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Study of Effect of Hepatitis C Virus on some Liver Function

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Abstract

Back ground: Hepatitis C virus (HCV) is a Hepacivirus of the Flaviviridae family, generally concerned with hepatic disorders, including chronic hepatitis that may develop to cirrhosis and hepatocellular carcinoma.

Aim: The aim of this study was detected of changes on some liver function in patients with hepatitis c virus.

Method: The current study is carried out in the health institutes of Al-Muthanna province, including (Al-Hussein Teaching Hospital- Al-Amal Center for renal dialysis, Teaching hospital for gyniatrics and pediatrics-Thalassemia Unit, Al-Rumaitha General Hospital, Al-Khader General Hospital, Main Blood bank and Public Health Laboratory).The study included (100) patients with hepatitis c virus and (100) control. The patients and control divided to three groups according to age. The ages were between (10-42) years old (6) ml were drawn from each patients and control. The blood samples allowed to coagulate at room temperature for (15-20) minutes then centrifuged at 3000 rpm for 10 min for separation of serum for estimation of the liver enzymes.

Results: The results for this study indicate a significant decrease at ($P<0.05$) in albumin level of patients comparing with control in all age groups, also the results showed a significant increase at ($P<0.05$) in Serum Total Bilirubin (STB), Glutamate Pyruvate Transaminase (GPT), Glutamate Oxaloacetate Transaminase (GOT) and Alkaline Phosphatase (ALP) levels of patients comparing with control in all age groups.

Keywords: Hepatitis c virus; Albumin; Bilirubin; GPT; GOT; ALP

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Introduction

Hepatitis C Virus (HCV) infection is a global public health problem, Hepatitis C a serious viral disease that effects on the liver [1]. According to the International Committee on Taxonomy of Viruses (ICTV) at 2011, HCV was classified under Flaviviridae family; has linear, single stranded, positive sense (positive polarity) RNA genome, approximately 9400 bases in length; this single and large open reading frame (ORF) encodes a polyprotein of more than 3000 of amino acids that represent 98% of all the nucleotides of the viral genome [2]. Infection with HCV causes acute infection that is usually asymptomatic and chronic hepatitis C (CHC) infection [3]. The symptoms of acute hepatitis C infection include decreased appetite, fatigue, abdominal pain, jaundice, itching and flu-like symptoms [4], Chronic HCV infection leads to cirrhosis in about 10 to 20 percent of patients, increasing the risk of complications of chronic liver disease, including portal hypertension, hemorrhage and hepatocellular carcinoma [5]. Unlike the developed countries, where the mode of HCV transmission is mainly through intravenous drug users (IDUs) [6]. In most developing countries, transmission of HCV occurs through exposure to infected blood and blood products at various healthcare facilities and localities. Such contamination usually occurs through unsafe injection, blood transfusions, organ transplants and sometimes vertical transmission through mother to child or the sharing needles among (IDUs) [7,8]. The diagnosis of hepatitis C is based on the detection of both anti-HCV antibodies and HCV RNA in the presence of biological or histological signs of chronic hepatitis [9]. Successful response to treatment against HCV infection seems to depend on several factors, involving both, the virus and the host [10].

Materials and Methods

Subjects and study location

This study included 200 samples (100 patients and 100 controls, ages were ranged (10-41) years old. The current study is carried out in the health institutes of Al-Muthanna province, including (Al-Hussein Teaching Hospital- Al-Amal Center for renal dialysis, Teaching hospital for gyniatrics and pediatrics -Thalassemia Unit, Al-Rumaitha General Hospital, Al-Khader General Hospital, Main Blood bank and Public Health Laboratory).

Blood Samples

Venous blood (6) ml was drawn from each patients and control. The blood samples allowed to coagulate at room temperature for 15-20 min then centrifuged at 3000 rpm for 10 min for separation of serum for estimation of the liver parameters.

Assessment of liver functions

Assessment of Albumin

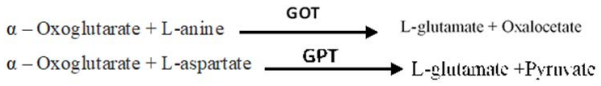
Biolyzer was used to determine albumin of patients and controls. The principle of apparatus as fallowing: micro tubes contain 1 ml of serum that put in the wells of apparatus then closed the cover and engine it. Serum albumin in the presence of brome cresol green at a slightly acid H produces color change of the indicator iron yellow-green to green blue. The intensity of color formed is proportional to the albumin concentration in sample, reference value in serum according to [11].

Assessment of bilirubin

The total serum bilirubin concentration was calculated by bilirubin meter after it was calibrated using a capillary tube containing distilled water. The serum samples were placed in similar capillary tubes and measured in mg /dl [12].

Assessment of GPT and GOT

GPT and GOT were determined enzymatic ally according to the method described by [13], as shown in the following reaction respectably.

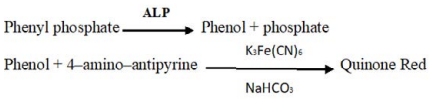


Calculation of Results

It has been calibrated spectrophotometer using a blank tube to be equal to zero absorbance, either absorbency sample tube recorded and compared with special tables for absorbance to determine the effectiveness of the enzyme in the sample.

Assessment of ALP

ALP was determined enzymatic ally according to the method described by [14], as shown in the following reaction:



Calculation of results

Spectrometer is calibrated by blank tube. After that, record the absorption of standard tube then the absorption of serum blank tube and serum sample tube, in the end, the ratio of ALP was obtained according to the following equation:

$$\text{ALP (U/dl)} = \frac{\text{Sample absorbance} - \text{blank absorbance}}{\text{Standard absorbance}} \times 142$$

Statistical analysis

This study designed by Completely randomized design (CRD) that used in the analysis of variance for data by using one way ANOVA test, independent *t*-test and treatment means were compared using the least significant difference (LSD) at (P<0.05)level of significance. Data were processed and analyzed by using statistical program social science (SPSS 20) and the results were expressed as Mean ± SD [15].

Results

The results of this study showed Albumin(0.973 ± 0.574)for patients and (5.124 ± 0.167) for control, Bilirubin(3.92 ± 0.45) in patients and (0.79 ± 0.16) in control, GPT(77.5 ±3.8) in patients and (8.4 ± 5.1) in control, GOT (75.3 ± 2.3) in patients and (17.1 ± 4.3) in control, ALP(83.02 ± 5.2)in patients and (28.12 ± 3.5) in control these results of age group (10-20) years old, while the results of age group(21-31)years old are Albumin (0.545 ± 0.029)for patients and (4.951 ± 0.095) for control, Bilirubin (4.32 ± 0.22) in patients and (0.64 ± 0.05) in control, GPT(66.8 ± 7.1) in patients and (27.2 ± 2.7) in control, GOT (86.7 ± 6.2) in patients and (22.5 ± 1.8) in control, ALP(69.05 ± 1.3) in patients and (40.31 ± 1.6) in control ,the results of age group (32-42) years old are Albumin (2.143 ± 0.478)for patients and (6.001 ± 0.084) for control, Bilirubin (2.77 ± 0.11) in patients and (0.51 ± 0.02) in control, GPT(19.8 ± 7.2) in patients and (98.2 ± 5.1) in control, GOT (92.3 ± 2.5) in patients and (12.4 ± 3.3) in control, ALP(90.51 ± 6.1) in patients and (32.43 ± 2.8)in control, table 1.

Discussion

Hepatitis C virus (HCV) is a major cause of chronic liver disease, frequently progressing to cirrhosis and increase drisk of hepatocellular carcinoma [16]. Albumin produced only by the liver, is the major protein that circulates in the blood. Albumin consists of 585 amino acids, has a molecular weight of approximately 69 kDa and it is the most abundant plasma protein, although 60% of the total albumin pool is in the interstitial space [17]. Albumin is essential for maintaining the entotic pressure in the vascular system. A decrease in oncotic pressure due to a low albumin level allows fluid to leak from the interstitial spaces into the peritoneal cavity, producing ascites. Albumin is also very important in the transportation of various molecules; including bilirubin, free fatty acids, drugs, and hormones. Serum albumin is an abundant multifunctional non-glycosylated, negatively charged plasma protein, with ascribed ligand-binding and transport properties, antioxidant functions, and enzymatic activities [18]. Low serum albumin concentration indicates poor liver function. The most common reason for a low albumin is chronic liver failure caused by cirrhosis. In advanced liver disease. The albumin level is clinically important as a predictive factor for patients with liver cirrhosis, because decreased serum albumin levels cause ascites and edema. Recent studies have demonstrated the efficacy of branched-chain amino acid (BCAA) supplementation in improving hyopoalbuminemia in cirrhotic patients [19].the study conduct by [20] investigated the correlation between albumin levels and the fat-free mass in patients. They showed that exercise and protein rich nutrition at the early stage of liver cirrhosis may be advisable for maintaining or increasing muscular volume. The study conduct by [21] reported that if cirrhotic patients were in the

Table 1: The change in Liver parameters of patients group as compared with control group.

Age (year)	Albumin mg/dl (Mean ± SD)		Bilirubin mg/dL (Mean ± SD)		GPT U /L (Mean ± SD)		GOT U /L (Mean ± SD)		ALPU/L (Mean ± SD)	
	Patients	Control	Patients	Control	Patients	Control	Patients	Control	Patients	Control
10-20	0.973* ± 0.574	5.124±0.167	3.92* ± 0.45	0.79 ± 0.16	77.5* ± 3.8	8.4 ± 5.1	75.3* ± 2.3	17.1 ± 4.3	83.0 2* ± 5.2	28.12 ± 3.5
21-31	0.545* ± 0.029	4.951 ± 0.095	4.32* ± 0.22	0.64 ± 0.05	66.8* ± 7.1	27.2 ± 2.7	86.7 * ± 6.2	22.5 ± 1.8	69.05* ± 1.3	40.31 ± 1.6
32-42	2.143 *± 0.478	6.001 ± 0.084	2.77* ± 0.11	0.51 ± 0.02	19.8* ± 7. 2	98. 2 ± 5.1	92.3* ± 2.5	12.4 ± 3.3	90.51* ± 6.1	32.43 ± 2.8

Where: *represent a significant difference between patients group as compared with control group.

compensated stage at the entry but with lower BCAA tyrosine ratio (BTR). The results showed a significant increase in Bilirubin, GPT, GOT and ALP patients when compared to control group, the reason for the rise in the amino transferase that the enzymes are found in the liver cells, and when the liver cells are affected by viruses, it will lead to the destruction of the liver cells, the exit of these enzymes, and their increased concentration in the bloodstream [22]. When parenchyma liver cells are damaged, amino transferase leak from the liver into the blood, resulting in elevated levels of these enzymes in the bloodstream. The exact definition of the normal levels of serum ALT activity is crucial for screening and follow-up studies in hepatitis C infection [23]. Levels of amino transferase (GPT) in the blood indicate the degree to which liver membrane injury has resulted in an increased release of hepatocellular enzyme into the bloodstream, because GPT is more specific than GOT for liver injury, GPT is used more often, in patients with risk factors for HCV infection and in whom there is no another explanation for increased enzyme levels, elevated aminotransferase levels are highly associated with HCV infection [24]. The study conduct by [25] showed a significant increase in the level of GPT and GOT enzyme in patients with hepatitis C and B virus. Bilirubin is the catabolic product of hemoglobin produced within theoretical endothelial system, released in unconjugated form which enters into the liver and converted to conjugated forms [26]. Bilirubin is removed from the blood by the liver. When the liver is not working well, bilirubin levels can rise. This test is a true liver function test, and higher levels suggest the liver is not working well. Signs of higher levels of bilirubin include yellowing of the skin and whites of the eyes (called jaundice). Moreover, backward leakage or decreased excretion of the pigment results in elevation of the serum total bilirubin level in patients suffering from chronic viral hepatitis, hyper bilirubinemia in acute viral hepatitis is directly proportional to the degree of histological injury of hepatocytes and the longer course of the disease [27]. The study conduct by [28] shown that a high serum total bilirubin level may protect neurologic damage due to stroke. ALP is present in mucosal epithelia of small intestine proximal convoluted tubule of kidney, bone, liver and placenta; it performs lipid transportation in the intestine and calcification in bone. The serum ALP activity is mainly from the liver, The reason for the high level of the enzyme is that the enzyme is present in the liver and when jaundice occurs in the case of viral hepatitis leads to a blockage of bile ducts inside the liver, which leads to an increase in the concentration of this enzyme in the blood stream [22]. This result corresponds with the study conduct by [29], which recorded a very significant increase in ALP concentration in patients with hepatitis C and B virus.

Conclusion

We conclude from this study that there are a serious effect of Hepatitis C Virus on liver enzymes and therefore lead to an imbalance in the liver function, especially metabolic function.

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