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Assessment of Some Biochemical Parameters in a Sample of Patients with Chronic Hepatitis C virus in Iraq

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Abstract

Background: Hepatitis C viral (HCV) infection is a medical condition marked by liver inflammation that represents a significant global public health problem and often causes fibrosis/cirrhosis and hepatocellular carcinoma.

Objective: This study aims to evaluate the changes in some biochemical parameters in chronic viral hepatitis c patients in Iraq. Among the biochemical parameters used to measure liver function were total Bilirubin (TBL), direct Bilirubin (DBL), indirect Bilirubin (IBL), alkaline phosphatase (ALP), Glutamic Oxaloacetic Transaminase (GOT), and glutamic-pyruvic transaminase(GPT). The lipid profile also included low-density lipoprotein, TG, and cholesterol.

Methods: 150 blood specimens were collected, 100 individuals were infected with viral hepatitis C, and 50 were used as healthy controls at the Baghdad Gastroenterology and Hepatology Teaching Hospital Ministry of Health. The data collection took place between December 2023 and April 2024.

GOT, GPT, ALP, total bilirubin, indirect and direct bilirubin, cholesterol, triglyceride, and low-density lipoprotein were evaluated by mindray BA-88A.

Results: The study showed a slightly higher male patient frequency (52%) than females (48%) with no statistically significant difference ($p = 0.86$), indicating that the disease may influence both males and females but with a tendency to males. The patient exhibited a significant elevation p-value of less than 0.001 in serum levels of GOT, GPT, ALP, Total bilirubin, direct bilirubin, indirect bilirubin, and Total cholesterol (46.75 ± 12.81, 58.17 ± 12.06, 599.11 ± 149.64, 1.46 ± 0.25, 0.6 ± 0.14, 0.86 ± 0.16, 151.39 ± 36.155) respectively versus the control group. However, the two groups had no statistical variation in serum triglyceride and LDL levels ($p > 0.05$).

Conclusions: The current study shows that individuals with HCV infection have higher levels of serum GOT (AST), GPT (ALT), ALP, Total bilirubin, direct Bilirubin, indirect Bilirubin, and Total cholesterol (TC) compared to the healthy control.

Keywords: Chronic hepatitis c, Biochemical parameter, Liver function test, Lipid profile

1. Introduction

Chronic hepatitis C is the term used to describe liver inflammation caused by infection with hepatitis C virus more than six months (Razavi, 2020). About 58 million individuals worldwide have long-term infections with the Hepatitis C virus (HCV). Typically, exposure to HCV results in persistent, lifelong infections. The rate of chronification is 55%–85% (Matthaei *et al.*, 2024). According to the World Health Organization (WHO), hepatitis B (HBV) and hepatitis (HCV) infections affect approximately 250 million people around the world, making them severe global health concerns (Ibrahim *et al.*, 2023). Due to HCV's asymptomatic nature, the majority of infected individuals are ignorant of their disease (Khudhair *et al.*, 2020). Chronic liver disease, cirrhosis, and hepatocellular carcinoma (HCC) are all highly likely to develop in individuals with HCV infection. HCV is responsible for approximately 27% of cirrhosis and about 25%

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of cases of HCC globally (Mohamed *et al.*, 2015). The primary methods of transmitting HCV infection were through transfusion of contaminated blood and blood products. Additional risk factors for acquiring HCV infection have been identified, such as acupuncture, tattooing, body piercing, specific cosmetic procedures, sharing of shaving razors, as well as needle-stick injuries among healthcare workers (Coppola *et al.*, 2016). Numerous factors can lead to liver inflammation, including toxic, metabolic, viral, pharmacological, or immune-mediated attacks on the liver (Razavi, 2020). Although the exact mechanisms causing liver injury are constantly changing, it is generally acknowledged that immune system-mediated responses and viral cytopathic effects play a role in the pathogenesis (Rios *et al.*, 2021). For the body to function normally, the liver is essential for digestion, making proteins and enzymes, eliminating toxins, and storing vitamins and minerals (Ali *et al.*, 2023). Hepatitis C was initially discovered in 1989 through molecular biology techniques, following a thorough examination of serum taken from animals intentionally infected for experimental purposes (Raham *et al.*, 2011). In the first year, about one-third of infections resolve independently; the others continue and progress into chronic hepatitis. A CHC infection may develop into advanced liver disease (Chaudhari *et al.*, 2021). Reviewing liver function tests usually include total Bilirubin, conjugated (direct) Bilirubin, unconjugated (indirect) Bilirubin, and lactate dehydrogenase, as well as liver enzymes (ALT, AST, ALP, GGT). These tests can assist in identifying the precise site of a liver lesion, and the elevation trend can aid in determining a differential diagnosis (Kalas *et al.*, 2021). With the loss of functional liver mass, liver function may be compromised, most like most likely as a result of both persistent hepatic inflammation and structural changes to the liver (Laursen *et al.*, 2020). HCV does not only damage the liver but also develops significant complications such as osteoporosis, problems with the kidneys, heart disease, and hematologic tumors. (Bugianesi *et al.*, 2012). The aim of this study was to examine the change in serum levels of ALT, AST,ALP, TBL, DBL, IBL in CHC patients as well as comparing the results with healthy individuals.

2. Materials and methods

2.1. Study design

Case-control study: This study included 150 participants aged 3 to 78 years. The participants were categorized into two cohorts: 100 individuals with chronic hepatitis C (52 men and 48 women). Additionally, 50 individuals (25 men and 25 women) served as the healthy category. The participant data encompassed various factors, including age, socioeconomic status, gender, place of residence, smoking habits, family history of chronic diseases, presence of hypertension, and diabetes mellitus.

2.2. Sample collection

Each participant was given a blood sample of four milliliters, which was then transferred into gel tubes. The samples were appropriately labeled and adequately transported to the laboratory. The serum levels of AST, GOT, GPT, Total cholesterol, triglyceride, low-density lipoprotein, and Total, direct, and indirect Bilirubin were determined using the mindray BA-88A machine. The specimens were collected from Gastroenterology and Hepatology Teaching Hospital between December 2023 and April 2024.

2.3. Inclusion criteria

All participants in this study have been diagnosed with chronic Hepatitis C, characterized by becoming infected with the virus for a duration exceeding six months.

2.4. Exclusion criteria

Hepatitis A, B, and D, all other liver diseases, cirrhosis, hepatocellular carcinoma(HCC), diabetes mellitus,

2.5. Ethical approval

Before commencing this study, all participants supplied written consent. The Gastroenterology and Hepatology Teaching Hospital's ethics committee approved the study on March 6, 2024.

2.6. Statistical analysis

The data analysis was conducted using the IBM SPSS-29 statistical package (IBM Statistical Packages for Social Sciences, version 29, Chicago, IL, USA). The qualitative variables were represented using metrics such as frequencies and percentages. Alternatively, the quantitative variables were presented using statistical measures such as mean and standard deviation, specifically through independent samples t-test. The test was conducted to compare two numeric variables. The P-value equal to or less than 0.05 is considered statistically significant.

Table 1. Distribution of the studied groups according to sex.

Parameters	Groups		Total	P-value
	Case (n = 100)	Control (n = 50)		
Gender				
Male	52 (52.0%)	25 (50.0%)	77 (51.3%)	0.86 (NS)
Female	48 (48.0%)	25 (50.0%)	73 (48.7%)	
Total	100 (100.0%)	50 (100.0%)	150 (100.0%)	

3. Results and discussion

3.1. Sex-based distribution of study group

The whole number of infected individuals who participated in this study was 100 (52% male, 48% female) and 50 healthy controls (25% male and 25% female). According to our result, no statistical significance was observed between gender groups (p-value > 0.05), as shown in Table 1.

Similar to previous study done in iraq (Rasheed *et al.*, 2022), our study showed a slightly higher male patient frequency (52%) than females (48%) with no statistical significant difference (p = 0.86) indicating that the disease may influence both males and females but with tendency to males. The more common incidence of HCV infection among males in Iraq can be related to the socio-community factors, where men typically carry the obligation of working and hence have greater exposure to pathogens compared to women.

3.2. Evaluation liver functions tests

The levels of TBS, TDB, and TIB in patients were (1.46 ± 0.25, 0.6 ± 0.14, 0.86 ± 0.16) and in control, were 0.53–0.16, 0.20–0.07, 0.32–0.11) respectively An assessment of liver function test outcomes in patients diagnosed with HCV compared to healthy individuals. Table 2 indicated that the mean and standard deviation of GOT, GPT, and ALP in infected patients were (46.75 ± 12.81, 58.17 ± 12.06, and 599.11 ± 149.64) while in the control group were (21.34 ± 7.71, 22.46 ± 10.17, 110.20 ± 28.31) respectively the same Table also shown that. All results found there was highly significant (p ≤ 0.0001) between HCV-infected patients and control.

Results of this study showed a high increase in patients' serum levels of GOT, GPT, ALP TSB, and direct and indirect Bilirubin at (p ≤ 0.0001). These results agree with a study conducted in Kirkuk, Iraq, that found that chronically infected patients had higher serum levels of liver function tests (Hasan *et al.*, 2023).

Table 2. Comparison the mean of Liver function test levels between cases and controls.

Test	Groups	Mean ± SD	P-value
G.O.T. (U/L)	Case	46.75 ± 12.81	≤0.0001
	Control	21.34 ± 7.71	
G.P.T. (U/L)	Case	58.17 ± 12.06	≤0.0001
	Control	22.46 ± 10.17	
A.L.P. (U/L)	Case	599.11 ± 149.64	≤0.0001
	Control	110.20 ± 28.31	
Total bilirubin (mg/dL)	Case	1.46 ± 0.25	≤0.0001
	Control	0.53 ± 0.16	
Total direct (mg/dL)	Case	0.6 ± 0.14	≤0.0001
	Control	0.20 ± 0.07	
Indirect bilirubin (mg/dL)	Case	0.86 ± 0.16	≤0.0001
	Control	0.32 ± 0.11	

Table 3. Comparative the mean levels of Lipid profiles between cases and control.

Test	Groups	Mean ± SD	P-value
TC (mg/dL)	Case	151.39 ± 36.155	≤0.0001
	Control	174.52 ± 35.46	
T.G (mg/dL)	Case	170.04 ± 71.98	0.24
	Control	153.94 ± 94.52	
LDL (mg/dL)	Case	92.21 ± 27.54	0.37
	Control	96.53 ± 29.69	

3.3. Evaluation of serum lipid profile in hepatitis c infection

Table 3 displays the lipid profile results among the control and patient groups. The infected patient exhibited average Serum cholesterol, Serum triglycerides, and serum LDL levels, and were 151.39 ± 36.155, 170.04 ± 71.98, and 92.21 ± 27.54, respectively.

In contrast, the average levels in the patient group were 174.52 ± 35.46, 153.94 ± 94.52, and 96.53 ± 29.69. The statistical examination demonstrated significant disparities between the patient and healthy categories regarding total cholesterol (p less than 0.0001), with lower levels in patients (p < 0.0001), with lower levels in patients. Conversely, no significant variation was observed in the serum triglyceride levels (P = 0.24) and LDL between the two groups (P = 0.27).

Plasma lipid levels are altered in patients with HCV, irrespective of the duration of infection. Both acute (Lambert *et al.*, 2013) and chronic HCV infection are linked to decreased levels of circulating LDL, apoB100, and total cholesterol when compared to healthy individuals. It is widely recognized that HCV has a reciprocal association with the metabolism of lipids and lipoproteins in the host (Shengir *et al.*, 2021). HCV impacts various aspects of lipid metabolism in liver cells. It promotes lipids' production, impairs lipids' breakdown through mitochondrial oxidation, and reduces the release of

apolipoproteins, especially VLDL. This results in the accumulation of lipids within the cells, as well as low levels of cholesterol and lipoproteins in the bloodstream (Chang, 2016).

Our finding showed a low total cholesterol level in patients compared to control, similar to a previous study done in Iraq (Al-Tamimi & Kamil, 2015). However, the previously mentioned study disagrees with our research in that the serum triglyceride and LDL levels are lower in infected patients. The interaction between HCV particles and human high-density lipoprotein (HDL), low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL) has been observed. Additionally, it has been noted that the LDL receptors may facilitate the entry of HCV into hepatocytes. Furthermore, HCV replication has the potential to reduce the production of cholesterol within the liver. Reducing intracellular cholesterol availability may also result in an elevation of LDL receptors and intrahepatic LDL. The increase in the uptake of LDL may explain the decrease in LDL levels in the bloodstream during HCV infection. The current research, in contrast with Another study done in Egypt, reported a highly significant increase in TC, TG, and LDL in all CHC patients (Abdelhai Sonbol *et al.*, 2023). These differences may be due to the virus's load and distribution frequency.

4. Conclusions

The current study shows that individuals with HCV infection have higher levels of serum GOT (AST), GPT (ALT), ALP, Total bilirubin, direct Bilirubin, indirect Bilirubin, and Total cholesterol (TC) compared to the healthy control.

Abbreviation

GGT	Gamma-Glutamyl Transferase
GOT	Glutamic Oxaloacetic Transaminase
AST	Aspartate Amino Transminase
HCV	Hepatitis C virus
ALT	Alanine Aminotransferase
GPT	Glutamic-Pyruvate Transaminase
TG	Triglyceride
LDL	Low-Density Lipoprotein
HDL	High-density lipoprotein
APO C III	Apolipoprotein C-III
TC	Total Cholesterol
ALP	Alkaline phosphatase
SD	Standard deviation

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