Altered levels of TC (Total Cholesterol) and TG (Triglyceride) in cirrhosis of the liver patients and their connection with severity

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Abstract

Background: The World Health Organization (WHO) describes cirrhosis as a widespread condition marked by fibrosis and the change of normal liver architecture into structurally abnormal lesions. Cirrhosis of the liver is a serious public health concern, responsible for significant morbidity and mortality globally.
Aim of the study: The goal of this study is to examine the altered levels of TC and TG in cirrhosis of the liver patients and their relationship with severity.
Methods: This was a hospital-based case control observational study that took place from January 2018 to September 2019 at the Department of Gastrointestinal, Hepatobiliary, and Pancreatic Disorders (GHPD), BIRDEM in Dhaka. A total of 90 cirrhotic patients were chosen based on inclusion and exclusion criteria and age-sex matched 90 healthy persons as control group. All data was collected, documented in a Microsoft Excel work sheet, and analyzed using descriptive statistics in SPSS 23.0.
Results: The most of cirrhotic patients were male (70%) where 30% were female. The mean age of cirrhotic patients was of 51.29±12.90 years and in control group mean age was 49.89±11.83 years. The mean value of TC and TG were 121.99±43.89 and 109.47±43.89 respectively. The mean (±SD) of TC was 156.16±33.80 mg/dl in control group, 133.09±48.66 in Child-Pugh A group, 126.29±40.59 mg/dl in Child-Pugh B group and 103.89±36.83 mg/dl in Child-Pugh C group. The mean TC between Child-Pugh A and Child-Pugh B patients was not statistically significant (p =0.550). There was no significant correlation between Child-Pugh score and TG (p=0.797). The mean TG between Child-Pugh A and Child-Pugh B patients was not statistically significant (p =0.705). The significant negative correlation (r= -0.292; p=0.005) between CP Score with total cholesterol and no significant negative correlation (r= -0.116; p=0.276) between CP Score with triglyceride.
Conclusion: Our study concluded that lipid profile parameters were decreased in cirrhotic patients, more severe the cirrhosis, there was greater fall in serum lipid profile. In our study, the mean serum level of total cholesterol was statistically significant (P<0.05) between three classes of cirrhosis. The mean total cholesterol was inversely correlated with the severity of liver damage in cirrhotic patients which was statistically significant. But there was no significant correlation between Child-Pugh score and TG. We found that the amount of decrements measured in the levels of serum total cholesterol in patients with cirrhosis was related to the progress in cirrhosis. We may measure disease severity in all cirrhotic patients using lipid profile markers.
Keywords: Total cholesterol, triglyceride, cirrhosis, liver patients.

I. INTRODUCTION

The World Health Organization (WHO) defines cirrhosis as a diffuse disease that causes fibrosis and the change of normal liver architecture into structurally aberrant lesions. Cirrhosis of the liver is a chronic liver illness characterized by liver cell degradation, fibrosis, and disorganized regenerating nodules, which lead to portal hypertension and accompanying consequences [1]. The Child-Pugh classification is used to predict survival in cirrhosis patients [2]. Lipids are a vital component for controlling cellular functioning and homeostasis. The liver is vital for lipid metabolism, lipid production, and transportation [3]. Low triglyceride and cholesterol levels are typically reported in chronic liver disorders due to diminished hepatic production capacity [4]. Severe liver disease is associated with hypolipidemia due to a reduction in synthetic function. However, most investigations conducted abroad found that all lipid fragments in cirrhotics were lower than in controls [3]. There is a large lipid derangement in cirrhosis of the liver patients, which has a negative relationship with the extent of liver damage. Cirrhosis of the liver is a significant health concern, and deaths from this condition are increasing rapidly in both men and women. Cirrhosis is a chronic liver illness characterized by diffuse loss and regeneration of hepatic parenchymal cells, as well as diffuse increase in connective tissue, resulting in disruption of the lobular architecture [5]. In lipid transport, apolipoproteins, which are produced in the liver, serve as structural components

of lipoprotein particles. Apolipoproteins facilitate the transport and uptake of cholesterol and lipids through their high affinity interactions with several cellular receptors. Apolipoproteins serve a significant role in lipoprotein metabolism, with the liver serving as the primary location for lipoprotein synthesis and clearance. Cirrhosis is more common in those in their mid-thirties (35-45). It is distinguished by the replacement of liver tissue by fibrosis (scar tissue) and regenerative nodules (lumps formed as a result of attempted repair of damaged tissue), with areas of regeneration developing frequently. The remaining cells multiply in an attempt to regenerate, forming "islands" of living cells divided by scar tissue. These living cell islands have a restricted blood supply, which impairs liver function [6]. Lipoproteins help with the absorption of dietary cholesterol, long chain fatty acids, and fat-soluble vitamins. Lipoproteins carry triglycerides, cholesterol, and fat-soluble vitamins from the liver to peripheral tissue, as well as cholesterol from peripheral tissue to the liver, and the liver is involved in many aspects of lipid metabolism and transport. Several investigations have revealed that chronic liver illness disrupts liver tissue and, as a result, deranges lipid metabolism. All lipid profile measures were lower in the severe form of liver disease, regardless of etiology. Furthermore, the degree of reduction in serum TC and TG was negatively correlated with the severity of liver disease. This revealed that lipid characteristics correlated inversely with illness severity [7]. The goal of this study is to examine the altered levels of TC and TG in cirrhosis of the liver patients and their relationship with severity.

II. METHODOLOGY

This was a hospital-based case control observational study that took place from January 2018 to September 2019 at the Department of Gastrointestinal, Hepatobiliary, and Pancreatic Disorders (GHPD), BIRDEM in Dhaka. A total of 90 cirrhotic patients were chosen based on inclusion and exclusion criteria and age-sex matched 90 healthy persons as control group. All data was collected, documented in a Microsoft Excel work sheet, and analyzed using descriptive statistics in SPSS 23.0.

Inclusion criteria
The inclusion criteria were intended to select group of patients with
1.   All patients of cirrhosis of liver were included on the basis of clinical, laboratory, radiological and endoscopic intervention methods in GHPD Department of BIRDEM General Hospital
2.   Age ≥ 18 years

Exclusion criteria
The following types of patients were excluded from this study:
1.   Diabetes mellitus
2.   Hypertension
3.   Obesity
4.   Acute pancreatitis
5.   Patients with HCC
6.   Patients with ESRD
7.   Patients on lipid lowering drugs
8.   Patient unwilling to give voluntary consent to participate in the study

III. RESULT

Table-1 depicts that most of cirrhotic patients were male (70%) where 30% were female. The mean age of cirrhotic patients was of 51.29±12.90 years and in control group mean age was 49.89±11.83 years. The mean value of TC and TG were 121.99±43.89 and 109.47±43.89 respectively. This value of lipid profile was less than control group and statistically significant (Table-2). Table-3 shows that the mean (±SD) of TC was 156.16±33.80 mg/dl in control group, 133.09±48.66 in Child-Pugh A group, 126.29±40.59 mg/dl in Child-Pugh B group and 103.89±36.83 mg/dl in Child-Pugh C group. Serum total cholesterol was reduced in cirrhotic patients other than control group. Table-4 demonstrates that the mean TC between Child-Pugh A and Child-Pugh B patients was not statistically significant (p =0.550). There was no significant correlation between Child-Pugh score and TG (p=0.797) (Table-5). The mean TG between Child-Pugh A and Child-Pugh B patients was not statistically significant (p =0.705) (Table-6). Table-7 shows the significant negative correlation (r= -0.292; p=0.005) between CP Score with total cholesterol and no significant negative correlation (r= -0.116; p=0.276) between CP Score with triglyceride. Figure-1 shows that the etiology of cirrhosis of these patients were different with leading cause of cirrhosis were HBV (38.89%) followed by HCV (6.67%) and remaining 54.44% were unknown (Non B Non C).

Table-1: Baseline characteristics of the study subjects (N=180)

Study subjects		
Sex	**Case** **n (%)**	**Control** **n (%)**
Male Female	63 (70%) 27 (30%)	56 (62.22%) 34(37.77%)
Age in years (mean±SD)	51.29±12.90	49.89±11.83
BMI(kg/m²) (mean±SD)	23.44± 11.84	22.08±1.56
Total	90	90

Table -2: Comparison of means of serum lipid profile of study group and control group

Lipid profile	Study Group	Control group
TC (mg/dl)	121.99±43.89	156.16±33.58
TG (mg/dl)	109.47±43.89	140.94±39.80

Table-3: Distribution of the study patients according to Total cholesterol (N=180)

Child Pugh Classes	TC (mg/dl) Mean±SD	n	P value
Child Pugh A	133.09±48.66	29	
Child Pugh B	126.29±40.59	30	0.029
Child Pugh C	103.89±36.83	31	
Control group	156.16±33.80	90	

Table -4: Multiple Comparison studies of Total cholesterol between Child-Pugh classes

Groups	Mean Difference	P value
Control Vs Child A	23.07	<0.001
Control Vs Child B	29.87	<0.001
Control Vs Child C	52.27	<0.001
Child A Vs Child B	6.80	0.550
Child B Vs Child C	22.40	<0.001
Child A Vs Child C	29.20	<0.013

**Table -5:** Distribution of the study patients according to triglyceride (N=180)

Child Pugh Classes	TG (mg/dl) Mean±SD	n	P value
Child A	112.78±41.87	29	
Child B	109.00±36.84	30	0.797
Child C	106.07±35.37	31	
Control group	140.94±39.80	90	

Table-6: Multiple Comparison studies of triglyceride between Child-Pugh classes

Groups	Mean Difference	P value
Control Vs Child A	28.16	<0.001
Control Vs Child B	31.94	<0.001
Control Vs Child C	34.87	<0.001
Child A Vs Child B	3.78	0.705
Child B Vs Child C	2.93	0.759
Child A Vs Child C	6.71	0.513

Table-7: Correlation of Child- Pugh Score with serum lipid profile (N=90)

Lipid profile	Pearson's correlation	
	r-value	p-value
TC	-0.292	0.005
TG	-0.116	0.276
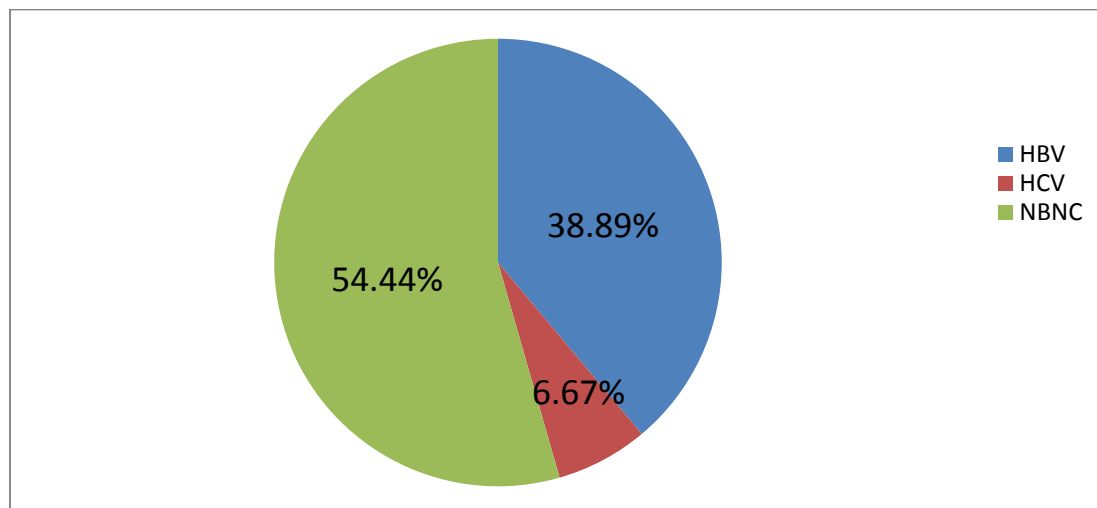
Figure-1: Pie diagram showing the causes of cirrhosis of patients

IV. DISCUSSION

Cirrhosis is the last phase of any chronic liver disease. In severe liver disease like cirrhosis, lipid metabolism is profoundly disturbed. Therefore, it is reasonable to expect an abnormal serum lipid profile in those with severe liver dysfunction. The severity of liver damage is usually assessed by Child-Pugh score. In this study, serum lipid profile was evaluated whether it correlated with increasing severity of liver damage in 90 cirrhotic patients. Serum lipid profile was also measured in 90 normal healthy persons. These patients attended at out-patient and in-patient department of GHPD, BIRDEM General Hospital. Etiology of cirrhosis of these patients were different with leading cause of cirrhosis were HBV (38.89%) followed by HCV (6.67%) and remaining 54.44% were unknown (Non B Non C). Our study showed that most of cirrhotic patients were male (70%) where 30% were female. The ratio of male and female patient was 2.3:1 supported by male predominance (4.6:1) in Bangladesh [8]. Male predominance was seen in other study [7]. The mean age of cirrhotic patients was of 51.29±12.90 years and in control group mean age was 49.89±11.83 years which was similar to the result found in other studies. Satish et al. (2018) found that the average age of the patients was 50.5 years [9]. Similar result was found in other studies [7, 10], so ranges of mean age of all these studies are similar with our study. In this study, the mean TC and TG were statistically significant between four groups of study patient in ANOVA test. In all cases there were declining pattern of each component of serum lipid profile with increasing severity of liver damage in cirrhosis of liver. Results of our study were similar to the result found in other studies. Ghadhir et al. (2010) found that mean value of TC and TG were 147.54 mg/dl and 105.99 mg/dl respectively [3]. This value of lipid profile was less than control group and statistically significant (P value <0.05). This results were in accordance to our study. In our study the mean (±SD) of TC was 156.16±33.80 mg/dl in control group, 133.09±48.66 in Child-Pugh A group, 126.29±40.59 mg/dl in Child-Pugh B group and 103.89±36.83 mg/dl in Child-Pugh C group. Serum total cholesterol was reduced in cirrhotic patients other than control group. Jatav et al. (2018) found that the mean TC was (135.33±37.04) and TG (88.1±37.92) were statistically significant between four groups of study patient in ANOVA test [11]. In all cases there were declining pattern of each component of serum lipid profile with increasing severity of liver damage in cirrhosis of liver. The fasting serum TC was inversely correlated with severity of the liver damage in cirrhotic patients which was statistically significant. But there was no significant correlation between Child-Pugh score and TG. The findings of our study were similar to the studies [3, 10]. In multiple comparison test, the mean TC between Child-Pugh A and Child-Pugh B patients was not statistically significant. Similarly the mean TG was not statistically significant between Child-Pugh A and Child-Pugh B patients in multiple comparison tests. This was probably due to narrow difference range of score between Child-Pugh A and Child-Pugh B of the study patients. Vijay et al. (2015) found that serum Total cholesterol was significantly decreased with advancement of liver disease (Child A to C) and tukey's test showed a statistically significant mean difference within the groups (Child A-B, A-C and B-C groups) [12]. Serum triglyceride level was decreased with advancement of liver disease but it was not statistically significant. Results

of this study were unanimous with our findings. In our study Pearson Correlation coefficient(r) with score was done and showed negative correlation of child-pugh score with the severity of liver disease and indicated an inverse correlation of lipid parameters with the severity of the disease. Similarly Muhammed et al. (2017) noticed that the amount of decrement in the serum TC and TG had a negative correlation with the severity of liver disease and indicated an inverse correlation of lipid parameters with the severity of the disease [7]. This results were in accordance to our study.

Limitation of the study:
The study featured a single focus point and minimal sample sizes. As a result, the study's conclusions may not completely reflect the entire situation.

V. CONCLUSION & RECOMMENDATION

Hypolipidaemia is common in cirrhosis of liver patients. Our study concluded that lipid profile parameters were decreased in cirrhotic patients, more severe the cirrhosis, there was greater fall in serum lipid profile. In our study, the mean serum level of total cholesterol was statistically significant (P<0.05) between three classes of cirrhosis. The mean total cholesterol was inversely correlated with the severity of liver damage in cirrhotic patients which was statistically significant. But there was no significant correlation between Child-Pugh score and TG. We discovered that the amount of decline in serum total cholesterol levels in cirrhosis patients was associated to the progression of the disease. We may measure disease severity in all cirrhotic patients using lipid profile markers. Serum lipid levels may be an important indicator to reflect the severity of liver disease. Further research is needed to determine the predictive utility of assessing lipid profiles as a means of estimating the extent of liver damage in cirrhotic patients.

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