



### RESEARCH ARTICLE

## ASSESSMENT OF CARDIAC FUNCTIONS IN RELATION WITH ELECTROCARDIOGRAPHY AND ECHOCARDIOGRAPHY IN CHRONIC ALCOHOLIC PATIENTS

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### Abstract

**Background:** Alcohol is most commonly abused drug worldwide. It has been shown to produce toxic effects in almost every organ system in the body. Many of these medical conditions can be attributed to direct effects of alcohol whereas others are indirect sequelae that may result from nutritional deficiencies or predisposition to trauma. Alcohol consumption has been associated with a variety of cardio vascular disorders this study was thus undertaken to know the Electrocardiographic and Echocardiographic abnormalities in asymptomatic chronic alcoholic patients.

**Materials and Methods:** This Analytical Cross sectional Study was carried out during 1st April 2021 to 30<sup>th</sup> Sept 2022 in 100 chronic alcoholic patients in the age group of 21-40 years with daily alcohol intake of > 80 g/day for > 5 years., having history of chronic alcoholism as defined, for more than 5 years were evaluated by electrocardiography and echocardiography. Patients with known diabetics, hypertensive and cardiovascular disorders were excluded from the study group.

**Results:** The prevalence of cardiovascular abnormalities in patients of chronic alcoholism is 37% in our study. Most common ECG changes are sinus tachycardia (18%), and Non specific ST-T changes (9%). Most common 2D ECHO changes were increased posterior wall thickness (11%) and followed by increased interventricular septum thickness and decreased ejection fraction (<40%). The prevalence of cardio vascular abnormalities are more with increased duration of alcohol consumption and also high in advanced age group.

**Conclusions:** This study confirms that many electrocardiographic as well as echocardiographic changes occur prior to symptomatic cardiac disorders established to be caused by chronic alcohol intake such as alcoholic cardiomyopathy which probably are early indicators of ongoing effects of alcohol and are reversible during the early stages detected by non invasive investigations like Electrocardiography and Echocardiography that later proceeds to alcoholic dilated cardiomyopathy.

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**Introduction:-**

Ethanol is most commonly abused drug worldwide. It has been shown to produce toxic effects in almost every organ system in the body. Many of these medical conditions can be attributed to direct effects of alcohol whereas others are indirect sequelae that may result from nutritional deficiencies or predisposition to trauma. Almost 30% to 40% admissions in hospitals are alcoholic related [1]. Patients with acute alcohol intoxication often present with pathological electrocardiographic (ECG) changes. The changes are more frequent and prognostically more significant in chronic alcoholics, in patients with ischaemic heart disease (IHD), in alcohol cardiomyopathy or another organic heart disease [2]. Chronic alcohol intake is known to cause cardiac dysfunction, most notably as congestive cardiomyopathy. Approximately 20 to 30% of patients admitted to a hospital are alcohol abusers. Cardiovascular effects of alcohol are directly proportional to alcohol consumption, age and genetic factors may also contribute. Alcohol damage to the heart is evident if alcohol consumption exceeds 90 to 100 g/d. Heavy alcohol consumption leads to increased risk for sudden cardiac death and cardiac arrhythmias. In patients with coronary heart disease, alcohol use was associated with increased mortality [3]. Prolonged alcohol consumption in the absence of evident malnutrition resulted in demonstrable intraventricular conduction abnormalities and morphologic alterations which were related to duration of ingestion, consistent with a cumulative toxic effect of ethanol. The typical ECG changes in alcoholic intoxication are disturbances of heart rate having the nature of electric impulse generation disorder or of impulse conduction pathology. In persons without clinical evidence of heart disease, they are classified as 'holiday heart syndrome' [2]. Several mechanisms are theorized to be responsible for the arrhythmogenicity of alcohol leading to cardiac dysarrhythmias [4]. The most common rhythm disorder is atrial fibrillation, which usually converts to normal sinus rhythm within 24 hours [5] less frequent but prognostically much more significant is torsades de pointes (TdP) polymorphous ventricular tachycardia. Among bradyarrhythmias, the most significant is alcohol-induced sinus bradycardia which may be manifested by recurrent syncope. The incidence of conduction disturbances increases with higher levels of blood alcohol concentration sometime even leading to sudden cardiac deaths [2]. Echocardiography changes like left ventricular mass, left ventricular dimensions, septal and left ventricular wall thicknesses, and left atrial dimension have been observed in persons with prolonged exposure to alcohol [6]. If stopped early alcoholic effects of heart can be stalled and even reversed. Alcoholic heart disease is reversible condition during the early stages detected by non invasive investigations like Electrocardiography and Echocardiography. excessive alcohol consumption is associated with alcoholic cardiomyopathy, characterized by enlargement of the heart, increased left ventricular (LV) mass, and ventricular dysfunction.[7] Moreover, alcohol intake has been associated with hypertension, which also contributes to alterations in cardiac structure and function.[8] Conversely, numerous studies support a protective association between light to moderate drinking with the risk of coronary artery disease (CAD) and even the risk of heart failure.[9,10] However, the cardiovascular mechanisms of the risks and potential benefits of alcohol are uncertain.[11,12] Furthermore, the variation in the toxic and protective effects of alcohol by sex remains controversial, as women may be more sensitive than men to the toxic effects of alcohol on cardiac function, developing alcoholic cardiomyopathy at a lower total lifetime dose of alcohol compared with men.[13].

**Material and Methods:-**

This Analytical Cross sectional Study was carried out during 1st April 2021 to 30<sup>th</sup> Sept 2022 in 100 chronic alcoholic patients in the age group of 21-40 years with daily alcohol intake of > 80 g/day for > 5 years. Patients with known history of diabetes, hypertension and coronary heart diseases were not included in the study. All subject history was taken including duration of alcoholism. Selected subjects underwent clinical examination by medical professional. Diabetes was ruled out by history and by measuring plasma glucose levels. CBC, LFT, RFT and other routine investigations were done for study participants to rule out any other underlying diseases which could have an impact on the results of the study. Based on history of alcohol consumption study participants were divided into two groups one with duration 5-10 years (32%) and >10 years (68%) and based on age 20-30 years (34%) and 31-40 years (66%).

**Results:-**

The sample size was 100, with 34% of participants in the 21–30 age range and 66% in the 31–40 age range (Table 1). Participants in the study made up 2% of women and 98% of men (Table 2). In total, 32% of study participants had a history of alcohol use for between five and eight years, and 68% had a history longer than eight years (Table 3).

**Table 1:-** Age distribution (N=100).

Age in years	No. of patients (N)	Percentage (%)
20-30	34	34
31-40	66	66

**Table 2:-** Sex distribution (N=100).

Gender	No of patients (N)	Percentage (%)
Males	98	98
Females	2	2

**Table 3:-** Duration of alcohol consumption (N=100).

Duration of alcohol consumption in years	Number of cases	Percentage (%)
5-10	32	32
>10	68	68
<b>Total</b>	<b>100</b>	<b>100</b>

Study participants' ECGs showed a variety of changes, the majority of which were sinus tachycardia (about 18%) and non-specific ST-T changes (about 9%). (Table 4). Sinus tachycardia was the most frequent ECG change in patients who had consumed alcohol for 5-10 years and for >10 years. Non-specific ST-T changes and left ventricular hypertrophy were other ECG changes seen in patients who had consumed alcohol for more than 10 years (Table 5).

**Table 4:-** ECG changes in study group (N=100).

ECG changes	No of patients	Percent age (%)
Sinus tachycardia	18	18.00
Atrial fibrillation	1	1.00
Atrial premature contractions	1	1.00
Ventricular premature contractions	1	1.00
Nonspecific ST-T changes	9	9.00
Left ventricular hypertrophy	3	3.00
RBBB	2	2.00
Poor R wave progression	1	1.00
<b>Total</b>	<b>36</b>	<b>36.00</b>

**Table 5:-** ECG changes in relation to duration of alcohol consumption in study group.

ECG changes	Duration of alcohol 5-10yrs N=32	Percentage (%)	Duration of alcohol > 10yrs N=68	Percentage (%)
Sinus tachycardia	5	15.50	13	19.12
Atrial fibrillation	0	0	1	1.47
Atrial premature contractions	0	0	1	1.47
Ventricular premature contractions	0	0	1	1.47
Nonspecific ST-T changes	1	3.11	8	11.77
Left ventricular hypertrophy	0	0	3	4.41
RBBB	1	3.11	1	1.47
Poor R wave progression	0	0	1	1.47
<b>Total</b>	<b>7</b>	<b>21.80</b>	<b>29</b>	<b>42.67</b>

Increased interventricular septum and ejection fraction (40%) were the most frequent 2D ECHO changes, followed by increased posterior wall thickness (11%) and interventricular septum (Table 6). Increased posterior wall thickness was the most frequent 2D ECHO change in patients who had consumed alcohol for more than 10 years. Other 2D ECHO changes in patients who had drunk alcohol for more than 10 years included an expanded interventricular septum and a low (40%) ejection fraction (Table 7).

**Table 6:-** Echocardiographic changes in study group (N=100).

Echocardiographic changes	No of cases	Percentage (%)
Increased Posterior wall thickness	11	11.00
Increased Interventricular septum thickness	8	8.00
Ejection fraction (<40%)	8	8.00
Increased Left ventricular end systolic diameters	5	5.00
Increased Left ventricular end diastolic diameters	5	5.00
<b>Total</b>	<b>37</b>	<b>37.00</b>

**Table 7:-** Corelation of 2D echo changes with duration of alcohol consumption.

Echocardiographic changes	Duration of alcohol 5-10 yrs N=32	Percentage (%)	Duration of alcohol >10 yrs N=68	Percentage (%)
Increased Posterior wall thickness	2	6.24	9	13.23
Increased Interventricular septum thickness	2	6.24	6	8.82
Ejection fraction (<40%)	1	3.12	7	10.29
Increased Left ventricular end systolic diameters	1	3.12	4	5.88
Increased Left ventricular end diastolic diameters	1	3.12	4	5.88
<b>Total</b>	<b>7</b>	<b>21.87</b>	<b>30</b>	<b>44.11</b>

## Discussion:-

The most frequently abused substance overall is alcohol. In almost every organ system in the body, it has been demonstrated to have toxic effects. Several cardio vascular disorders have been linked to alcohol consumption. Heart failure symptoms were observed in people who had consumed excessive amounts of alcohol during the second half of the 19th century, and cardiac enlargement was discovered during autopsies. In addition to heart failure, alcohol use has been shown to have numerous negative effects on the cardio vascular system. It has been linked to arrhythmia, such as ventricular and atrial ectopic beats and atrial fibrillation. Hypertension and sudden death are additional effects. This study was conducted to determine the prevalence of cardiovascular abnormalities in alcoholism patients of various ages and durations. The current study's mean age (35.257.2) correlates with Mahela et al. [14]'s (38.853.3) and Lazarevic et al. [15]'s (32.854.3) mean ages. Out of 100 chronic alcoholic patients, 98 of them are men and only two are women. This study's lower proportion of female cases might be attributable to Indian culture (the incidence of females taking alcohol is less in India). The majority of the patients in this study (66% of them) are between the ages of 31 and 40. Only 34% of patients were in the 20–30 age range. Sinus tachycardia (18%) is the most frequent electrocardiographic abnormality seen in patients. 11% of these patients are between the ages of 31 and 40, and 7% are between the ages of 20 and 30. According to a study by Ryan and Howes [16], sinus-tachycardia is the most frequently seen ECG abnormality in chronic alcoholics. 20% of the cases in this study have sinus tachycardia. Mahela et al study [14] also revealed 25% sinus tachycardia. Non-specific ST-T changes are the second most frequent abnormality found in ECGs. According to a study by Mahela et al. [14], 17.5% of chronic alcoholic patients had non-specific ST-T changes. 9% of the patients in our study have non-specific ST-T changes. Chronic alcoholics frequently experience ectopics. Atrial and ventricular premature contractions are the two types of ectopics that are most frequently seen. In our study, 1% of the participants have APC, and 1% have VPC. The most frequent rhythm abnormality seen in chronic alcoholics is atrial fibrillation. Usually, it subsides on its own. alcohol binge drinking predisposition, also known as holiday heart syndrome. 1% of the participants in our study have atrial fibrillation. In one study, alcohol consumption was found to be the cause in 5–10% of new cases of atrial fibrillation

in the western population. In one study at JLN Medical College in AJMER, 2% of patients had a right bundle branch block. In 5% of cases, Mahela et al. [14] observed RBBB. Krasniqi A et al study [17] found RBBB in more than 5% of cases. In 1% of patients, poor R wave progression was noted. In the age group of 31 to 40 years, the majority of ECG abnormalities were discovered. Therefore, drinking alcohol while getting older results in more abnormalities. The Framingham Cohort Study has looked at the pattern of alcohol consumption in relation to clinical outcomes and changes in cardiovascular risk. The study found that drinking alcohol for longer periods of time and in older age groups were associated with an increase in cardiovascular abnormalities. Longer alcohol consumption is associated with more ECG abnormalities being seen in chronic alcoholics. Alcohol consumption that lasts longer has a direct correlation with ECG abnormalities. In our study, patients who had been drinking for 5-10 years had an ECG abnormality rate of 21.80%, while patients who had been drinking for more than 10 years had an abnormality rate of 42.67%. In our study, the most frequent echocardiographic changes were increased posterior wall thickness (11%), increased interventricular septum thickness (8%), and decreased ejection fraction (8%). Among them, patients with lower Ejection fraction have larger left ventricular end systolic and end diastolic diameters. The majority of these patients fall within the 31–40 age range. Two distinct studies carried out in various locations. In JLN Medical College, Mahela et al [14] found that 15% of patients had thicker posterior walls and interventricular septa, and 12.5% had lower ejection fractions after consuming alcohol for 5-10 years. Similar increases in left ventricular echocardiographic parameters were seen in a different study by MP Gautam et al [18]. Males experience 17.89% and females experience 20% of the observed echocardiographic abnormalities. The higher cardiotoxicity in females is the cause of this high incidence. Alcohol consumption duration was correlated with changes in echocardiography. In our study, echocardiographic abnormalities were seen in 21.87% of patients who had been drinking for 5-10 years and in 44.11% of patients who had been drinking for more than 10 years.

### Conclusion:-

According to our study, 37% of chronic alcoholism patients have cardiovascular abnormalities. The majority of patients were between the ages of 31 and 40 (66%); 98% of patients were men, and 2% were women. The majority of patients (68%) were discovered to have drunk for longer than 10 years. The most frequent 2D ECHO changes were increased posterior wall thickness (11%) and increased interventricular septum and ejection fraction (40%). The most frequent ECG changes are sinus tachycardia (18%) and Non specific ST-T changes (9%). The prevalence of cardiovascular abnormalities is higher in older age groups and increases with increased alcohol consumption duration.

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