	55	73.8182	5.36135	0.468
	>10 years	30	74.6667	4.67077	
<b>Posterior wall thickness</b>	1-10 years	55	.9545	0.11835	0.013 (NS)
	>10 years	30	.8867	0.11666	
<b>Inter ventricular septal thickness</b>	1-10 years	55	.9745	0.12941	0.767
	>10 years	30	.9833	0.13153	
<b>Left ventricular mass index</b>	1-10 years	55	84.7445	11.69503	0.018 (NS)
	>10 years	30	78.7247	9.40985	
<b>Isovolumetric relaxation time</b>	1-10 years	55	88.7636	13.05397	0.120
	>10 years	30	84.3000	11.43543	
<b>Deceleration time</b>	1-10 years	55	173.3964	29.69303	0.035(NS)
	>10 years	30	160.4733	19.26746	
<b>E wave</b>	1-10 years	55	0.7824	0.13944	0.238
	>10 years	30	0.8217	0.15643	
<b>A wave</b>	1-10 years	55	0.7184	0.17171	0.964
	>10 years	30	0.7167	0.14547	
<b>E/A ratio</b>	1-10 years	55	1.1389	0.29040	789042310.603
	>10 years	30	1.1717	0.24885	

NS - Not Significant

Abnormality is noted in left ventricle diastolic function and is corresponded to quantity and duration of alcohol. Moderate amount of less than 150 gms of ethanol did not showed toxic effects in heart while severe quantity and duration more than ten years of intake showed left ventricle dysfunction and most of the patients are without cardiovascular symptoms.

## DISCUSSION

Thus ethanol is found have direct toxic effect in heart musculature resulting in alcoholic cardiomyopathy.<sup>16-29</sup> Acetaldehyde, a strong metabolite impairs phosphorylation of mitochondria, The myocyte in toxicated heart are found to have abnormal structure which inturn leading to cardiomyopathy.<sup>30,31,34</sup> There are other certain mechanisms which includes inhibition of interaction in calcium myofilament, protein synthesis, reduction in receptor expression.<sup>33,35,36</sup> Sinus tachycardia is the most common abnormal change found in electrocardiographic rhythm.<sup>32,37</sup>

In our study we have used echocardiography as a study variable. We have subjected each patients to echocardiography and observed that duration of alcoholic beverages is directly proportional to the cardiovascular changes.

We came to the conclusion 61.8% of my cases who had endured ethanol for more than ten years showed low left ventricular function.

## Limitations

There is no control in our study, comparison with normal adult is not possible. As the disease is reversible proper follow up could not be done in most cases. No female cases are willing for this study as our topic is related to alcohol.

## CONCLUSION

Ethanol consumption in massive amount impair cardiac contractile function. Change in left ventricle volume takes place before the defect in the ventricular filling, which would be a marker for effect of ethanol in heart. Duration of detoxification (abstinence) for three months could reverse the cardiac dysfunction.

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