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ASSESSING THE IMPACT OF HCV ON C- REACTIVE PROTEIN TO IMPROVE RISK IDENTIFICATION AND TREATMENT ENHANCEMENT IN PAKISTAN

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Abstract

Background: *Among the many systemic symptoms that are associated with hepatitis C infection, inflammation is one of the most prominent ones. There are a variety of viral and inflammatory disorders that have been associated to C-reactive protein (CRP), which is a sign of inflammation that is universally recognized.*

Objectives: *The correlation between HCV and CRP levels, an indicator of systemic inflammation, was examined in this study.*

Methodology: *The research employed a sample size of 772 individuals, consisting of 573 patients and 199 controls. CRP levels were measured in HCV-positive patients. Some additional parameters, including Liver function test, Complete blood count, and Renal function test, were computed in order to ascertain their correlations with the CRP level.*

Results: *When compared to the control group, patients inflicted with HCV demonstrated a statistically significant elevation in CRP levels. This finding suggests that there is a correlation between HCV and an increased level of CRP.*

Conclusion*: Gaining insight into the function of CRP in inflammation associated with HCV could potentially impact the management and surveillance of the disease.*

INTRODUCTION

Viruses that cause hepatitis C are known as hepatitis C viruses (HCV). As a result of the virus's ability to overcome the immune systems of the host, around sixty percent to eighty percent of patients who have Acute Hepatitis C Virus (AHCV) acquire chronic infection (1). HCV may be categorized into seven established genotypes and 67 subtypes (2). These genetic variations result in varying prognoses for HCV and impact the choice of antiviral treatment (3). It takes between one and two weeks for the HCV ribonucleic acid (RNA) in the blood to become detectable after an individual has been exposed to HCV. After being exposed to the virus, the incubation period for those who are exhibiting

symptoms may range anywhere from two to twelve weeks. An estimated eighty percent of those who have an AHCV infection do not exhibit any symptoms. Fever, lethargy, nausea, vomiting, diarrhea, stomach pain, dark urine, and jaundice are some of the symptoms that may be experienced by twenty percent of this population(4). AHCV infection progression and outcome can be influenced by a variety of host and viral factors, including gender, race, co-infection with HIV or hepatitis B virus (HBV), symptoms of jaundice, interleukin-28B polymorphism, human leukocyte antigen (HLA) class II alleles, HCV-specific T cell response, viral genotype, peak HCV RNA level, and diversity of viral quasispecies(5). There are three phases between viral exposure and seroconversion: the preramp-up phase (2–14 days after exposure) with intermittent low or below-detection levels of HCV RNA, the ramp-up phase (the next 8–10 days) with an exponential increase in serum HCV RNA levels, and the plateau phase (45 to 68 days after the second phase) with stable serum HCV RNA levels (6).

Significant attention is drawn to CRP, an acute phase protein found in humans, owing to its notably high concentrations in the bloodstream during chronic inflammatory conditions such as atherosclerosis(7). CRP, with a molecular weight of around 120 kDa, is a member of the pentraxins family. Pentraxins has a cyclic multimeric structure. The pentraxin possesses a calcium-dependent ligand-binding site on one of its faces. CRP's primary ligand is PC, found on the surface of the majority of microorganisms. CRP interacts with PC in a way that depends on the presence of calcium. CRP has a binding site for complement protein C1q and is capable of initiating the conventional complement pathway. CRP is a versatile molecule of the human innate immune system. CRP in the bloodstream indicates widespread inflammation. Hepatocytes largely produce and release it, and its regulation is influenced by interleukin-6 (IL-6), interleukin-1 (IL-1), and tumor necrosis factor-alpha (TNFá).

For the purpose of measuring antigens, antibodies, proteins, and glycoproteins in biological samples, the enzyme-linked immunosorbent assay (ELISA) is a popular immunological technique.. Additionally, the western blot approach was used in a research study for the purpose of detecting CRP.

The degree of liver fibrosis and HCV replication are proposed as explanations for the reduced CRP level. The lack of evidence on how liver fibrosis severity affects IL-6 and CRP levels is probably due to the challenges of doing liver biopsies on a large patient population. Furthermore, little research has investigated the correlation between HCV replication and IL-6 and CRP levels (8). The impact of changes in lipid metabolism on IL-6 and CRP levels is uncertain, despite the belief that HCV replication utilizes pathways related to low-density lipoprotein (LDL) metabolism. It is clinically important to comprehend how HCV infection, liver fibrosis severity, and inflammation are related, as liver fibrosis can persist even after successful HCV treatment and may provide insights into how CHCV infection causes injury outside the liver(9).

While the association between HCV infection and CRP is seen in patients, research on this topic is scarce in the general population. Research has shown that CRP levels were reduced in individuals who tested positive for HCV in the majority of patient population studies(10). A research by Özekinci, Atmaca (11) revealed that CRP levels were elevated in those who tested positive for HCV-RNA compared to those who tested negative for HCV-RNA. Another research found that among women infected with HCV, greater levels of HCV-RNA were linked to a 9% decrease in CRP levels. Conversely, CRP was identified as a predictive marker for disease advancement in CHCV patients (12).

HCV genotype is a prognostic factor that correlates with the chronic nature of the infection. The predominant HCV genotypes in the U.S. were genotypes 1, 2, and 3. HCV genotype 1 is associated with increased aggressiveness, higher risk of hepatocellular carcinoma, and a greater likelihood of becoming chronic. An inquiry is required to examine the association between CRP and HCV infection in the general population due to inconsistent findings seen in the patient group. It was predicted that variations in CRP levels are influenced by genotype in the general population with HCV infection(13).

The high frequency of HCV infection in Pakistan, in conjunction with the little amount of research that has been carried out on CRP levels in this area, makes this study very significant, and it may even be required. In addition to contributing to the burden

of extrahepatic symptoms, it is probable that increased CRP levels, which are an indication of systemic inflammation, might make the difficulties associated with HCV even more severe. To shed light on the association between HCV and CRP within the Pakistani community, the goal of this research was to identify people who are at a greater risk of acquiring the disease, to impact treatment choices, and to drive measures that are done to enhance public health. Specifically, the study aimed to identify persons who are at a higher risk of developing the illness. It is also feasible that the results might be beneficial in the development of biomarker-based risk stratification approaches and in the creation of policy recommendations that would help minimize the overall impact of HCV-related illness in Pakistan. Both of these possibilities are plausible.

1. MATERIALS AND METHODS

1.1. Study Design:

It was a Cross sectional study.

1.2. Sample Size:

A total of 573 blood samples of PCR-confirmed HCV-positive patients and 199 blood samples of healthy controls were collected after signing consent form.

1.3. Sampling Technique:

It was a Convenient Sampling Technique

1.4. Study Setting:

The patients visiting Jinnah Hospital Lahore, Social security hospital, Lahore , and Shaikh Zayed Hospital, Lahore were included in the study.

1.5. Duration:

The duration of study was 4 months after the approval of synopsis.

1.6. Sample Selection:

Inclusion Criteria:

PCR-confirmed HCV-positive patients were included in the study irrespective of their age and gender after obtaining written consent.

Exclusion Criteria:

- Participants are unwilling to offer consent.
- Individuals having comorbid chronic illnesses that affect CRP levels.
- Patients with concomitant diseases, excluding HCV.
- Individuals using medications that are known to affect CRP levels.
- Participants with missing or partial medical records.

Sample Collection:

Patients were made to feel comfortable and make them seated on chairs. In order to make the venipuncture procedure easier, a tourniquet was applied to the patient's arm while it was extended.

The region of the venipuncture was cleaned with an alcohol swab once it had been chosen as the site for the procedure. Samples of the patient's blood were collected at the designated site for the venipuncture. Each blood sample was painstakingly marked in order to guarantee proper identification and traceability of the samples. In order to prevent the specimen containers from being detached or smeared, adhesive labels were used to fix them in place. The separation of cellular components from serum samples was accomplished by the use of controlled centrifugation. After being separated into their respective categories, the serum samples were moved to storage containers that were appropriately marked and had secure lids. Keeping temperatures between 2-4 degrees Celsius was accomplished by the use of environment-controlled refrigeration units that contained the storage cylinders. The temperature was continuously monitored to verify that the storage conditions that were stated were adhered to.

Biochemical Tests

For the purpose of eliminating the potential of additional diseases, a variety of screening tests, including HIV and HBsAg, were carried out with the assistance of Bio check screening kits (Catalogue no. 2107189). Forty microliters of serum were subjected to anti-HIV testing, which was then followed by the addition of one drop of the relevant buffer to each of the kits. Additionally, ninety microliters of serum was added for HBsAg. After three to five minutes, the results were summarized.

The complete blood count (CBC) of samples was performed using blood samples that were collected

from tubes containing ethylenediaminetetraacetic acid (EDTA). To do this, blood was analyzed using an automated Sysmex pocH-100iTM Automated Hematology Analyzer (USA), Within the sample, the CBC analyzer provided comprehensive report consisting of seventeen parameters. These findings were used in order to evaluate the effect that HCV had on blood.

CRP Analysis:

For the purpose of CRP analysis, the CRP Latex Test Kit manufactured by ANTEC DIAGNOSTIC PRODUCTSTM, United Kingdom was used. Patient serum was added on CRP kit along with reagent. It was determined that the CRP result was positive since the reaction mixture had clumps that could be seen. Clumps are a sign of elevated CRP levels because they are the result of CRP molecules attaching themselves to latex particles. It is possible to determine that the CRP result is negative when there are no clumps visible in the reaction mixture. The absence of clumping was indicative of low CRP levels, which indicated that inflammation was either normal or minimal.

Detection Of HCV Antibodies:

For the purpose of identifying antibodies that were directed against the HCV, the Enzyme-Linked Immunosorbent Assay (ELISA) method, which is a method that is often used, was utilized. The ELISA kit manufactured by ALPCO North America was the one that was adopted for usage. It is possible to detect specific antibodies that are produced by the immune system in response to
an infection caused by the influenza virus with the assistance of this sensitive test. Polymerase chain reaction (PCR) was used to do further analysis on the positive serum samples that were found via the use of ELISA. This was done in order to determine whether or not the samples contained active viral replication (18). The antibody concentration in the sample was estimated by comparing the sample signal to a standard curve established using known quantities of the target antibody.

Viral Load Detection:

Using the TM37600 HCV TaqMan RT-PCR Kit China, HCV RNA was detected. This tool uses both TaqMan probe technology and reverse transcription polymerase chain reaction (RT-PCR) to find HCV RNA very accurately and sensitively. The PCR amplification was done in the lab using Labnet's Multigene Gradient Thermal Cycler. This device makes it possible to precisely control the temperature during the PCR cycle process. In order to help diagnose and treat HCV infections, this test accurately finds and measures viral RNA in patient samples by amplifying specific HCV RNA sequences. A full scientific test for HCV illness is made possible by mixing RT-PCR for finding viral RNA and ELISA for finding antibodies. This method allows for both antibody screening and confirmation that the virus is still replicating.

Data analysis

Statistical Package for the Social Sciences (SPSS) version 25 (IBM, USA) was used for statistical interpretation of the data. The data distribution was analyzed by the Shapiro-Wilk test. Descriptive statistics were employed to summarize the data, with continuous variables presented as mean and standard deviation (SD), and categorical variables as frequencies and/or percentages. Chi-square tests or Fisher's exact tests were performed to compare categorical variables while continuous variables were analyzed by employing the student t-test test. The degree of correlation between variables and disease severity was evaluated by point biserial correlation. Stepwise logistic regression analysis was performed to identify predictors of the outcome variable(s) while controlling for potential confounding factors. Model fit was assessed using goodness-of-fit tests, such as the Hosmer-Lemeshow test for logistic regression models, ensuring the adequacy of the regression model. Predictive values were identified via the area under the curve (AUC) calculated from the receiver operative characteristics (ROC) curve while optimum cutoff values were calculated via Youden's index, providing valuable thresholds for clinical decision-making. A two-tallied p-value of less than 0.05 was described as statistically significant. Statistical significance was set at a predetermined alpha level (e.g., $\alpha = 0.05$), and all tests were two-tailed unless otherwise specified, ensuring the integrity of the statistical analysis. Additionally, appropriate

adjustments for multiple comparisons were applied where necessary to minimize the risk of Type I error.

2. RESULTS

This research was a cross-sectional investigation, and it included 772 participants. Of those participants, 199 were healthy controls, and 573 were HCV-positive patients. There were 275 male patients and 298 female patients. Within the control group, there were 87 males and 112 females (**Figure 3.1**).

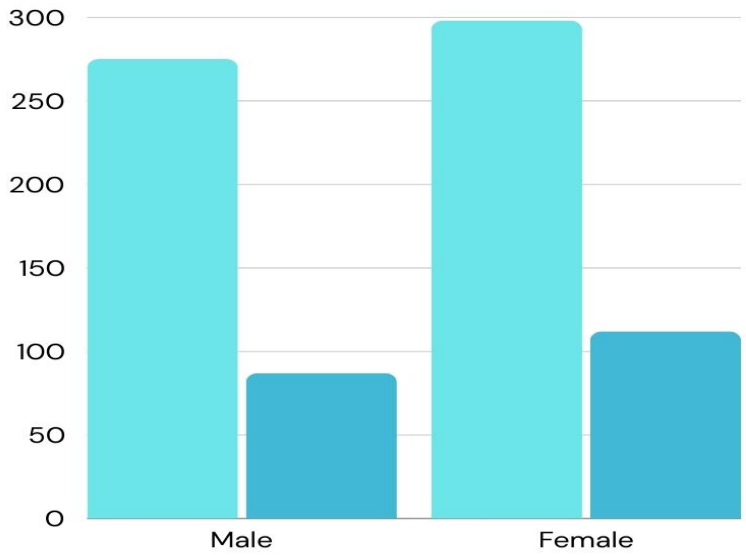

Figure 3.1: Frequency distribution of gender among patients and control groups.

The age distribution of control was that there were 5 controls under 20 years, 95 controls were in range of 21 to 40 years, 84 were in range of 41 to 60 years and 15 controls were over 60 years. Similarly, in patient group, 21 patients were under 20 years, 323 were in age range of 21 to 40 years, 185 were in range of 41 to 60 years and 44 patients were over 60 years of age (**Figure 3.2**).

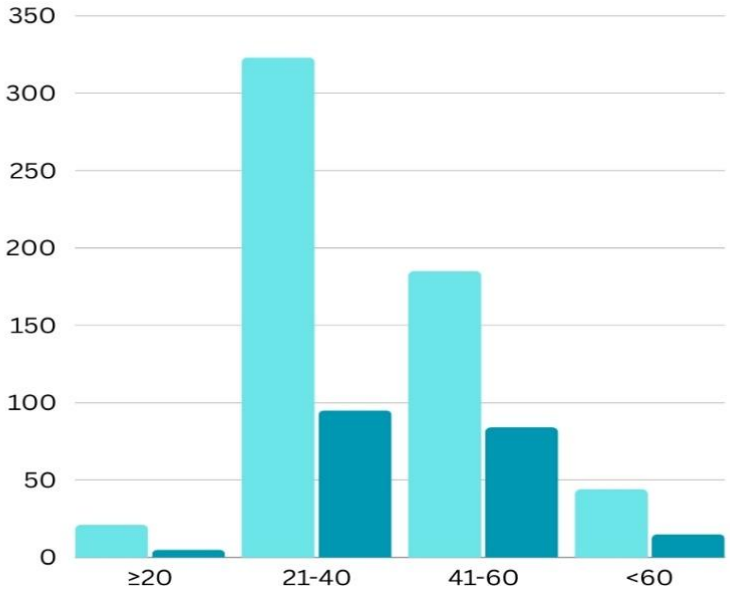

Figure 3.2: Frequency of distribution of patients and controls in different age groups

When it comes to clinical features, the CBC, liver function test (LFT), Renal function test (RFT), and lipid profile are all provided, along with a p-value, which indicates that they are clinically significant. In comparison to controls, patients exhibited significantly elevated levels of Hemoglobin (Hb), Red Blood Cell (RBC), Hematocrit (HCT), White Blood Cell (WBC), Neutrophils, Lymphocytes, Monocytes, Eosinophils, Bilirubin, Alanine Transaminase (ALT), Aspartate Transaminase (AST), Alkaline Phosphatase (ALP), Total Protein (T.P), Albumin (ALB), Urea, and Lactate dehydrogenase LDH ($p < 0.001$). In addition, Platelets levels were lower in the patients ($p = 0.205$) and comparable in the controls for Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC), and CRP ($p > 0.05$).

Table 3.1: Demographic and clinical characteristics of the study participants.

Parameters	Total Cohort (n=772)	Controls (n=199)	Patients (n=573)	p-value
Gender n (%)				
Male	362 (46.9)	87 (4307)	275 (48)	0.323
Female	410 (53.1)	112 (56.3)	298 (52)	
Age Groups (Years)				
≥20	26 (3.4)	5 (2.5)	21 (3.7)	0.079
21-40	418 (54.1)	95 (47.7)	323 (56.4)	
41-60	269 (34.8)	84 (42.2)	185 (32.3)	
<60	59 (7.6)	15 (7.5)	44 (7.7)	
Parameters	**Total Cohort (n=772)**	**Controls (n=199)**	**Patients (n=573)**	**p-value**
Viral Load	8.32 (8.85)	8.32 (4.2-13.1)	----------	

Complete Blood count

Parameters	Total Cohort (n=772)	Controls (n=199)	Patients (n=573)	p-value
HB	12.4 (2.4)	12.4 (11.2-13.6)	13.1 (12.4-13.9)	<0.001
RBC	4.8 (1.7)	4.8 (4.1-5.8)	4.62 (4.2-5.01)	<0.001
HCT	36 (8)	36 (32-40)	41 (31.8-43.2)	<0.001
MCV	82 (11)	82 (76-87)	83 (72-91)	0.715
MCH	29 (7)	29 (26-33)	29.1 (27.6-30.8)	0.511
MCHC	34 (4)	34 (32-36)	34.3 (33.2-35.7)	0.518
PLT	236 (124)	236 (198-322)	246 (191-302)	0.205
WBC	6.4 (3.9)	6.4 (4.7-8.6)	7.4 (6.2-8.9)	<0.001
NEU	65 (18)	65 (56-74)	70.0 (62-78)	<0.001
LYM	29 (19)	29 (18-37)	25.0 (17-31)	<0.001
MONO	5 (2)	5 (4-6)	2.0 (2-4)	<0.001
EOSI	3 (2)	3 (2.4)	2.0 (1-3)	<0.001

Liver Function Test

Parameters	Total Cohort (n=772)	Controls (n=199)	Patients (n=573)	p-value
ALT	156 (772)	156 (32-804)	29.0 (26-36)	<0.001
AST	165 (464)	165 (36-500)	27.0 (24-32)	<0.001
ALP	265 (301)	265 (165-466)	171.0 (145-198)	<0.001
T. P	6.4 (0.9)	6.4 (5.9-6.8)	7.2 (6.7-7.9)	<0.001
ALB	4.5 (1)	4.5 (3.9-4.9)	4.2 (3.8-4.9)	0.002
BILI	3.6 (5.6)	3.6 (0.8-6.4)	0.6 (0.4-0.8)	<0.001

Renal Function Test

Parameters	Total Cohort (n=772)	Controls (n=199)	Patients (n=573)	p-value
UREA	28 (11)	28 (24-35)	14.0 (10-17)	<0.001
CREAT	0.9 (0.62)	0.9 (0.7-1.32)	1.1 (0.8-1.2)	0.310

C-Reactive Protein

Parameters	Total Cohort (n=772)	Controls (n=199)	Patients (n=573)	p-value
CRP	4.3 (8.3)	4.35 (0.8-9.2)	5.1 (2.1-7.4)	0.811

The point-by-point correlations between a variety of clinical indicators and HCV infection are displayed in the **table 3.2.** The concentrations of HB, NEU, MONO, EOSI, BILI, ALT, AST, ALP, T.P, UREA, CRP, and LDH correlate significantly ($p < 0.05$) with HCV infection. There exists a positive correlation among several markers, namely NEU, MONO, EOSI, BILI, ALT, AST, ALP, T.P, UREA, CRP, and LDH. Conversely, HB, WBC, and CREAT demonstrate negative associations. This observation suggests that HCV infection may have an impact on a range of clinical indicators, underscoring the significance of CRP as a potential indicator in the pathogenesis of HCV.

Table 3.2: Point biserial correlation of clinical parameters with the HCV infection.

Variables	Coefficient	p-value
HB	-0.145	<0.001
RBC	-0.042	0.249
HCT	-0.048	0.185
MCV	0.031	0.389
MCH	-0.058	0.110
MCHC	-0.071	0.047
PLT	0.06	0.095
WBC	-0.092	0.010
NEU	-0.165	<0.001
LYM	0.104	0.004
MONO	0.528	<0.001
EOSI	0.268	<0.001
BILI	0.457	<0.001
ALT	0.361	<0.001
AST	0.347	<0.001
ALP	0.309	<0.001
T. P	-0.384	<0.001
ALB	0.053	0.142
UREA	0.676	<0.001
CREAT	-0.006	0.868
CRP	0.101	0.005
LDH	0.719	<0.001

There are few correlations between viral load and demographic and clinical characteristics among HCV patients, according to the correlation study as shown in **table 3.3.** Age and certain blood parameters, including red blood cell (RBC) count and hemoglobin (HB), appear to have a weak positive correlation; however, the results are inconclusive due to the fact that p-values frequently surpass significance levels. An ALT level of liver function indicates a marginally positive correlation, which may indicate that the liver is involved in the replication of the virus. CRP levels exhibit a modest

positive correlation, suggesting a possible link between HCV infection and inflammation; further investigation into this relationship is crucial for gaining a comprehensive understanding of the disease's impacts.

Table 3.3: Correlation of viral load with the demographic and clinical variables.

Variables	Pearson Coefficient	p-value
AGE	0.061	0.150
HB	-0.052	0.220
RBC	0.036	0.380
HCT	0.032	0.450
MCV	-0.042	0.311
MCH	-0.028	0.500
MCHC	-0.023	0.581
PLT	-0.045	0.290
WBC	-0.035	0.411
NEU	-0.023	0.591
LYM	0.014	0.730
MONO	-0.027	0.530
EOSI	-0.010	0.810
BILI	0.043	0.300
ALT	0.097	0.020
AST	-0.006	0.891
ALP	0.019	0.642
T. P	-0.063	0.130
ALB	-0.004	0.916
UREA	0.072	0.085
CREAT	0.017	0.692
CRP	0.067	0.109
LDH	-0.053	0.206

The data given in **table 3.4** shows the results of a binary logistic regression study investigating factors associated with HCV infection. Variables such as HB, WBC, NEU, MONO, EOSI, BILI, ALT, ALP, T.P, UREA, CREAT, CRP, and LDH have substantial relationships with HCV infection, as shown by odds ratios (O.R.) and p-values. There is a significant association between HCV infection and CRP, suggesting that CRP may be involved in the inflammatory response linked to HCV. The data provide important contributions to understanding the intricate impact of HCV infection on biochemical markers like CRP, shedding light on its systemic implications.

Table 3.4: Binary logistic regression analysis to analyze the factors associated with HCV infection.

Univariate				Multivariate		
Variables	O.R.	95% CI	p-value	O.R.	95% CI	p-value
HB	0.842	0.774-0.916	0.001	0.93	0.667-1.308	0.691
RBC	0.994	0.982-1.0060	0.339	1.00	0.963-1.031	0.84
HCT	0.996	0.989-1.003	0.231	0.89	0.816-0.970	0.01
MCV	1.006	0.992-1.021	0.390	1.10	1.027-0.1183	0.01
MCH	0.992	0.981-1.003	0.174	1.01	0.988-1.030	0.42

MCHC	0.962	0.924-1.022	0.061	0.82	0.709-0.952	0.01
PLT	1.002	1.000-1.004	0.095	1.01	1.002-1.018	0.01
WBC	0.879	0.817-0.945	<0.001	0.98	0.937-1.025	0.382
NEU	0.968	0.955-0.982	<0.001	1.01	0.919-1.115	0.811
LYM	1.021	1.007-1.035	0.004	1.03	0.933-1.145	0.530
MONO	2.515	2.174-2.909	<0.001	2.39	1.586-3.614	<0.001
EOSI	1.817	1.545-2.136	<0.001	1.00	0.568-1.752	0.990
BILI	8.016	4.327-14.851	<0.001	5.39	0.839-34.563	0.080
ALT	1.061	1.036-1.086	<0.001	1.12	1.031-1.225	0.010
AST	1.132	1.098-1.168	<0.001	1.08	0.987-1.173	0.091
ALP	1.008	1.006-1.010	<0.001	0.99	0.976-0.997	0.011
T. P	0.302	0.240-0.381	<0.001	0.25	0.133-0.487	<0.001
ALB	1.39	1.166-1.657	<0.001	1.17	0.568-2.392	0.685
UREA	1.473	1.385-1.566	<0.001	1.59	1.352-1.864	<0.001
CREAT	0.964	0.624-1.490	<0.001	0.12	0.018-0.776	0.030
CRP	1.045	1.013-1.078	<0.001	1.14	0.979-1.323	0.090

Receiver Operating Characteristic (ROC) curves for monocytes, total protein, urea, and low-density lipoprotein are illustrated in Figure 3.3. Each biomarker's ability to distinguish between individuals with and without HCV infection is depicted by a curve; larger curves indicate greater discriminatory capability. By calculating the area under each curve, one can quantify the biomarker's ability to distinguish between HCV infection cases.

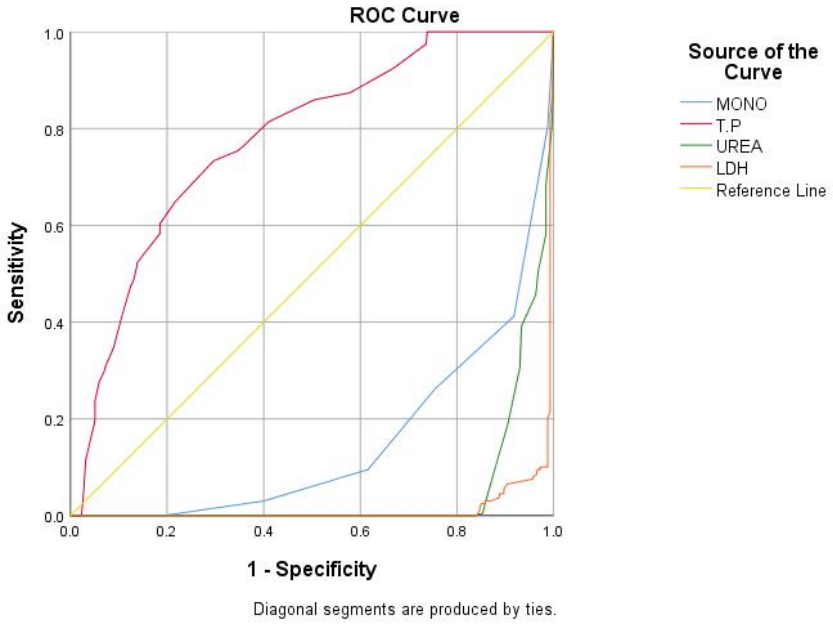

Figure 3.3: Receiver Operative Characteristic Curve

4. DISCUSSION

This research was a well-characterized cross-sectional study in which 573 individuals, including both male and female patients of all age groups, were evaluated to determine the influence that HCV has on the levels of CRP in the body. The research found that the level of CRP was elevated in all patients who were affected by HCV. This was the case in all of the patients. Additionally, it was discovered that the presence of HCV infection had an effect on the liver function test.

A study by Floris-Moore et al. showed the systemic consequences of viral co-infections has been expanded by the discovery of a unique connection

between HCV infection and reduced CRP levels in HIV-infected persons. This study adds another piece of information to our understanding. CRP has historically been considered an inflammatory marker; however, the reduced levels that have been reported in persons who are infected with HCV show that HCV may be able to modulate the inflammatory response. In light of this discovery, established beliefs are called into question, and it is clear that more study is required to shed light on the underlying processes that are responsible for this link (16).

Women with fibrosis who were infected with HCV had a 28% decline in CRP levels, compared to those without fibrosis who had a 47% reduction. Higher levels of HCV-RNA were associated with a 9% decline in CRP levels in women with HCV infection for every doubling of the amount. Elevated IL-6 levels are associated with increased liver fibrosis. However, it appears that HCV replication, rather than hepatic fibrosis severity, reduces the effect of IL-6 on CRP. It is vital to do research on the possibility of CRP reappearance following HCV-RNA removal, as well as the long-term impact of liver fibrosis on organ damage(9). The CRP and IL-6 levels in each of the women included in the Shah et al. study showed a favorable connection. Nonetheless, these researchers discovered that women with HCV infections whether or not they were HIV-positive had lower CRP levels for all IL-6 levels. IL-6 levels in HCV-infected women with fibrosis were about 2.7 times higher than in controls; IL-6 levels in infected women without fibrosis were comparable to controls.

An immunohistochemical analysis was performed by Shima et al. to compare the expression of CRP in patients with HBV and HCV+ patients. A substantial correlation was observed between the intensity of CRP expression and disease progression in patients with HBV. However, this association was not detected in patients who tested positive for HCV(19). In their investigation, Lin et al. examined elevated CRP levels in non-uremic cirrhotic individuals as a result of bacterial infection. They discovered that in order to detect these instances, a higher CRP threshold was required. A notable disparity in the hs-CRP/IL-6 ratio was observed among patients with HCV+ status, indicating that hepatic cell injury might have an effect on CRP production in HCV+ HD patients. IL-6 levels did not differ significantly between HCV+ and HCV-negative patients (20).

In their study, Nascimento et al discovered that there was no significant difference in the levels of hs-CRP or IL-6 between HCV+ patients and HCV- patients. HCV+ patients showed lower levels of CRP in comparison to IL-6 levels than HCV- patients, which resulted in a decreased ratio of low-sensitivity CRP to high-sensitivity CRP. The difference that was found indicates that the presence of HCV may have the effect of lowering the hepatic response to the activation of IL-6. Therefore, it is reasonable to hypothesis that the damage to the liver that is brought on by HCV might result in an anomaly in the generation of CRP inside the body (21)

A study conducted by Popović-Dragonjić et al. revealed that there was a statistically significant increase in the hs-CRP value among patients with CHCV in comparison to the control group. This conclusion was arrived at in light of the study's findings. Upon comparing the cohort of patients diagnosed with CHCV to the control group, a statistically significant increase in the concentration of hs-CRP was identified. Hs-CRP should be considered a predictive indicator for the development of CHCV, according to this evidence. This conclusion was arrived at on the basis of the acquired information. This possibility would enable the implementation of a rapid and individualized treatment plan for individuals with CHCV who are at an increased risk of developing the disease in the future (13). In light of the fact that a comparable correlation was discovered in our own research, these study findings were constrained to our own research. People who had HCV had a higher CRP level than those who did not have the HIV infection.

Kerner et al found that CRP is strongly implicated in the inflammatory pathways connected to metabolic syndrome. This disease is more frequent in individuals who have CHCV compared to those who do not have HCV (22). We also found that persons with HCV had a higher CRP level than the general population, which is consistent with the findings of this study.

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