Journal of Communicable Diseases
Volume 57, Issue 2 - 2025, Pg. No. 62-66
Peer Reviewed & Open Access Journal

Research Article

Study of Immunological Parameters IL-2, IL-6 and TNF in Patients infected with Hepatitis C Virus

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DOI: https://doi.org/10.24321/0019.5138.202538

I N F O

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How to cite this article:
Jameel Y M, Khalil Z K. Study of Immunological Parameters IL-2, IL-6 and TNF in Patients infected with Hepatitis C Virus. J Commun Dis. 2025;57(2):62-66.

Date of Submission: 2025-01-08
Date of Acceptance: 2025-05-21

A B S T R A C T

Background: Hepatitis C virus (HCV) infections constitute serious global health problems due to their high morbidity and mortality. It is also estimated that about 200 million people are infected with HCV, among which 170 million are chronically infected.

Objective: This study aimed to assess the values of interlukin-2 (IL-2), interlukin-6 (IL-6) and tumor necrosis factor alpha (TNF-α) in patients infected with hepatitis C virus.

Methods: Venous blood samples were collected from (100) individuals, including (50 patients infected with hepatitis C virus and 50 healthy people as a control group). The levels of serum IL-2, IL-6 and TNF were measured using the Cobas 411 technique.

Results: The results showed that HCV infection was detected in 26 (51.0%) male patients and 24 (49.0%) female patients in comparison with the controls where 24 (49.0%) participants were males and 26 (51.0%) were females, with non-significant differences (p = 0.84). According to residency, the results showed that 26 (51.0%) patients with hepatitis C were residing in rural areas in comparison with the control group, in which 24 (49.0%) people were living in rural areas, while 24 (49.0%) infected patients were residing in urban areas in comparison with the 26 (51%) controls were residing in urban areas, with non-significant differences (p = 0.84). The distribution of study groups according to age showed that the highest infection rate 15 (55.6%) was observed in the age group (30–39) years compared to the control group in which 12 (44.4%) people belonged to this group, followed by the age group (20–29) years 13 (59.1%) compared to the control group 9 (40.9%) individuals in this age group, with non-significant differences (p = 0.84).

Conclusion: It can be concluded from our study that there was a highly significant increase in the levels of IL-2, IL-6 and TNF-α in patients infected with hepatitis C virus (HCV).

Keywords: Hepatitis C, Immunologic Parameters

Introduction

About (60–80%) of the acute infections caused by hepatitis C virus (HCV) develop into chronic infections and the symptoms appear after hepatic damage progression.[1] Deaths happen because of complications after hepatic damage progression to hepatic cirrhosis and carcinomas. Intravenous drug use is the main risk factor for transmission of HCV infection. In developed countries, approximately (60–80%) of HCV infections result from intravenous drug use.[2] The risk of infection with HCV is elevated as the intravenous drug use duration increases.[3] When a contaminated syringe or a drug cooker and cotton are shared, the users may be exposed to blood-borne pathogens.[4] Other factors that contribute to contamination are non-sterile medical tools, blood transfusions, and unsafe surgical and medical procedures.[5] HCV infection diagnosis includes screening tests with confirmatory laboratory examinations. The HCV infection screening depends on serological assays for antibody detection from current or past infections and the confirmation is accomplished by molecular tests for the detection of HCV ribonucleic acid (HCV-RNA).[6] Chronic HCV infection management includes pharmacological and non-pharmacological approaches.[7] The basic part of treatment is non-pharmacological interventions like behavioral modification among active users of intravenous drugs.[8] Patients undergoing pharmacological treatments need to be monitored for adverse complications and should be subjected to routine laboratory examinations, e.g. liver function tests, serum creatinine as well as HCV-RNA detection.[9] It is the effectiveness of host immune response, particularly of specific CD4+ and CD8+ T-cells and production of effector cytokines that determine the outcome of HCV infection.[10] However, as the HCV infection continues, there is gradual impairment of the host immune function, referred to as immune exhaustion, and spontaneous clearance of the virus becomes very unlikely.[11]

Our study aimed to assess interleukin-2 (IL-2), interleukin-6 (IL-6), tumour necrosis factor (TNF) in patients infected with hepatitis C virus (HCV).

Materials and Methods

The present study was conducted in the Gastroenterology and Liver Disease Hospital-Bafgdad during the period from December 2021 to September 2022. Venous blood samples were obtained from 100 individuals (50 patients infected with HCV and 50 healthy people as a control group) by means of disposable syringes. The blood samples were left to clot and centrifuged for 15 minutes at 3000 rpm to obtain serum. The serum samples were placed in Eppendorf tubes and stored at -20C until use. The levels of IL-2, IL-6 and TNF were measured by the Cobas 411 technique.

All patients who were infected with hepatitis C virus were included in the study. Informed consents were obtained from all the participants in the current study. Approval of the research ethics committee's at the (Institute of medical technology-Al-Mansoor) was also obtained.

Statistical Analysis

Statistical analysis was performed using the SPSS version 25 program (SPSS- 25). Data were introduced as mean ± SD or numbers and percentages. For comparison between the patient group and controls, the Student t test was used. The p value of ($p \leq 0.05$) was considered as significant.

Results

The results in table (1) showed that HCV infection was detected in 26 (51.0%) male patients and 24 (49.0%) female patients in comparison with the controls where 24 (49.0%) participants were males and 26 (51.0%) were females, with non-significant differences ($p = 0.84$). According to residency, the results showed that 26 (51.0%) patients with hepatitis C were residing in rural areas in comparison with the control group, in which 24 (49.0%) people were living in rural areas, while 24 (49.0%) infected patients were residing in urban areas in comparison with the 26 (51%) controls were residing in urban areas, with non-significant differences ($p = 0.84$).

The distribution of study groups according to age showed that the highest infection rate 15 (55.6%) was observed in the age group (30–39) years compared to the control group in which 12 (44.4%) people belonged to this group, followed by the age group (20–29) years 13 (59.1%) compared to the control group 9 (40.9%) individuals in this age group, with non-significant differences ($p = 0.84$), as shown in table (2).

The immunological results in the table (3) demonstrated that the mean IL-2 level in the HCV group was (21.36 ± 10.61) Pg/ml compared to the control group which showed a mean value of (1.23 ± 7.39) Pg/ml with a highly significant difference ($p = 0.001$). The mean value of IL-6 levels in the HCV group was (16.97 ± 7.39) Pg/ml as compared to a mean value of (1.73 ± 2.39) Pg/ml in the control group, with a highly significant difference ($p = 0.001$), and the mean TNF was (18.45 ± 5.75) Pg/ml in the patient group compared to (1.31 ± 2.21) Pg/ml in the control group, with a highly significant difference ($p = 0.001$).

IL-2: Interleukin-2, IL-6: Interleukin-6, TNF-α: Tumour necrosis factor-alpha

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202538

Table 1.Distribution of the study groups according to gender and residency

Gender	Study Groups		p Value
	Cases (n = 50) n (%)	Controls (n = 50) n (%)	
Male	26 (51.0)	24 (49.0)	Chi-square = 0.04 p value = 0.84 (NS)
Female	24 (49.0)	26 (51.0)	
Residency			
Rural	26 (51.0)	24 (49.0)	Chi-square = 0.04 p value = 0.84 (NS)
Urban	24 (49.0)	26 (51.0)	

Table 2.Distribution of the study groups according to age

Age Range (Years)	Groups		Total N (%)	p Value
	Cases n (%)	Controls n (%)		
1–9	7 (100.0)	0 (0.0)	7 (100.0)	Chi-square = 0.04 p value = 0.84 (NS)
10–19	0 (0.0)	3 (100.0)	3 (100.0)	
20–29	13 (59.1)	9 (40.9)	22 (100.0)	
30–39	15 (55.6)	12 (44.4)	27 (100.0)	
40–49	4 (33.3)	8 (66.7)	12 (100.0)	
50–59	7 (31.8)	15 (68.2)	22 (100.0)	
60–69	4 (66.7)	2 (33.3)	6 (100.0)	
70–78	0 (0.0)	1 (100.0)	1 (100.0)	
Total	50 (50.0)	50 (50.0)	100 (100.0)	

Table 3.The mean levels of IL-2, IL-6 and TNF-*a* in the study groups

Parameter	Study Groups	Mean	Std Deviation	t Test	p Value
IL-2	Case	(21.36) Pg/ml	10.61	12.99	0.001
	Control	(1.23) Pg/ml	2.23		
IL-6	Case	(16.97) Pg/ml	7.39	13.58	0.001
	Control	(1.73) Pg/ml	2.39		
TNF	Case	(18.45) Pg/ml	5.75	19.66	0.001
	Control	(1.31) Pg/ml	2.21		

Discussion

In this study, a total of 100 individuals were included (50 patients infected with HCV and 50 healthy people as a control group). The results showed that among the HCV-infected people, 26 (51.0%) were male in comparison with the controls, where 24 (49.0%) were male, and 24 (49.0%) HCV-infected patients were female as compared to 26 (51%) females in the control group, with non-significant differences. Similarly to our results, Yousaf et al. reported that in their study, about half of the patients infected with HCV were male and others were female.[12] Also, the distribution of HCV infections according to the place of residence demonstrated that 51.0% of HCV-infected people were from rural areas, in comparison with 49.0% of participants of the control group, and 49.0% of HCV-infected people were from urban areas, in comparison with 51.0% of participants of the control group, with non-significant differences. Dambadarjaa et al. revealed that the infection rate with HCV among patients who live in rural areas was more than the rate among those who live in urban areas.[13] The distribution of study groups according to age showed that the highest infection rate 15 (55.6%) was in

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202538

the age group (30–39) years, with 12 (44.4%) participants belonging to this age group in the control group, followed by the age group (20–29) years, seen in 13 (59.1%) HCV-infected patients as compared to 9 (40.9%) participants in the control group, with non-significant differences. These findings were similar to those of Farshadpour and Taherkhani, who showed that most HCV patients were found in the age group (20–29) years (39.2%) and (30–39) years (28.8%).[14]

The immunological results revealed that the mean IL-2 level in the HCV patients was (21.36 ± 10.61) Pg/ml compared to the control group with a mean value of (1.23 ± 7.39) Pg/ml, with highly significant differences. Gattia et al. reported that there was an association between the biochemical parameters and the receptors of IL-2 and IL-6 and that there was a direct association between IL-2 receptors (IL-2Rs).[15] The mean level of IL-6 was (16.97 ± 7.39) Pg/ml in the current study as compared to the control group with a mean value of (1.73 ± 2.39) Pg/ml, which showed a highly significant difference; a result which agreed with that of Gattia et al., who found an increase in the levels of this cytokine.[15] The results in the current study also showed a highly significant difference in the mean level of TNF between the patients infected with HCV (18.45 ± 5.75) Pg/ml and the control group (1.31 ± 2.21) Pg/ml. Noh et al. stated that serum IL-6 and TNF-α levels among the study groups, showed statistically significant differences between the HCV Patients and controls.[2]

Conclusion

According to the results, we conclude that a highly significant increase was observed in the levels of IL-2, IL-6 and TNF in HCV patients due to severe immunologic stimulation following this serious viral infection.

Conflict of Interest: None

Source of Funding: None

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process: None

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ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202538