RESEARCH

Cardiac Manifestations in Alcoholic Liver Disease

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Abstract: Background: Alcohol is harmful to the body. Alcohol causes 5.3% of global deaths, according to the world health organization(WHO). Alcohol abuse considerably increases the risk of liver, heart, pancreatic, brain, kidney, and cancer diseases. Chronic alcohol usage is connected to several heart diseases. Alcohol consumption and duration raise the risk of liver cirrhosis and heart issues. Over 10 to 12 years, drinking more than 25 grams of alcohol per day for men and 12 grams for women increases the risk of liver cirrhosis. Multiple literature studies identified cardiac issues in Western chronic drinkers. In the northeastern Indian state of Manipur, where alcoholism is endemic, it is important to understand the range of cardiac symptoms associated with alcoholic liver disease (ALD) and how they relate to disease severity and cirrhosis. **Materials and Methods:** The Regional Institute of Medical Sciences (RIMS) in Imphal, Manipur conducted this cross-sectional survey from October 1, 2019 to September 30, 2021. Enrolled were 98 General Medicine ward patients with alcoholic liver disease. A chest X-ray, ECG, and echocardiogram showed cardiac symptoms. Diagnostic testing for liver function, viral indicators, and other clinical suspicions. **Results:** The study comprised 98 alcoholic liver disease patients. The average age of participants was 47.01±12.43 years, with 28.6% in the 41-50 age range. Males made up 88.8% of the participants and females 11.2%. Fatty liver was 26(26.5%), hepatitis 25(25.5%), and cirrhosis 47(48%).Cardiomegaly on chest X-ray was found in 36.7% of patients, ischemic alterations in 23.5%, Dilated cardiomyopathy (DCM) in 37.8%, hypertension in 7.2%, ischemic stroke in 14.3%, and hemorrhagic stroke in 5.1%. Cardiomegaly, ECG ischemia alterations. Cirrhotic individuals had a considerably greater incidence of DCM and stroke compared to fatty liver and hepatitis patients (p value< 0.005). This study found no correlation between liver disease grade and hypertension. **Conclusion:** Cirrhosis was positively correlated with cardiomegaly, ECG ischemic alterations, DCM, and stroke in our study. This study shows that alcoholic cardiomyopathy and cirrhosis often coexist. This study reveals

INTRODUCTION

Alcohol abuse has been linked to numerous organ injuries, most notably liver damage. It has less of an impact on the cardiovascular system, though. The World Health Organization (WHO) estimates that 5.3% of fatalities globally are caused by alcohol abuse. Cardiovascular illnesses are responsible for 19% of all alcohol-related deaths.[1] Abnormal alcohol intake dramatically raises the risk of liver, heart, pancreatic, brain, renal, and cancer-related illness and death..[2] For a period of 10–12 years, drinking more than 25 g of alcohol per day for men and more than 12 g per day for women is linked to an elevated risk of liver cirrhosis.[3] Due to the cardio-protective properties of such alcohol, persons with liver cirrhosis may actually have cirrhotic cardiomyopathy rather than alcoholic heart disease.[4,5]

Recent research on the hemodynamics, metabolism, and structure of the heart in humans and experimental animals has highlighted the harmful effects of long-term alcohol consumption on the heart.[6-12]

Since the liver is where ethanol is mostly processed, it is the organ most impacted.[13,14] but there are obvious effects on the musculoskeletal system, nutrition, endocrine system, heart and vascular system, peripheral and central nervous systems, and gastrointestinal tract.[15]

Cardiomyopathy is a serious condition affecting the heart muscle that is typified by a major electrical or functional malfunction of the myocardium, with the most catastrophic outcome being progressive heart failure. Primary and secondary cardiomyopathies are two categories into which they fall.[16] Alcohol is one of toxic substances frequently consumed globally.[17] While ischemic and non-ischemic patients' cardiovascular health is improved by daily low to moderate alcohol use, chronic and excessive alcohol consumption can lead to progressive cardiac dysfunction and heart failure. (HF).[18,19]

A common example of secondary cardiomyopathy linked to long-term, excessive alcohol usage is alcoholic cardiomyopathy, which is a kind of dilated cardiomyopathy (DCM). It represents 40% of DCM cases.[20-23] Left ventricular end-diastolic diameter (LVEDD) is elevated and left ventricular ejection fraction is decreased in alcoholic cardiomyopathy (ACM), similar to other causes of DCM.

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(LVEF).[24] Alcoholic cardiomyopathy and heart failure (HF) are conditions that can occur in people who drink more than 80 grams of alcohol per day for at least five years.[25,26]

Many risk factors, including advanced age, hypertension, diabetes mellitus, obesity, valvular heart disease, and myocardial infarction, have been identified as indicators of heart failure (HF).[27,28] Limited data are available on the effects of modifiable lifestyle factors on the risk of HF.

The importance of alcohol as a cause of DCM was investigated in only few studies. With this background in mind, the study was conducted to identify the various cardiac manifestations in alcoholic liver disease (ALD) and to correlate them with the severity of ALD.

MATERIAL AND METHODS

This cross-sectional study was conducted in Regional Institute of Medical Sciences (RIMS), Imphal, Manipur from 1stOctober 2019 to 30thSeptember 2021. 98 alcoholic liver disease patients who were admitted in the General Medicine wards were enrolled following the criteria.

InclusionCriteria

1. All previously or newly diagnosed alcoholic liver disease patients (>30g/day for more than 5years) with deranged LFT, USG evidence of fatty liver, hepatitis, cirrhosis.
2. Those above 18years of age giving consent for participation.

Exclusion Criteria

Patients diagnosed with Viral hepatitis/ (Hep B, Hep C related cirrhosis), drug induced hepatitis /cirrhosis, haemochromatosis, Wilsons Disease, autoimmune steato-hepatitis and those not giving consent.

Study procedure Independent variables: A detailed history of presenting symptoms, past history and personal history were recorded in proper Performa along with age, sex, stages of hypertension, grade of chronic liver disease and cardiac manifestations. A complete physical examination with emphasis on the disease activity and duration of every subject was also done. Cardiac manifestation was observed by Chest X-ray, ECG and Echocardiography. Kidney function test, complete hemogram,liver function tests, viral markers, prothombin time and other investigations were done as per requirement.

Operational definitions:

Standard Alcoholic Drink: A standard alcoholic drink contains approximately 14gms of alcohol, which is equivalent to 12 ounces of beer (~5% alcohol), 8.5 ounces of malt liquor (~9% alcohol), 5 ounces of wine(~12%alcohol), 3.5ouncesof fortified wine (e.g.,sherryor port), or 1.5 ouncesofliquor (distilled spirits;~40% alcohol).

Moderate AlcoholConsumption:

Men: No more than two standard alcoholic drinks/day

Women: No more than one standard alcoholic drink/day

Heavy alcohol consumption

Men: More than 14 standard alcoholic drinks/ week or more than 4 standard alcoholic drinks in a day

Women: More than7standardalcoholicdrinks/weekor more than 3 standard alcoholic drinks in a day.

Statistical analysis: Study variables were expressed as frequency and percentages, mean (+SD) or median (IQR), depending on the type of distribution. Frequencies & proportions for categorical variables like gender, age groups, grade of liver disease, stages of hypertension etc were summarised. Chi squared test was used to see the association between cardiovascular manifestations and grade of liver disease. A p-value of <0.05 was considered significant.

Statistical software: IBMSPSSVersion 21.0 for Windows, Armonk NY: IBMCorp. were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

Approval of Research Ethics Board and Informed consent: The study was approved by Research Ethics Board Regional Institute of Medical Sciences, Imphal. (Ref No. A/206/REB-Comm (SP)/ RIMS/2015/564/42/2019.)

RESULTS

A total of 98 alcoholic liver disease patients were included in the study. Baseline characteristics of the study subjects were given in [Table 1]. The mean age of the participants was 47.01±12.43 years with majority (28.6) of the patients in the age group of 41-50 years. Majority (88.8%) of the participants were males and females were 11 (11.2%). Fatty liver was present in 26(26.5%), hepatitis in 25(25.5%) and majority were cirrhotic in 47(48%). Cardiomegaly on chest X-ray was present in 36.7% patients, ischemic changes were present in 23.5% of the patients, DCM on echocardiogram was detected in 37.8%. subjects, hypertension in7.2% patients, ischemic stroke in 14.3%, hemorrhagicstrokein 5.1%.Associations of grade ofliver disease with cardiomegaly, ischemic changes on ECG, DCM on echo, incidence of stroke and incidence of hypertension were shown in table 2,3,4,5,6 respectively. Cardiomegaly, ischemic changes on ECG. DCM and incidence of stroke were significantly higher among cirrhotic patients when compared with fatty liver and hepatitis patients and their association were statistically significant (p value< 0.005). There was no significant association between liver disease grade and incidence of hypertension in this study.

DISCUSSION

Consuming alcohol in moderation can be beneficial for conditions such as coronary artery diseases, heart failure, and stroke. Consuming one or two drinks, where each drink contains 17.6ml of 100% alcohol, is considered acceptable. Exceeding this quantity might have detrimental effects on the heart, potentially resulting in alcoholic cardiomyopathy.[29] Cardiomyopathy is a serious heart muscle condition with myocardial functional or electrical failure. Progressive heart failure, with high mortality, is the worst complication. In the absence of other cardiac disease conditions, long-term high alcohol consumption induces dilated cardiomyopathy. .In this study, a total of 98 patients were recruited consecutivelyfor a period of two years with mean age of 47.01±12.43 years and majority of them were males (88.8%). Other studies observed similar findings.[30-32] We observed that almost half (48%) of study subjects had cirrhosis which is in concordance with findings by Gautam MP et al 32(56% of the alcoholics had cirrhosis).

In our study, ischemic changes on ECG were present in 23.5% of the patients. Mishra SK et al,[33] conducted a cross sectional study to discuss the circulatory and cardiovascular dysfunction in cirrhosis and also examine the pathophysiologic and clinical implications found that Electro physiologically, 38.33% patients of cirrhotic liver patients had abnormal ECG in form of prolonged QTc interval. They found QTc prolongation more in severe degree of cirrhosis MELD score III (7 out of 10) 70%, than moderate (40%) MELD score II and mild (20%) MELD score I of cardiac QTc prolongation. Sharma KRD and KavyaST,[34] also found similar results, indicating that 59% of the patients exhibited aberrant ECG readings.40% of patients exhibited QT prolongation, which was correlated with the severity of liver illness. They concluded that chronic liver disease patient's QT prolongation is the most common ECG abnormality. The most prevalent echocardiographic result was diastolic dysfunction, which

exhibited a robust connection with the severity of the liver illness. Mishra proposed that diastolic dysfunction should be considered a primary criterion for diagnosing cirrhotic cardiomyopathy.

Cardiomegaly was observed in 36.7% of the participants in our study. The majority of the cardiomegaly was evidently detected by a chest x-ray. The echo may indicate the presence of dilated cardiomyopathy, which was found in 37.8% of the participants in our study. Similarly, Estruch R et al. discovered that 50% of the individuals they studied (10 out of 20 active drinkers with cirrhosis) exhibited indications of dilated cardiomyopathy (DCM). The researchers observed cirrhosis in 13 out of 30 patients with ACM, accounting for 43% of the cases. They found that actively drinking alcoholics with cirrhosis had a significantly lower average ejection fraction and shortening fraction, as well as a higher average end-diastolic diameter and left ventricular mass compared to abstaining alcoholics with cirrhosis. Alcoholics who are admitted specifically for cardiomyopathy have a greater occurrence of cirrhosis compared to alcoholics without heart disease who are not picked based on any specific criteria. Alcoholics who are actively consuming alcohol and are admitted for cirrhosis display reduced cardiac performance, but alcoholics who have stopped drinking and have liver disease generally exhibit normal cardiac function.

Table 1: Baseline characteris- tics of the study subjects.

Parameters	Results n(%), 98 (100%)
Age in years, mean (range)	47.01±12.43years
Gender: Male Female	87(88.8%) 11(11.2%)
Grades of liver disease Fatty liver Hepatitis Cirrhosis	26(26.5%) 25(25.5%) 47(48%)
Chest Xray findings Cardiomegaly normal	 36(36.7%) 62(63.3%)
ECG findings Ischemic changes Lowvoltagecomplexes Normal	 23(23.5%) 28(28.6%) 47(48)
Echo findings Dilated cardiomyopathy (DCM) Normal	 37(37.8%) 61(62.2%)
Hypertension stages Normal Prehypertension Stage1hypertension Stage2hypertension	 59(60.2%) 32(32.7%) 3(3.1%) 4(4.1%)
Types of stroke No stroke Ischemic stroke Hemorrhagic stroke	 79(80.6%) 14(14.3%) 5(5.1%)

Table 2: Association of grade of liver disease with cardiomegaly on CXR

Grade of Liver Disease	Cardiomegaly on Chest X-ray		P-value
	Present	Absent	
Fatty Liver	3(8.3%)	23 (37.1%)	
Hepatitis	3(8.3%)	22 (35.5%)	<0.05
Cirrhosis	30 (83.3%)	17 (27.4%)	

Table 3: Association of grade of liver disease with Ischemic

Grade of Liver Disease	Ischemic changes on ECG		P-value
	Present	Absent	
Fatty Liver	1(4.3%)	25 (33.3%)	<0.05
Hepatitis	3(13.0%)	22 (29.3%)	
Cirrhosis	19 (82.6%)	28 (37.3%)	

Table 4: Association of grade of liver disease with dilated cardiomyopathy on Echocardiography

Grade of Liver Disease	Dilated Cardiomyopathy on Echocardiography		P-value
	Present	Absent	
Fatty Liver	2(5.4%)	24 (39.3%)	<0.05
Hepatitis	3(8.1%)	22 (36.1%)	
Cirrhosis of Liver	32 (86.5%)	15 (24.6%)	

Table 5: Association of grade of liver disease with incidence of

Grade of liver Disease	Stroke		p-value
	Present	Absent	
Fatty Liver	1(5.3%)	25(31.6%)	<0.05
Hepatitis	2(10.5%)	23 (29.1%)	
Cirrhosis of Liver	16 (84.2%)	31 (39.2%)	

Table 6: Association of grade of liver disease with incidence of

Grade of liver Disease	Hypertension		p-value
	Present	Absent	
Fatty Liver	17 (28.8%)	9 (23.1%)	<0.635
Hepatitis	16 (27.1%)	9 (23.1%)	
Cirrhosis of Liver	26 (44.1%)	21 (53.8%)	

Research conducted by J Ren suggested that intracellular calcium cycling proteins, such as sarcoendoplasmic reticulum calcium ATPase, Na-Ca2+ exchanger, and phospho-lamban, can disrupt the management of intracellular calcium. Alcohol compounds, such as ethanol and acetaldehyde, lead to a decline in heart function, enlargement of the heart, and heart failure via elevating catecholamines and reactive oxygen species. Some proposed mechanisms include oxidative stress, the development of protein-aldehyde adducts, the accumulation of fatty acid ethyl esters, and changes of lipoprotein and apolipoprotein particles.[35,36]

Cardiomyopathy was observed to be substantially more prevalent in cirrhotic patients compared to patients with fatty liver or hepatitis. Gautam et al. found that 58% of their participants experienced DCM, a greater proportion. Our study found that 86.5% of the patients with cirrhosis had dilated cardiomyopathy, which is consistent with previous research and literature.[32,37-39] Dadhich S et al,[40] found that cirrhosis with portal hypertension is linked to elevated heart rate, ejection fraction, and mean peak systolic velocity, but mean arterial pressure is reduced. Cardiac chamber dilation primarily occurs in the left atrium. The researchers determined that there is a frequent association between the progression of hepatic dysfunction and left ventricular diastolic dysfunction, while systolic function remains intact until severe hepatic failure.

Estruch R et al,[35] along with other researchers, suggested that the high occurrence of cardiomyopathy in alcoholics with liver illness indicates a greater vulnerability to lethal arrhythmias, which likely contributes to the occurrence of sudden death in alcoholics with cirrhosis or fatty liver.[41,42] Alcoholics who actively use alcohol and have cirrhosis had a notably lower average ejection fraction and shortening fraction, along with a higher average end-diastolic diameter and left ventricular mass compared to alcoholics with cirrhosis who abstain from drinking. Their conclusion is that there is a positive link between alcoholic cardiomyopathy and cirrhosis. Alcoholics who are actively consuming alcohol and are admitted for cirrhosis exhibit reduced cardiac performance, but alcoholics who have stopped drinking and have liver disease tend to display normal

cardiac function. Therefore, based on the results of this study, we may deduce that chronic alcoholic liver disease has a substantial detrimental impact on the cardiovascular system.

CONCLUSION

Alcoholic cardiomyopathy is a form of dilated cardiomyopathy that occurs as a result of prolonged and excessive alcohol consumption, without any other identifiable causes for heart muscle degeneration. Out of the cirrhotic patients in our study, 32 (86.5%) had dilated cardiomyopathy, 19 (82.6%) had ischemic abnormalities on electrocardiogram (ECG), 30 (83.3%) had an enlarged heart (cardiomegaly), 16 (84.2%) experienced a stroke, and 26 (44.1%) had hypertension. Additionally, the results indicated a substantial increase in these findings among the cirrhotic individuals in comparison to patients with fatty liver or hepatitis. There were statistically significant connections between cirrhosis and cardiomegaly, ischemic alterations on electrocardiogram (ECG), and dilated cardiomyopathy (DCM). Based on these data, we can confirm that cardiac impairment is a subsequent outcome of liver cirrhosis and we may conclude that liver cirrhosis has a considerable unfavorable impact on the cardiovascular system. This study included a representative sample of individuals with chronic alcoholism. However, it would have been beneficial to include a larger sample size that also included moderate drinkers and non-drinkers for the purpose of making comparative findings. Therefore, conducting a prospective study with a substantial sample size is essential to provide additional explanation and enhance the validity of the findings in this study.

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