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Distribution of ABO/Rhesus Blood Groups Among Hepatitis B and C Virus (HBV Ag, HCV Ab) Positive Patients in Anbar Providence, Iraq

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ABSTRACT

This study aimed to retrospectively investigate the prevalence of Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) infections among blood donors at Anbar Blood Bank in Iraq. The study also explored the correlation between ABO and Rh blood groups with Transfusion-Transmissible Infections (TTIs) and sociodemographic factors and cross-sectional retrospective study was conducted on 100 blood donors at Anbar Blood Bank from March 24, 2023, to June 21, 2023. Inclusion criteria encompassed HBV and HCV-positive patients who provided consent, while exclusion criteria included individuals without HBV and HCV infections. Blood samples (5 mL) were collected, and tests for TTI markers (HBV, HCV) and ABO and Rh blood grouping were performed using enzyme-linked immunosorbent assay (ELISA) and slide method, respectively. Sociodemographic data, TTI marker results, and ABO and Rh blood types were recorded for analysis. Descriptive analysis of sociodemographic data was performed, and a chi-square test was employed to assess the correlation between ABO and Rh blood groups with TTI markers and sociodemographic factors (Age, sex, and living area). Statistical significance was set at $P<0.05$. The results revealed a male predominance (71%), with the majority aged between 20-30 years (39%) and residing in rural areas (52%). The most common blood group was O+ (39%), while AB- was the least prevalent (0%). In terms of viral infections, 80% of participants were found to be infected with HBs Ag, and 20% with HCV Ab. Notably, blood group O+ exhibited the highest infection rates for both HBs (28%) and HCV (11%), while blood group A- demonstrated the lowest HBs infection rate (3%) and no HCV infection. The study provides valuable insights into the prevalence of HBV and HCV infections among blood donors in Anbar, Iraq. Additionally, correlations between ABO and Rh blood groups, TTI markers, and sociodemographic factors were explored. The findings contribute to the understanding of transfusion safety and may inform blood screening and donor selection protocols.

Keywords- ABO, Hepatitis B, Hepatitis C, Viral infection, Transfusion-Transmissible Infections.

I. INTRODUCTION

The Hepatitis B virus (HBV) is one of the small encapsulated viruses that belong to the family Hepadnaviridae[1]. The Hepadnaviridae virus causes both acute and chronic viremia and antigenemia infections. Additionally, there is a strong hepato tropism and somewhat strict species specificity in this virus family. The hepatitis B virus may survive outside of a living organism for at least seven days [2]. If an individual who has not been vaccinated comes into touch with the virus during this period, it may cause disease. The incubation period of the hepatitis B virus is 75 days on average, although it can take anywhere from 30 to 180 days. Chronic hepatitis B may result from the infection if it persists. After 30 to 60 days of infection, it can be detected[1]. Hepatitis B virus (HBV) infection is a major global public health concern [3].

The ABO blood system has four blood groups: A, B, AB, and O. The first known genetic polymorphism in humans is this one. They are essential to the physiology and pathophysiology of red blood cells and are present on their surface. grasp a range of disorders requires a grasp of the ABO blood type system. Blood

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group structures can explain a relationship between blood groupings and health [4]. These days, research has demonstrated that having an ABO blood type raises the risk of cardiovascular disease in addition to various malignancies, including epithelial ovarian, stomach, pancreatic, and skin cancers [5–6].

Epidemiological research has looked at the relationship between blood type and HBV infection, but the results have been inconsistent[7]. found that blood groups B (9.6%) and AB (9.1%) had lower HBV prevalence, but blood group O (10.2%) had greater prevalence [8]. suggested that blood group O was associated with a greater incidence of HBV infection. Donors with blood type O exhibited lower levels of the hepatitis B surface antigen (HBsAg), according research by Mohammadali et al. [9]. Still, Szmuness et al. [10, 11] and Behal et al. [12] failed to find a link between blood type and HBV infection. Thus, the question of whether blood type and HBV infection are related remains unanswered, as does the question of which antigen is protective or dangerous. We did a systematic review and meta-analysis to clarify the connection between ABO blood types and the risk of acquiring HBV. This will support our efforts to eradicate HBV as a worldwide public health problem by enhancing blood safety and preventing HBV infection.[13]

II. METHODS AND MATERIALS

At the Anbar Blood Bank in Iraq, a cross-sectional retrospective study was carried out on 100 blood donors out of 3865 total donors between March 24, 2023, and June 21, 2023. Patients who gave their consent and tested positive for HBV and HCV met the inclusion criteria. Patients who did not have an HBV or HCV infection met the exclusion criteria.

All blood donors provided five milliliters of blood, from which TTI markers (HBV, HCV) and ABO and Rh blood grouping tests were conducted. Each blood donor's serum sample was examined using an enzyme-linked immunosorbent assay (ELISA). Using third-generation ELISA, the HBV surface antigen (HBsAg) and anti-HCV antibody (anti-HCV) were examined. Using commercially available antisera, both forward and reverse ABO grouping were achieved using the slide method (anti-A and anti-B and Rh typing). All donor information was recorded in informed records, including pertinent sociodemographic, TTI marker results, and ABO and Rh blood types.

Following approval from the Anbar Health Directorate Blood Bank, the data were gathered. After being verified as complete, the data were imported into SPSS version 23 for additional examination. ABO and Rh blood groups with TTI markers and ABO and Rh with sociodemographic data (Age, sex, and residing area) were correlated using a chi-square test, which was used to do descriptive analysis on the sociodemographic data. A P-value of less than 0.05 was deemed statistically significant.

III. RESULTS

The study conducted showed the percentage of males was higher than the percentage of females (71%, and 29%), respectively, this results explained in (Table No.1)

Table 1: Showed the frequency and percent of participant sex

Sex	Frequency (n)	Percent (%)
Male	71	71
Female	29	29
Total	100	100

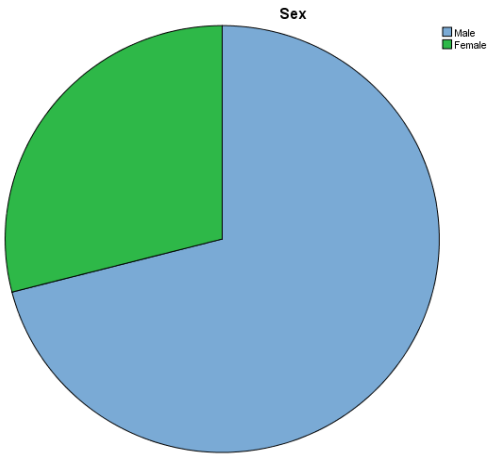

Figure 1: Shows the percentage of participants *Sex*

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Volume-3 Issue-2 || April 2024 || PP. 45-53

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While the higher frequency and percentage of age periods were (20-30 years), with a percentage (39%). Followed successively by (30-40 years), (less than 20 years), (40-50 years) and finally (above 50 years) and in percentages (37, 13, 9, and 2 %) respectively.

Table 2: Showed the frequency and percent of participant Age periods

Age periods	Frequency (n)	Percent (%)
less than 20 Years	13	13
20-30 Years	39	39
30-40 Years	37	37
40-50 Years	9	9
More than 50 Years	2	2
Total	100	100

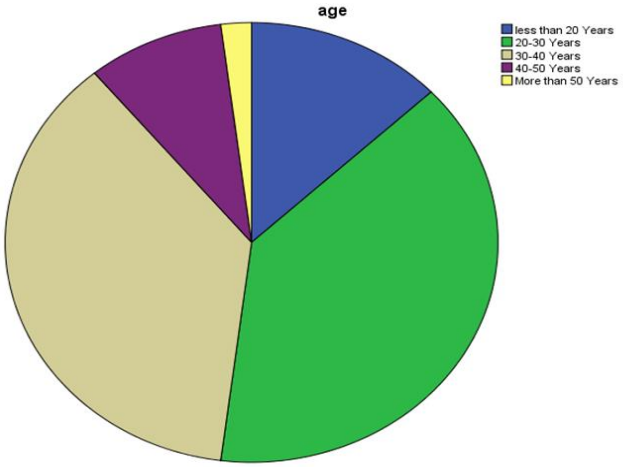

Figure 2: Showed the percentage of participants age

Table No. 3 represents the percentage of the living area of participants in the study, which showed that 48% of participants live in the city, while 52% live in the countryside. This result gives the impression that most people infected with the viral infection living in the countryside.

Table (3) showed the frequency and percent of participant Living area

Living area	Frequency (n)	Percent (%)
City	48	48
Country side	52	52
Total	100	100

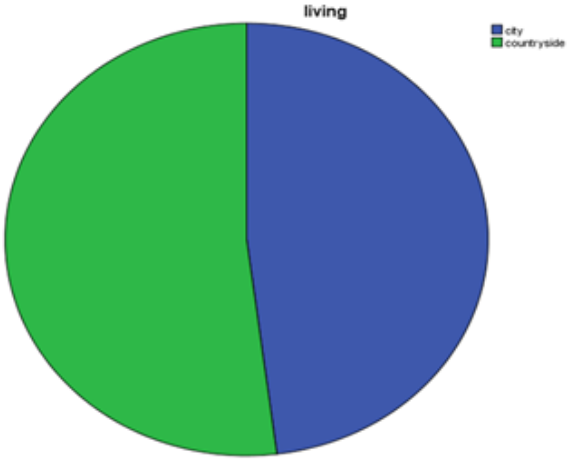

Figure 3: Showed the percent of participitants living area

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Table No. 4 shows the percentage and frequency of viral infection (HBs Ag and HCV Ab) for participants in the study. The results were found that 80% were infected with the HBS Ag virus while 20% were infected with the HCV Ab virus.

Table 4: Showed the frequency and percent of participant Viral infection

Viral infection	Frequency (n)	Percent (%)
HBS Ag	80	80
HCV Ab	20	20
Total infection	100	100

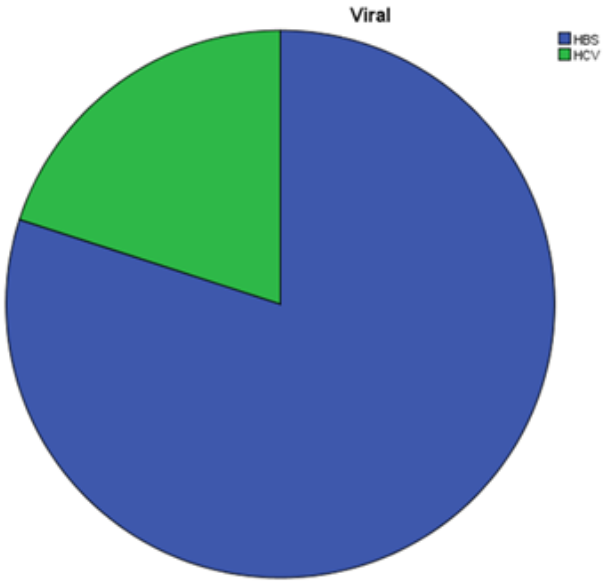

Figure 4 : Showed the percent of participitants Viral infection

The current study (Table 5) showed the frequency and percentage of blood group types for the participants. The highest percentage was for the (O+) (39%), while the lowest percentage was for the (AB-) (0%). The other types A+, B+, and B- ranged in percentages of 18 and 16%, and 12% respectively. While the blood group types for O-, AB+, and A- were less percentage from AB- and have (7%, 5%, and 3%) respectively.

Table 5: Showed the frequency and percent of participants Blood groups

Blood group	Frequency (n)	Percent (%)
A+	18	18
B+	16	16
A-	3	3
B-	12	12
AB+	5	5
AB-	0	0
O+	39	39
O-	7	7
Total	100	100

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Volume-3 Issue-2 || April 2024 || PP. 45-53

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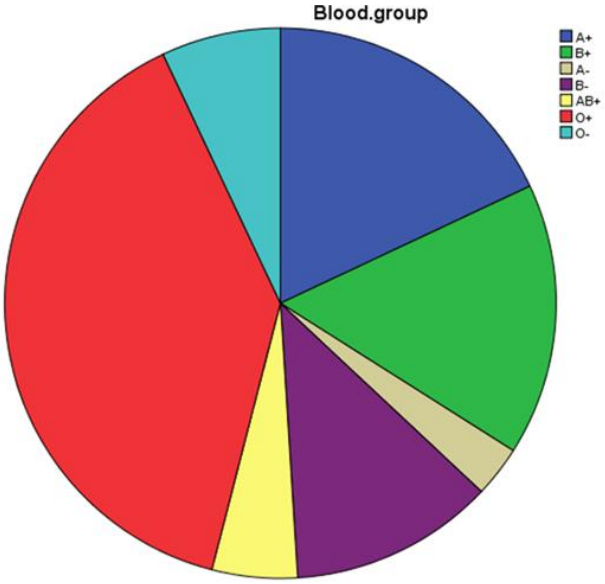

Figure 5: Showed the percent of participants blood group types

The current study showed that the highest age group of participants was 20-30 years old, with a percent 39% (24% for males) and (15% for females), while the lowest age group was over 50 years old, with a percent 2% (2% for males) and (0% for females). The age group percent (20-30 years) was 37% (29% for males) and (8% for females), in addition to the percentage of the age group under 20 years was 13% (9% for males) and (4% for females). In addition, the age percentage (40-50 years) was 9% (7% for males) and (2% for females). Although the value of X^2 (3.771) was not significant (less than 5%) and without correlation, the results showed that the largest age group for participants was 20-30 years.

Table 6: Showed the relation (Chi-sequare) between age period and Sex

Age period	Sex			Chi-square	P-value	Correlation	P-value
	Male(%)	Female(%)	Total(%)				
Less than 20 years	9	4	13	3.711	0.466	0.145	0.091
20-30 Years	24	15	39				
30-40 Years	29	8	37				
40-50 Years	7	2	9				
More than 50 Years	2	0	2				
Total	71	29	100				

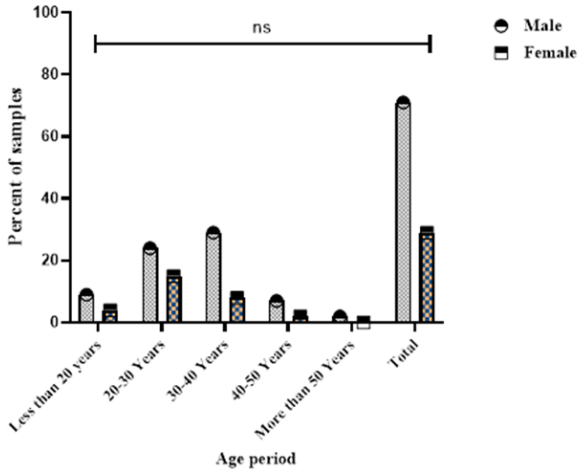

Figure 6: Showed the relation (Chi-sequare) between age period and Sex

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The current study found that the highest percentage of participants for males and females was blood group O+ 39% (31% for males and 8% for females), while the lowest percentage was blood group AB- was 0%. The study results showed no correlation between blood groups and the sex of participating samples, with a value of X^2 (7.489) and P-value (0.278). While the value of person correlation was (0.152) without significant differences (P-value = 0.097).

Table (7) showed the relation (Chi-sequare) between Blood group types and Sex

Blood group	Sex			Chi-square	P -value	Correlation	P -value
	Male(%)	Female(%)	Total(%)				
A +	11	7	18	7.489	0.278	0.152	0.097
B +	11	5	16				
A -	3	0	3				
B -	7	5	12				
AB +	2	3	5				
AB -	0	0	0				
O +	31	8	39				
O -	6	1	7				
Total	71	29	100				

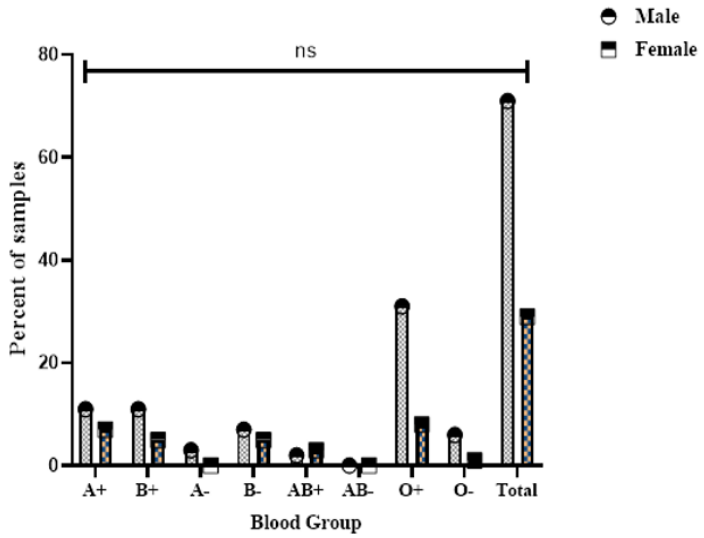

Figure (7) showed the relation (Chi-sequare) between Blood group and Sex

Out of 100 study samples, the study showed that the majority of participants with blood type O+ live in the countryside, at a percent 20%, while those who live in the city 19%. Next comes the A+ group, with a percentage of 9% who live in the city and the same percentage who live in the countryside. In addition, the rest of the blood groups were distributed differently. For example, the B+ group showed the largest percentage of those who live in the countryside, at 10%, while the AB+ blood group showed that those living in the city had a higher percentage 4%, while those who lived in the countryside had a higher percentage of 1%.

Table (8) shows that the value of X2 was (5.818) with a p-value (0.444) while the person correlation value was (0.068) with a p-value (0.502) and this indicates that there is no significant correlation between the blood group types and living area.

Table 8: Showed the relation (Chi-square) between Blood group types and living area

Blood group	Living area			Chi-square	P-value	Correlation	P -value
	City(%)	Countryside(%)	Total(%)				
A +	9	9	18	5.818	0.444	0.068	0.502
B +	6	10	16				
A -	0	3	3				
B -	6	6	12				

ISSN: 2583-4053
Volume-3 Issue-2 || April 2024 || PP. 45-53
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AB +	4	1	5				
AB -	0	0	0				
O +	19	20	39				
O -	4	3	7				
Total	48	52	100				

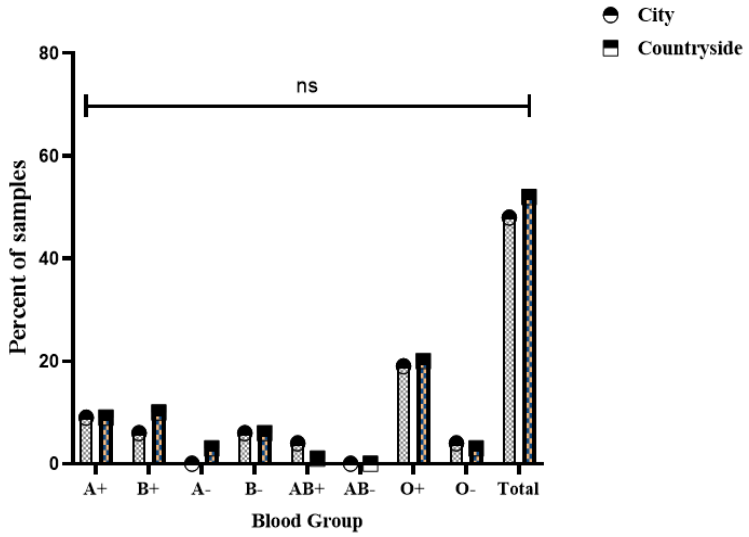

Figure 8: Showed the relation (Chi-square) between Blood group and living area

From the study conducted, (Table 9) showed that the O+ blood group was the most infected with viral hepatitis B, at a percentage of 28%, while the blood group least infected with the same type of virus was A- with a percentage of 3%. The order of the blood groups was from the highest viral infection with hepatitis B to the lowest (A+, B+, B-, O-, and AB+) with percentages (16%, 11%, 10%, 7%, and 5%), respectively. While the percentage of those infected with viral hepatitis B for blood group AB- was 0%.

Through studying and examining the participating samples, it was found that the largest percentage of people infected with viral hepatitis C was blood group O+ with a percentage of 11%, followed by blood group B+ with a percentage of 5%. While the results showed that the blood group A+ infection percentage was 2%. The rest of the blood groups did not show any infection with viral hepatitis C with a percentage of 0%.

Even though it was not statistically significant (X2 = 7.269, p - value = 0.267), According to this study, blood group O+ has the highest prevalence of HBs cases. HCV was shown to be comparatively more common in the O+ blood group.

Table 9: Showed the relation (Chi-sequare) between Blood group types and Viral infections

Blood group	**Viral**			**Chi-square**	**P - value**	**Correlation**	**P-value**
	HBs (%)	**HCV(%)**	**Total(%)**				
A +	16	2	18	7.629	0.267	0.047	0.644
B +	11	5	16				
A -	3	0	3				
B -	10	2	12				
AB +	5	0	5				
AB -	0	0	0				
O +	28	11	39				
O -	7	0	7				
Total	80	20	100				

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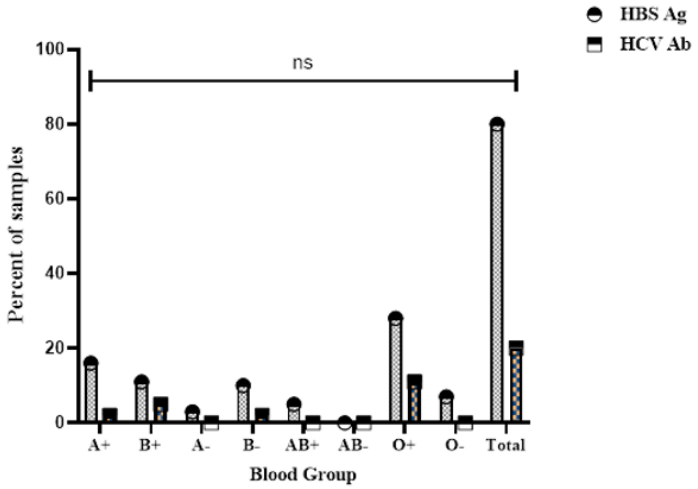

Figure 9: Showed the relation (Chi-square) between Blood group and Viral Hepatitis

IV. DISCUSSION

There is proof that certain infectious diseases are associated with ABO polymorphism. The presence or lack of A/B antigens and the accompanying presence or absence of anti-A/B antibodies determine whether an organism has strong or weak defenses against infection. Because they preserve the ABO gene, many vertebrate species have profited from it. It might not matter, though, if a species shared both functioning A and B genes, as it might ultimately lose its anti-A/B antibodies. On the other hand, recombination with partly functional genes or frequent A/B specificity gene conversion leading to amino acid modifications may have created a defense mechanism against microbial invasion.[14]

Red cell surfaces that have been glycoconjugated are effective receptors for attachment for bacteria, viruses, and parasites. Because infectious pathogens typically employ cell surface glycoconjugate as receptors for attachment, glycosylation variations in the ABO blood type may affect host-pathogen connections and result in susceptibility disparities across people with varied glycosylation profiles.[15]

The results of our study indicated that blood type O with Rh positive had the highest percentage of viral infection (HBs and HCV). Additionally, there was no discernible change in viral infection or blood types ($p > 0.5$). This study and the one by Alireza Emami Naein, et al., are complementary.[16]

A research on blood types and the degree of fibrosis in chronic viral hepatitis C found that types A, B, and AB, ABO were associated with increased thrombotic events. It was discovered that blood types other than O can be associated with an increased risk of venous thrombosis.[17[

The study done by [18], showed that was not significant ($p=0.62$) between ABO and viral infection by hepatitis (B and C), While it was acknowledged that blood groups A and B had the lowest positivity rates and blood group AB had the highest prevalence of HBV, this study contradicts our findings in other ways.

Additionally, studies conducted by Prakash et al[19] and Sreedhar Babu et al[20] revealed no association between viral markers and ABO blood groups, and these two studies were corresponded with our study results.

However, a study carried out by Liu et al[8] showed that blood group O was associated with an increased HBV infection rate, this study showed substantial agreement with our study on Iraqi samples.

The results of our study indicated that blood groups A and O had a higher percentage of hepatitis infection (C) with no statistically significant differences. This is consistent with a study by Biruk Legese et al. [18] which demonstrated that donors in blood groups A and O had a significantly higher prevalence of HCV positive. This mismatch may arise from the characteristics of the research participants as well as differences in the blood type frequency distribution among different ethnic groups.[8]

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Volume-3 Issue-2 || April 2024 || PP. 45-53

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