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Association of the Hepatitis C Virus with the ABO Blood Group in the Teaching Hospital for Gastroenterology and Hepatology, Sulaimaniyah, Iraq

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Abstract— Background: Hepatitis C virus (HCV) infection is a major cause of chronic liver disease and cirrhosis that is more predominant in males and inversely correlated with age. **Objectives:**This study was designed to explore a correlation between hepatitis C viremia and sociodemographic characteristics. **Patients and Methods:** A total of 229 HCV-positive patients at theTeaching Hospital for Gastroenterology and Hepatology, Sulaimaniyah, Iraq, were included in this study from July 2021 to December 2022. Patients' sociodemographic characteristics including age and genderwere also collected using a self-designed questionnaire. Additionally, the patient'sblood type, Rh factor, and viral load were determined.**Results:**The findings showed that most of the patients (n=96, 41.92%) were aged≥45 years, males (n=134, 58.51%) with blood type O (n= 126, 55%) and had Rh-positive (n=213, 93%).On the other hand, males had a higher mean viral load (5.47 log10 IU/mL) than females(5.16 log10 IU/mL). Also, patients with blood type AB had higher mean viral load(5.6 log10 IU/mL)than other blood types(5.16, 5.33, and 5.39log10 IU/mL mean viral loads for A, B, and O blood groups, respectively). In addition, the patients with Rh-positivefactor(n=213)had a higher mean viral load(5.37log10 IU/mL)than the Rh-negative factor(n=16) which had 4.96log10 IU/mL. **Conclusion**: We concluded that age and gender were more severely impacted by HCV viremia. Additionally, blood group type and Rh-factor were other two factors that increased the possibility of getting the HCV infection.

Keywords: Blood group, hepatitis, Rh factor, viremia, cross-sectional study

Introduction

Hepatitis C virus (HCV) remained a main public health problem with around half of the patients untreated and undiagnosed worldwide [1]. HCV had a global prevalence of approximately71 million cases in 2021, most of which were concentrated in continental Asia and Africa, especially in indigenous incarcerated or homeless peoples[2]. Thus, control and prevention strategies for hepatitis C haveassumed great importance since a vaccine for chronic hepatitis C is unavailable, despite costly treatment[3].

A suboptimal complete recovery rate was achieved, which increased the risk of hepatic sequelae such as cirrhosis, hepatocellular carcinoma (HCC), and liver failure. Chronic HCV

is linked to the development of hepatic as well as extrahepatic symptoms and a disproportionately high number of fatalities[4, 5].

It is widely acknowledged that the two primary strains of HCV are among the most dangerous and widespread infectious agents that cause the most significant health concerns in industrialized nations[6]. Furthermore, the HCV virus is the recognized cause of transfusion-related non-A and non-B hepatitis. The most common and efficient mechanism of HCV infection transmission is through blood transfusions. This interaction is thought to be caused by antigenic similarity, deregulation of antibody response, and affinity towards common receptors[7].

The prevalence rate of HCV infection among Iraqi people is comparable to those seen in the majority of Asian and non-Asian populations[8]. The main mode of HCV transmission is through blood transfusions and renal dialysis, especially for healthcare workers (HCWs). Thus, maintaining surveillance of blood donors, HCWs, and hospitalized patients and screening for HCV markers using a molecular technique are potential requirements at hospitals[9].

The relationship between blood groups and specific disease need to be studied intensively and it has been found that bacterial, parasitological, and viral illnesses are all in some way connected to a person's blood type [10]. Thus, in the case of persistent infection with hepatitis C, the severity of liver fibrosis is connected with the blood group [1]. The most common blood type in Iraq is blood group O with positive Rh factor; however, no reportin Sulaimaniyah city examines the correlation between blood groups and the incidence of HCV infection. Thus, we aimed to determine the correlation between HCV and their ABO blood group together with the sociodemographic characteristics of patients.

Materials and methods

Sample size and study setting

A total of 229 positive HCV patients in the Teaching Hospital for Gastroenterology and Hepatology, Sulaimaniyah, Iraq were enrolled in this study, from July 2021 to December 2022.

Questionnaire

The patient’s sociodemographic characteristics (age and gender) were taken using a questionnaire.

Inclusion criteria

Patients with HCV were enrolled regardless of age, gender, ethnicity, and nationality.

Exclusion criteria

Patients with other types of hepatitis viral infection rather than HCV were excluded from the study.

Ethical consideration

This study was approved by the scientific and ethics committees of the College of Nursing and College of Medicine, University of Sulaimani, Sulaimaniyah, Iraq. The final administrative preparations (IRB) to obtain an official agreement for the actual data collected by the Sulaimani General Directorate of Health and the Sulaimani General Teaching, Iraq, were also done. On the other hand, a consent form was filled out by the patient to allow the research to be conducted on their blood sample.

Blood typing

The ABO blood type distribution of the collected blood samples was determined by observing the agglutination using an ABO kit, Bridport, Dorset, England. Simultaneously, the Rh factor was also determined for each patient.

HCV Load determination using q-PCR

Quantitative Polymerase Chain Reaction (q-PCR) wasdone using PDHS-BR016 Listeria Monocytogenes Real-Time PCR Kit from Russia to determine the viral load of studied patients. Briefly, within 3 hours of blood collection, sera were separated, diluted, aliquoted, and frozen at – 20 º C. Then, the Superquant test was used to quantify HCV RNA. In a nutshell, serum RNA was isolated from HCV and used to create a complementary DNA template according to the instructions of a manufacturing company. After that, the cDNA was amplified in four different PCR reactions with cycle lengths of 25, 30, 35, and 45 using primers from the 59 noncoding regions of the HCV genome. This test detected HCV RNA at 100 copies/mL (2.0 log10 copies/mL). On the other hand, Cobas Version 2.0 (Roche Molecular Systems) was used for RNA quantification. Primers from the HCV genome's noncoding region 59 were used for reverse transcription and amplification of HCV. When hybridized to a bio-tin-labelled probe, both the standard and sample DNAs were identified. Cobas Amplicor equipment automatically performed reverse transcription, amplification, amplicon identification, and international unit computation after manual extraction using a Quantiplexkit with Cat. No. A00680. This test has a lower detection limit for HCV RNA of 600 IU/mL (2.8 log10 IU/mL). Samples with concentrations >850,000 IU/mL were outside the assay's linear range. Therefore they were diluted by a factor of 100 and retested, and the second outcome was considered. This test has a sensitivity of 200,000 Eq/mL (5.3 log10 Eq/mL) for the detection of HCV RNA.The outcome can be classified as either having a high viral load, which is often defined as>800,000 IU/L or a low viral load of<40,000 IU/L.

Statistical analysis

To investigate each variable included in the research groups, IBM SPSS version 25.0 was used to create tabulations and perform analyses on all of the presented data. To characterize the relationship between the variables, a pie chart, as well as histograms, were produced.

Results

The prevalence of blood groups in hepatitis C viremic patients and any possible association between the occurrence of viral load and the blood groups were investigated in 229 positive hepatitis C patients whoattended the outpatient diagnostic department.

The age of the studied patients (n=229) ranged from 18 - >45 years, and their age was categorized into four groups. Most hepatitis C infected patients (n=96, 41.92%) were aged ≥45 years, followed by the 18 - 26 years age group (n=73, 31.87%), then age group 27 - 35 years (n=31, 13.53%), while the least was reported for age group 36 -44 years (n=27, 11.79%) (Table 1).

Regarding gender, most (n=134) of the infected patients were males (58.51%), and the rest (41.49%) were females (n=95). Consequently, an association between the viral loads and the gender of the patients was investigated, and the mean viral load was much higher among males (5.47 log10 IU/mL) than females (5.16 log10 IU/mL) (Figure 1).

Regarding the blood groups among the patients, the blood group O was the most frequent type (n= 126, 55%), followed by group A (n=60, 26%), then group B (n=22, 10%), while group AB (n=21, 9.0%) wasthe least prevalent (Figure 2). On the other hand, patients with the blood type AB had higher mean viral loads(5.6 log10 IU/mL), while the mean viral load of 5.16, 5.33, and 5.39log10 IU/mLwere reported in blood groups A, B, and O, respectively (Figure 3).

Furthermore, patients with Rh positive factor (n=213) had a greater range of mean viral load (5.37 log10 IU/mL) than patients withnegative Rh factor (n=16), which was 4.96 log10 IU/mL (Figure 4).

Discussion

Infection with HCV is one of the most common reasons for severe hepatic fibrosis and cirrhosis, as well as a considerable increase in the risk of developing hepatocellular carcinoma (HCC)[11]. The morbidity and mortality associated with HCV-related HCC continue to be substantial, despite the prevalence of HCV cirrhosis continuing to rise[12]. Therefore, in the long run, the purpose of antiviral treatment for chronic HCV is to lessen the severity of problems caused by cirrhosis, including the development of HCC[13].

Most hepatitis C-infected patients (n=96, 41.92%) were aged ≥45 years, while the least was reported for the age group 36 - 44 years (n=27, 11.79%). Thus, the older age group appeared to have a higher prevalence of HVC compared to the younger population. These outcomes agreed with the results of Jasim et al. 2021[8] in Iraq and Umutesi et al. 2019[14] in Rwanda, who reported the highest frequency of HCV in patients aged >50 years. However, these findings did not agree with that of Noreen et al. 2021 in Pakistan, who declared that the age group 26–34 years was most commonly infected with HCV [1]. Also, our findings disagreed with Hofmeister et al. 2019 who demonstrated that HCV is most markedly reported among people aged 20-39 years old[15]. Two different factors may demonstrate these truths. Patients who had high HCV viral loads would pass away before reaching this age, or the older and middle-aged population would have a larger risk of falling prey to the disease because of their increased vulnerability to the condition.

Another element that had a role in influencing the results of this research was gender. We demonstrated that the male gender is a risk factor for HCV infection, and the mean viral load among males was higher than among females. These outcomes agreed with Al-Rubaye 2016 and Jasim et al. 2021 in Iraq, who found more male gender prediction of HCV than females [8]. However, Noreen et al. 2021 in Pakistan [1] and Aziz et al. 2019 in Saudi Arabia [16] observed that females were more aggressively affected by HCV viremia than males and the mean viral load among the females was higher than that of the males. These differences might be related to the individual's occupation, disease epidemiology/severity, and genetic factors.

Moreover, our findings demonstrated a direct association between blood group O and HCV viremia, as the blood group O was the most frequent type (n=126, 55%), while group AB (n=21, 9.0%) wasthe least prevalent among our studied patients with HCV.These outcomes were agreed with that found by Hassan et al. 2020 in Iraq, who showed that most hepatitis C blood donorswere blood group O (45.5%), while the least was AB blood type(7.9%) [17]. However, it was not agreed with that found by Naseri et al. 2016 in Iran who mentioned that different blood groups had not a significant effect on the incidence of HCV infection among their studied patients [18], while Bahardoust et al. 2019 in Iran mentioned that HCV was more prevalent among patients with blood group O (41.9%) [19].

Regarding the mean viral load in HCV-infected patients, we found that those with blood type AB had higher mean viral loads(5.6 log10 IU/mL), while those with blood type A reported the least mean viral load (5.16 log10 IU/mL). Our findings were inconsistent with that confirmed by Noreen et al. 2021 in Pakistan, who demonstrated that patients with the O blood group (60.37%) were reported to have higher viral load than any of the other blood groups[1].

The fact that a high viral load was connected with the Rh factor of the patients drove us to investigate this line. Although more Rh-negative individuals were seen with chronic HCV, the signal strength of their factor was much less than that of the Rh-positive factor. Patients with an Rh-positive had an increased risk of HCV infection and demonstrated the highest mean viral load. These results were in the same line with that found in Iran by Bahardoust et al. 2019[19] and Naseri et al. 2016 [18] and another study in Pakistan by Sreedhar et al. 2015 [20]. On contrary, Noreen et al. 2021 showed that the Rh-negative factor (26.42%) was associated with higher viral load (2.283 log10 IU/mL) than that of the Rh-positive factor (73.58%) which was 1.949 log10 IU/mL[1].

Conclusion

The ABO blood group system provided evidence that the blood group system had a contributing role in HCV viremia. In this regard, individuals with blood type O were more vulnerable to HCV, while AB blood type was least. In addition, people with HCV who had blood type AB were more likely to have higher viral load than those with other blood types.To improve the lives of people with HCV as well as healthcare workers, it is important for society to be more aware of this chronic dreaded viral infection.

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Tables:

Table 1. Age distribution among the studied patients with hepatitis C virus.

Age group (Year)	Number	Frequency (%)
18 - 26	73	31.87
27 - 35	31	13.53
36 - 44	27	11.79
≥ 45	96	41.92
Total	229	100

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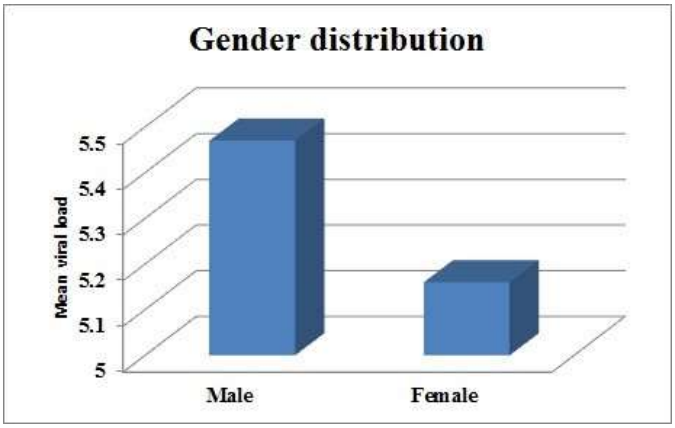

Figure 1. Viral load among male and female patients infected with hepatitis C virus.

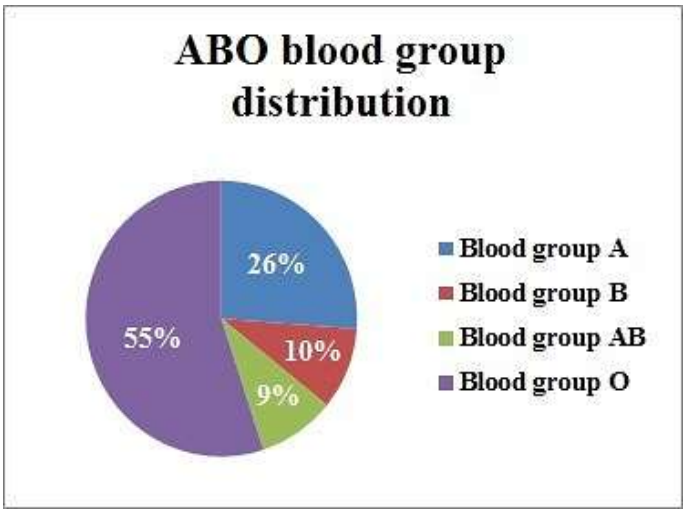

Figure 2. Blood group distribution among studied subjects.

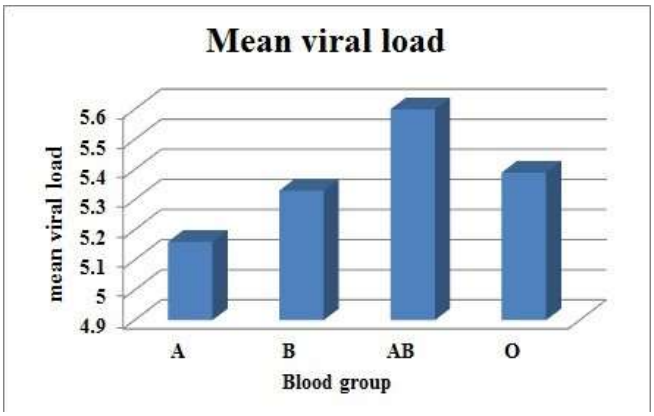

Figure 3. Viral load among different blood groups of hepatitis C patients.

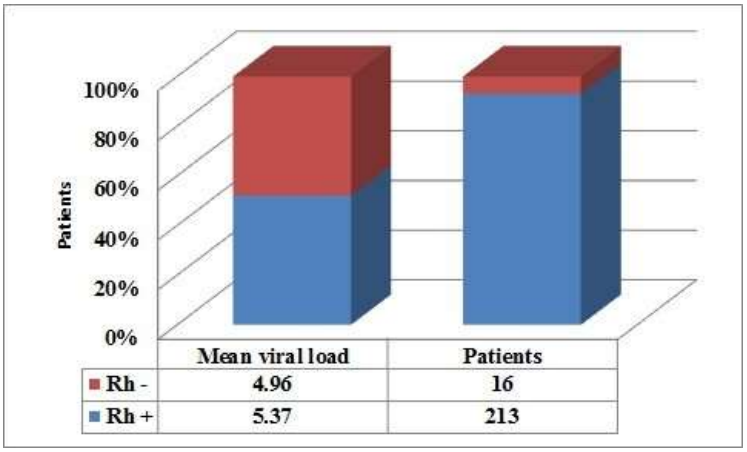

Figure 4. Distribution of viral load among patients with hepatitis C infection with different Rh factors.