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RESEARCH ARTICLE

LIPID PROFILE CHANGES IN EGYPTIAN PATIENTS WITH LIVER CIRRHOSIS

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ABSTRACT

Background: Lipid changes are common in cirrhotic patients due to the important role of liver in their synthesis and transport.
Objective: To test lipid profile changes in Egyptian cirrhotic patients and to examine the effect of liver disease severity on these changes.
Methods: Hundred twenty two cirrhotic patients (>18 years) recruited from liver cirrhosis clinic at the National Liver Institute, University of Menoufyia from 2015 to 2017 were reviewed to identify their lipid profile changes.
Results: Median age was 56 years (40 – 75 years) and 63% were men. The primary cause of liver disease was hepatitis C (HCV) 86.1%. All tested lipid profile variables, except triglycerides, showed a highly significant negative correlation with the liver dysfunction tested by MELD and MELD-Na scores (All values were $p < 0.0001$). After grouping patients in four groups according to their MELD score, we founded that the more hepatic dysfunction was associated with more declines in total cholesterol (the four groups means were 161, 139.7, 130.5 and 103.4; $p < 0.0001$), in HDL (52.5, 51, 44.9 and 29.3; $p < 0.0001$) and in LDL (100.5, 81.2, 76.5 and 66.9; $p = 0.004$).
Conclusion: Serum total cholesterol, HDL and LDL decrease with liver cirrhosis and their degree of decrease increases with the advancement of liver disease.

INTRODUCTION

Lipids are essential for our bodies; triglycerides (TGs) are main source of energy while cholesterol is an important component of our cell membranes beside its importance in synthesis of hormones and bile acids. The liver is crucial for lipids metabolism and changes in their plasma levels are expected if dysfunction occurred. Lipids are water insoluble so are packed and transported via lipoproteins. Low and high density lipoproteins (LDL and HDL) are the two cholesterol forms of clinical importance. Scarce data are available about Egyptian patients, although liver disease prevalence is high. In a recent national Egyptian Health Issue Survey conducted in 2015, the prevalence of hepatitis C antibody was 10% in the 15-59- year age group.(Kandeel *et al*., 2017) Our study will test the lipid profile changes in patients diagnosed with cirrhosis and if the severity of liver disease affects these changes.

METHODS

Our retrospective study was performed over adult cirrhotic patients (≥ 18 years) recruited from liver cirrhosis clinic at the National Liver Institute, University of Menoufyia from 2015 to 2017. This study was approved by the Medical Ethics Committee of the National Liver Institute, University of Menoufyia. After exclusion of patients with incomplete laboratory results, malignancy, diabetes mellitus, previous history of hyperlipidemia, cholestatic liver diseases and renal impairment, we had 122 patients to be enrolled in the study. Available anthropometric measurements as height and weight were recorded while BMI were calculated as bodyweight in kilograms divided by height in meters squared, as indicated by the World Health Organization (Physical status, 1995). Liver dysfunction evaluation was done by available data of clinical features examinations, laboratory tests, and imaging tests i.e. ultrasound. Lipid samples, as a routine measure in NLI, were usually withdrawn after fasting twelve hours to avoid the direct effect of dietary lipid intake.

Liver disease severity scoring systems were calculated, where

a) Model for End-stage Liver Disease, MELD, was calculated using the following equation (Kamath *et al*., 2001):

(0.957 ln(creatinine) + 0.378 ln(bilirubin) + 1.120 ln(international normalized ratio of prothrombin) + 0.643) X 10.

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We used one as the minimum acceptable value to prevent the occurrence of scores below 0, no special precaution was needed for creatinine values as patients with renal impairment were excluded from this study. Scores results were rounded and reported as whole numbers.

b) MELD-Na, incorporating serum sodium to MELD score, calculated using the formula(Biggins *et al*., 2006):

MELD + 1.59 (135 - serum sodium)

The minimum value for serum sodium was 120 mEq/L and the maximum was 135 mEq/L.

Statistical Analysis

Values are expressed as means plus or minus standard deviation. As appropriate, lipid profile values were tested against categorical variables using the Anova test. While the correlation Pearon's test, was used to test these values against the rest continuously-distributed variables. A p value of less than 0.05 was regarded as statistically significant.

RESULTS

One hundred twenty two Egyptian cirrhotic patients were included in our study. Median age was 56 years (40 – 75 years) and 63% were men. The primary cause of liver disease was hepatitis C (HCV) 86.1% (n = 105), hepatitis B 5.7% (n = 7) and cryptogenic cause 8.2% (n = 10). Table 1 shows the characteristics of patients. Our results showed that only triglycerides showed a positive correlation with BMI (p = 0.04).

Lipid profile variables failed to show a significant correlation with age or sex. All tested lipid profile variables, except triglycerides, showed a highly significant negative correlation with the liver dysfunction tested by MELD and MELD-Na scores. The more hepatic dysfunction was associated with more declines in total cholesterol, LDL and HDL values. Table 2 showed the negative correlation between lipid profile and liver function scoring system. Patients were classified according to MELD score into four groups for statistical reasons. Twenty nine patients were less than 11, fifty one between 11 and 18, twenty one between 19 and 24 and lastly twenty one patients had scores above 24. Table 3 showed again a highly significant negative correlation between lipid profile variables, except triglycerides, and the groups of MELD score.

DISCUSSION

Lipids are essential for cell function and homeostasis, and as liver plays an important role in their synthesis and transport, it is necessary to understand their changes when liver dysfunction is present. Previous studies showed significant decrease in different lipid variables in cirrhotic patients compared to normal people (Siagris *et al*., 2006; Selimoglu, 2002; Miyazaki *et al*., 2011; Ghadir *et al*., 2010), but no or scarce data are available about their changes in Egyptian cirrhotic patients where hepatitis C is the leading cause of liver disease. In our study we aimed to test the different lipid profile variables (total cholesterol, LDL, HDL and triglycerides) in cirrhotic patients against simple body measurements as (weight, height and BMI), different liver function tests and liver dysfunction scoring systems (MELD and MELD-Na).

Table 1. Patients' Characteristics

	Mean	SD		Mean	SD
Height	169 cm	11.7	Bilirubin	6.2 mg/dL	9.4
Weight	75 Kg	19.6	Creatinine	1.15 mg/dL	0.73
BMI	25.9	6.2	INR	1.42	0.4
TGs	93.8 mg/dL	65.5	Na	136.7 mEq/L	5.1
HDL	46.3 mg/dL	19.7	ALT	64.4	53.5
LDL	82.2 mg/dL	34.7	MELD	14.8	8.1
Cholesterol (total)	137.5 mg/dL	44	MELD-Na	16.9	8

SD: Standard Deviation, BMI: Body Mass Index, TGs: Triglycerides, HDL: High Density Lipoprotein, LDL: Low Density Lipoprotein, INR: International Normalized Ratio, Na: Serum Sodium, ALT: Alanine transaminase, MELD: Model for End-stage Liver Disease

Table 2. Lipid profile in relation to liver dysfunction scoring systems

	Cholesterol (total)	HDL	LDL	TGs
MELD	P < 0.0001	P < 0.0001	P < 0.0001	P > 0.05
MELD-Na	P < 0.0001	P < 0.0001	P < 0.0001	P > 0.05

Table 3. Lipid profile in relation to MELD score groups; data presented as mean +/- SD and variables measuring units are mg/dL

MELD	Cholesterol (total)	HDL	LDL	TGs
Less than 11 (n=29)	161+/-35.1	52.5 +/- 22.8	100.5 +/- 30.5	105.3 +/- 64..6
Between 11-18 (n=51)	139.7+/-40.5	51 +/- 14.7	81.2 +/- 34	84.9 +/- 65.5
Between 19-24 (n=21)	130.5+/-41.3	44.9 +/- 20.8	76.5 +/- 32.5	92 +/- 56.6
More than 24 (n=21)	103.4+/-46	29.3 +/- 15.8	66.9 +/- 35	98.2 +/- 76.1
P value	< 0.0001	< 0.0001	0.004	> 0.05

We also aimed to test lipid changes against different stages of liver cirrhosis and dysfunction. Our study showed that, regarding the association of BMI with lipids profile, there was only a significant correlation with triglycerides, while there was no correlation with LDL, HDL or total cholesterol, this is in agreement with previous studies (Aziz *et al*., 2003; Shamai, 2011), but our result needs further assessment as we couldn't calculate the dry BMI from the available files' data. Our main finding is that, all the tested lipid profile variables, except triglycerides, showed highly negative correlation with liver dysfunction scoring systems, as these variables decrease significantly with the more advancement of liver disease.

Our results go with Ghadir *et al*. (2010), who showed the negative correlation of lipid variables: total cholesterol, LDL, HDL with liver cirrhosis severity, but they also showed that TGs doesn't show significant decrease in advanced stages of liver cirrhosis. In our study, we tested the original MELD and its modified form (MELD-Na) and both showed the same result, TGs showed decreasing levels with the advancement of liver disease, yet their values, on the contrary to cholesterols, didn't show significant decrease.

This could be explained by the fact that cholesterol is mainly formed by the liver cells but TGs have, beside its hepatocytes formation route, an important exogenous route. Triglycerides form most of the dietary lipids (>95%), which are secreted in blood as chylomicrons. Plasma TGs test measures chylomicrons, VLDL and their remnants, so TGs level decrease with cirrhosis but doesn't correlate significantly to the liver disease severity. Due to the high correlation relationship between cholesterols and liver disease severity, we recommend their evaluation in large studies to test if it is possible include them in a new liver disease scoring system.

Conclusion

Liver cirrhosis is associated with decrease in lipid profile variables but only total cholesterol, LDL and HDL showed a highly significant inversely proportional relation to the degree of liver disease severity. These parameters could be used in further studies for evaluation of liver function deterioration.

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