

RESEARCH ARTICLE

Association of Viral Hepatitis with ABO Blood Group in apparently Normal Iraqi Blood Donors

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ABSTRACT

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are counted as a public health issue worldwide. The virus is transmitted to infect others through blood and blood products. Appointed blood groups and Rh-positive are more prone to the transmission of the infection by blood transfusion.

The aim of this study is to find out the frequency of hepatitis B and C in apparently healthy blood donors and whether there is an association between ABO and Rh blood groups.

ABO blood groups and their relationship with HBV and HCV infections were studied in 87,124 blood donors of both genders. Out of these donors, 353 individuals were found to be infected with HBV and HCV with a ratio of 1:250.

The study was conducted between January to June 2018, which was presented to the Central Blood Bank in Baghdad and Al-Razi Medical Centre.

It found that most hepatitis B and C blood donors were blood group O with a prevalence of 33.7 and 45.5%, respectively, while the results for those with blood group A showed 28.5 and 22.7% HBV and HCV infections, respectively.

On the other hand, the incidence of HBV in individuals with blood group B was 29.8%, and HCV was 23.8%. AB blood group donors demonstrated the least incidence at 7.9% for both HBV and HCV. In conclusion, it has been found that there is a significant association between blood groups and Rh factor with hepatitis B and C infections.

Keywords: Blood groups, Blood transmitted infections, Bloodborne diseases, Rh factor, Viral infections.

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INTRODUCTION

ABO blood groups have displayed an association with specific infectious diseases.^{1,2}

The two main types of hepatitis, B (HBV) and C (HCV), are among the most serious and very prevalent infectious diseases; they are considered one of the major health problems in developed countries.³⁻⁶ HBV infection is the tenth cause of death in the world.^{7,8}

HCV virus is an identifiable cause of transfusion-related non-A, non-B hepatitis, and the main mode of efficient transmission of HCV infection is via blood transfusion.⁹ Over the last decade, there was a debate regarding the association between blood groups and specific disease transmission in obviously normal asymptomatic people, particularly viral infections; this relation is thought to be caused by the interaction between microorganisms and red blood cell membrane, which could be due to antigenic similarity, deregulation of antibody response, and affinity towards common receptors.¹⁰

The incidence of certain diseases is proved to be related with specific ABO Blood groups; for instance, diabetes mellitus (DM) type 2 is higher in blood group B compared to blood group O,⁸ also, type A has a higher incidence of salivary glands and gastric cancer than type O group.⁶

In Iraq, blood group O, Rh-positive is the dominant type,¹¹ however, there is no previous study illustrating the association between blood group types and frequency of HBV and HCV infection. Therefore, this study is trying to determine the frequency HBV, HCV among male blood donors in the central blood bank in Baghdad and Al-Razi Medical Centre under the supervision of the Iraqi Red Crescent Society, moreover, to assess the association of blood group type with HBV and HCV infections in those blood donors.

MATERIALS AND METHODS

The study was conducted in Central Blood Bank in Baghdad and Al-Razi Medical Centre under the supervision of Iraqi Red

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Crescent. 87,124 individuals, both males and females aged 20 to 60 years, were included in the study; blood donors samples were collected over a period of six months from January to June 2018. The medical history of each person recruited in the study was taken; donor selection criteria were followed to eliminate professional donors (Appendix 1). Verbal consent was obtained, and the study aim was explained to the participants; all ethical aspects were considered, and confidentiality was maintained. Hepatitis C infection was diagnosed by the detection of anti-hepatitis C virus (HCV-AB) using enzyme-linked immune sorbent assay (ELISA) technique (Fortress Diagnostics ELISA manufactured in the UK).

A similar process was done for the detection of hepatitis B surface antigen (HBs-Ag). Initial reactive samples were tested in duplicate. All the reactive samples were repeatedly tested before labeling them seropositive.

The ABO blood group was determined by forward blood grouping and reverse blood grouping, by test tube agglutination method. Rh-negative blood groups were confirmed by the antiglobulin technique. The results were analyzed statistically using the SPSS program, version 25. Comparison between the groups assessed for significance by the implementation of the chi-square test. The p value of <0.05 considered a significant difference between the various groups.

RESULTS

The study population consists of 87,124 blood donors; the blood samples were collected from all donors for the investigation of blood group and viral hepatitis. 86,253 of the donors were male (99%), and 871 were female (1%). The period of study was six months (from January to June 2018). During this period,

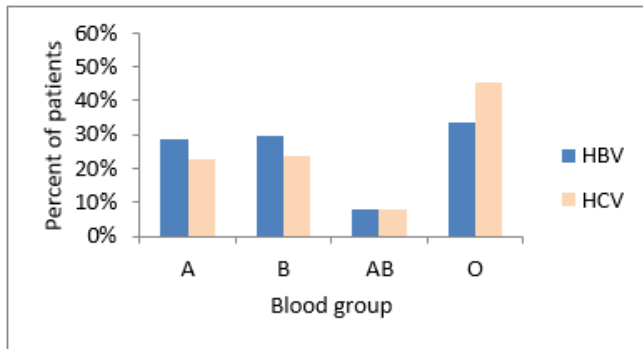


Figure 1: Prevalence of HBV and HCV in different blood group

Table 1: Frequency of hepatitis B and C among blood donors per month

Month	No. of donors	HBV positive		HCV positive	
		Count	%	Count	%
January	15,406	49	0.32%	19	0.12%
February	13,714	51	0.37%	16	0.12%
March	16,497	48	0.3%	19	0.12%
April	13,939	34	0.24%	21	0.15%
May	15,235	41	0.27%	15	0.1%
June	12,333	29	0.24%	11	0.1%
Total	87,124	252	0.29%	101	0.12%

353 donors' blood results were positive for viral hepatitis. 252 donors were diagnosed with HBV, and 101 donors were diagnosed with HCV.

The overall prevalence of HBV was about double compared to the prevalence of HCV at 0.29% and 0.12%, respectively (Table 1). By comparing the prevalence of HBV and HCV in each month during the period of study, it has been found that there is no significant difference ($p > 0.05$).

The ABO blood group distribution with HBV positive was as follows (Table 2 and Figure 1): highest incidence noted in those with group O, 85 donors (33.7%); closer results seen in group B, 75 donors (29.8%), and group A, 72 donors (28.5%); while, the least incident observed in those with group AB, 20 (7.9%).

On the other hand, the distribution of blood groups with positive HCV showed that donors with blood group O, 46 donors (45.5%) have the highest positive results, which is roughly double than those with group A, 23 donors (22.7%); while, group B, 24 donors (23.8%) and lowest percentage seen in group AB, 8 donors (7.9%).

The distribution of Rh in donors with HBV showed 230 (91%) Rh-positive, which is ten commoner compared to Rh-negative 22 (9%); however, donors with HCV showed 95 (94%) Rh-positive and 6 (6%) Rh-negative, as illustrated in Table 3 and Figure 2. Regarding the blood group in donors with HBV, there is a significant difference between different blood groups ($p < 0.05$). The eloquent result is observed between

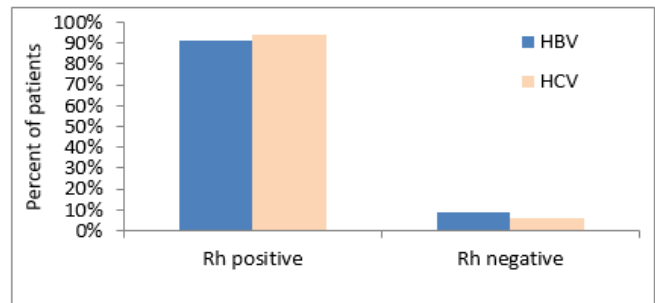


Figure 2: Prevalence of HBV and HCV in Rh⁺ and Rh⁻ factor donors

Table 2: Distribution of blood group in donors with positive HBV and HCV

Blood group	HBV		HCV	
	No.	%	No.	%
A	72	28.5	23	22.7
B	75	29.8	24	23.8
AB	20	7.9	8	7.9
O	85	33.7	46	45.5
Total	252	100	101	100

Table 3: Distribution of Rh factor in donors with positive HBV and HCV

Rh factor	HBV		HCV	
	No.	%	No.	%
Rh positive	230	91	95	94
Rh negative	22	9	6	6
Total	252	100	101	100

blood group AB and O. In terms of blood group distribution in donors with HCV, there is also a significant difference between blood groups ($p < 0.05$). The main significant difference is observed between the blood group AB and O.

DISCUSSION

Hepatitis or inflammation of the liver can be due to various reasons for which viral infection is the most serious, which may lead to a great morbidity and mortality.¹² Different types of viral hepatitis are present, but HBV and HCV represent significant public health problems all over the world. These infections can be transmitted through blood transfusion; therefore, HBs-Ag and HCV-Ab screening is carried out routinely in all blood transfusion centers.¹³

The prevalence of the hepatitis B virus varies from country to country, depending on the complex interaction of behavioral, environmental, and host factors. The present study deals with the prevalence of HBV and HCV infection in apparently healthy blood donors in Baghdad.

The seroprevalence of HBs Ag was 0.29% (during the period of the study from January to June 2018). The result findings indicate that HBV seroprevalence was lower compared to those reported for Iraq in previous studies.^{14,15} Ataallah *et al.*¹⁶ found HBs Ag seroprevalence of 0.66% in blood donors in Baghdad. Before 2000, it was 0.97% in blood donors and 4.17 in the apparently healthy population.^{14,17}

One large scale community-based study established in Iraq found that HBs Ag seroprevalence was 1.6%.¹⁸ Alsamarai *et al.*¹⁹ found in a study performed in Iraq during the period of 2011 to 2013 that HBs Ag seroprevalence was 3.3%. Considering Iraq's geographical region, it is found to be similar to the United Arab Emirates in having intermediate endemicity, while Kuwait, Bahrain, and Iran having low endemicity, Jordan, Palestine, Saudi Arabia, and Yemen have high endemicity.^{20,21}

In our study, the seroprevalence of HBs Ag among blood donors (0.29%) is at a lower rate when compared to the previous studies. This study showed the prevalence of HCV infection among apparently healthy donors was 0.12%. Comparing the result of other studies, it is considered of low prevalence. According to a retrospective cross-sectional observational study during the year 2006 to 2009, the prevalence of HCV infection was 0.7%.¹⁶

In comparison with other countries, the prevalence of anti-HCV in Kuwait was 0.8%; in Jordan, it was 0.9%.^{22,23} There are several studies that show the association of blood groups and various diseases, and there is evidence that people with O blood group and positive Rh are more vulnerable to bloodborne infections.^{24,25} In our study, the seroprevalence of HBs Ag and HCV Ab were found to be higher in donors with blood group O, 33.7 and 45.5%, respectively, and lowest in donors with blood group AB, 7.9 and 7.9%, respectively, and these results agreed with studies reported by Omar *et al.*,²⁶ Ali reza EN *et al.*,²⁷ R. Behal *et al.*,²⁸ and Alaoddoleheno H *et al.*²⁹

Host factors play a role in the genesis of this disease.³⁰ Also, blood group O, Rh-positive is more liable to develop hepatitis as shown in this study and other results,²⁶ hence, the association

between HBV and HCV infections and blood group antigens cannot be ruled out. Nevertheless, there are studies presented evidence that the link between blood groups and hepatitis B and C were insignificant.²⁸ This is maybe due to the possibility of antigenic differences between the viruses that would lead to a difference in the results or may be due to small sample size and study design differences.³⁰

In the current study, a significant correlation was observed between positive Rh factor and hepatitis infection; Rh⁺ was more common among people with HBs Ag and HCV Ab (91, 95%, respectively) comparing with Rh⁻ result HBs Ag 9% and HCV Ab 6%, as shown in Figure 2. Our results are consistent with data presented by Omar *et al.*²⁶ and Kumar *et al.*,³¹ who reported that O positive Rh blood groups show the highest rate of hepatitis. Another study in India³² demonstrated that bloodborne infections were more common among people with negative Rh, that people with negative A blood group had a higher rate of HBs Ag, which was controversial to our findings.

In conclusion, many factors, whether racial, social, geographical, and national differences, have an influence on hepatitis infection,³³ and it is recommended that more investigations be conducted on blood groups and Rh in order to prevent bloodborne infectious diseases in the future.

Appendix 1

Donors selection criteria that were followed to eliminate professional donors.

- General health: Should be healthy and not having any transmittable disease
- Age must be in between 18 to 65 years, and should be 50 kg weight as minimum
- Stable heart rate between 50 to 100 beat/min regular beats
- Normocytic normochromic with hemoglobin level of 12.5g/dL as minimum
- Blood pressure and temperature should be within normal level, 50 to 100 mmHg dia and 100 to 180 mmHg sys, and 37.5°C maximum oral temperature
- The minimum period between each successive donation should be more than 3 months

While, those who are suffering from serious conditions are not allowed to donate blood

- HIV positive people
- DM, hypertension, cardiac problems, cancer, epilepsy, kidney disease
- People who underwent immunization for the past month, treat rabies, or receive HB vaccine for at least 6 months in the past
- Persons with a tattoo or other implanting accessories, such as, ear piercing in the past 6 months
- Alcoholic persons and not ceased for 24 hours
- Pregnant and lactating women, and women with abortion or miscarriage in the past 6 months
- A person who undergo surgeries or have a major dental procedure for the past month
- Those who are suffering from tuberculosis, asthma, and allergic conditions in the past

REFERENCES

- Jefferys SD, Kenneth CA. Transfusion Biology and therapy. Gerad L. Mandell, Principles and practice of Infectious Diseases 6th ed. Philadelphia: Churchill Livingstone. 2005;46:708.
- Umit T, Tiftik EN, Sakir U, Ozrur G, Tamer IK, Handan C. Relationship between ABO blood group and skin. *Dermatol Online J*. 2008;11(3):1-6.
- Rifat-uz-Zaman. Comparative immunogenicity of commercially available recombinant vaccines against hepatitis B in human urban population of Bahawalpur district, Pakistan. *J. Biol. Sci.* 2006; 6:1053-1058. Available from: doi.org/10.3923/jps.2006.1053.1058.
- Hejazi, M.S., R. Ghotaslou, M.F. Hagh and Y.M. Sadigh. Genotyping of hepatitis C Virus in north west of Iran. *Biotechnology*. 2007; 6:302-308. Available from: doi.org/10.3923/biotech.2007.302.308.
- Hemeida, A.A., M. Osman, M. El-shahat, M.H, Hashem, A. Mohammed and H.Dahi. Genetic variations in a conserved 5'-untranslated region of hepatitis C virus isolated from Egypt. *Int. j. Virol*. 2011; 7:91-99. Available from: doi.org/10.3923/ijv.2011.91.99.
- Kilic IH, Koruk MM, Ozaslan M, Karagoz ID, Zer Y, Koruk M, Uyar C, Guler I. Mutation analysis of protein kinase binding domain of HCV NS5A gene isolated from patients with chronic hepatitis C. *International Journal of Pharmacology*. 2012; 8(6):519-26. Available from: doi.org/10.3923/ijp.2012.519.526
- Kao JH, Chen DS. Global control of hepatitis B virus infection. *Lancet Infect Dis*. 2002;2(7):395-403. Available from: doi.org/10.1016/s1473-3099(02)00315-8
- Shepard CW, Simard EP, Finelli L, Fiore AE, Bell BP. Hepatitis B virus infection: epidemiology and vaccination. *Epidemiologic reviews*. 2006 Aug 1;28(1):112-125. Available from: doi.org/10.1093/epirev/mxj009
- Zeisel MB, Barth H, Schuster C, Baumert TF. Hepatitis C virus entry: molecular mechanisms and targets for antiviral therapy. *Frontiers in bioscience (Landmark edition)*. 2009;14:3274-3285. Available from: doi.org/10.2741/3450
- McBride WJ. Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases 7th edition.
- Suad AZ et al., relationship between ABO blood groups and lone atrial fibrillation in Iraqi patients. *Am. J. Pharm Tech Res*. 2018; 8(5): 275-280. Available from: doi.org/10.46624/ajptr.2018.v8.i5.022
- Pallavi K, Sravani D, Durga S, Durga PN, Pavan PN, Babu PS, Raviteja K. Hepatitis review on current and future scenario. *J In Silico In Vitro Pharmacol*. 2017;3(1):1-5. available from: https://pharmacology.imedpub.com/
- Anwar MS, Siddiqi GM, Haq S, Khokhar G, Jaffery GH. Association of blood group types to hepatitis B and hepatitis C virus infection. *Biomedica*. 2011 Jan;27(12):57-61.
- Hussein AA. Epidemiological study on prevalence of Hepatitis B virus among Baghdad population in 2007. *AL-Faith Journal*. 2008;37.
- Al-Mashhadani JI. *Seroepidemiological study on HBV and HCV infections among health care workers* (Doctoral dissertation, Ph. D. Thesis. College of Medicine, University of Baghdad).1998
- Ataallah TM, Hanan KA, Maysoun KS, Sadoon AA. Prevalence of hepatitis B and C among blood donors attending the National Blood Transfusion Center in Baghdad, Iraq from 2006- 2009. *Saudi Med J*. 2011;32(10):1046-1050.
- AL-Hammieary TK. *Seroepidemiology and molecular study of 29. Hepatitis B virus in AL-Rusafa sector of Baghdad* (Doctoral dissertation, Ph. D. Thesis. College of Science. University of Baghdad).2009.
- Tarky, A., Akram, W., Al-Naaimi, A., & Omer, A. Epidemiology of viral hepatitis B and C in Iraq: a national survey 2005-2006. *Zanco Journal of Medical Sciences (Zanco J Med Sci)*, 2018; 17(1), 370_380. Available from: https://doi.org/10.15218/zjms.2013.0017
- Alsamarai AM, Abdulrazaq G, Fatah A, Alobaidi AHA. Seroprevalence of Hepatitis B Virus in Iraqi Population. *J Vaccines Immunol* 2016: 102. Available from: doi.org/10.29011/2575-789X.000102
- Janahi EM Prevalence and Risk Factors of Hepatitis B Virus Infection in Bahrain, 2000 through 2010. *PLoS ONE*. 2014; 9(2): e87599. Available from: https://doi.org/10.1371/journal.pone.0087599
- André F. Hepatitis B epidemiology in Asia, the Middle East and Africa. *Vaccine*. 2000;18 (1):S20-S22. Available from: doi.org/10.1016/s0264-410x(99)00456-9
- Ameen R, Sanad N, Al-Shemmari S, et al. Prevalence of viral markers among first-time Arab blood donors in Kuwait. *Transfusion*. 2005;45(12):1973-1980. Available from: doi.org/10.1111/j.1537-2995.2005.00635.x
- Al-Gani FA. Prevalence of HBV, HCV and HIV-1, 2 infections among blood donors in Prince Rashed Ben Al-Hassan hospital in North region of Jordan. *Int J Biol Med Res*. 2011;2(4): 912-916.
- Sathe PV, Toshniwal MH, Gosawi SB. ABO Blood Groups and Seropositivity For Syphilis in Blood Donors and Antenatal Cases. *Indian J Dermatol Venereol*. 1973;39(4):170-171.
- Naseri Z, Ghannad MS, Hosseini SM, Roshanaei G, Nejad AS, Mohammadi A. Evaluation of accompaniment of ABO blood groups system and rhesus blood group types with infection to hepatitis B virus and hepatitis C virus in Hamadan, Iran. *International Journal of Medical Research & Health Sciences*. 2016;5(4):1-5. Available online at www.ijmrhs.com
- Aljooani O, Al-Hayani N, Mohammed M. The infection with HBV and HCV and their relationship to ABO blood group among blood donors. *JFacMedBagdad [Internet]*. 1Apr.2012 [cited 17Sep.2020];54(1):52-6. Available from: http://iqjmc.uobaghdad.edu.iq/index.php/19JFacMedBaghdad36/article/view/771
- Naeini AE, Rostami M, Naeini SE. Chronic viral hepatitis and their relation to ABO blood groups and rhesus (Rh) factor. *Medical Case Studies*. 2010 Oct 30;1(1):5-7. Available from:doi.org/10.5897/MCS.9000003
- Behal R, Jain R, Behal KK, Dhole TN. Variation in the host ABO blood group may be associated with susceptibility to hepatitis C virus infection. *Epidemiol Infect*. 2010;138(8):1096-1099. Available from: doi.org/10.1017/S0950268809991117
- Alaoddoleheno, H., Sadighian, F., and Shahandeh. Z. The study of ABO groups and Rh factor in Active and Non-active carriers of Hepatitis B virus. *J. Hepatitis Monthly*. 2007;7(1):43-44.
- Mujeeb SA, Shahab S, Hyder AA. Geographical display of health information: study of hepatitis C infection in Karachi, Pakistan. *Public health*. 2000 Sep 1;114(5):413-415. Available from: doi.org/10.1038/sj.ph.1900669
- Kumar MR, Rao MS, Pulicherla KK, Ghosh M, Kumar MH, Rekha VP. Studies on the distribution of hepatitis B (HBV) and human immunodeficiency virus (HIV): their relation to blood

- groups and rhesus (Rh) factor in Guntur district of Andhra Pradesh, India. *Asian J Pharm Clin Res.* 2013;6(1):109-1.
32. Banu, A., Ahmed, S., & Shastri, S. (1). Distribution Of Abo And Rh Blood Groups In Hiv Seropositives At An Integrated Counseling And Testing Centre In Karnataka, India. *SAARC Journal of Tuberculosis, Lung Diseases and HIV/AIDS*,2011; 8(2), 42-45. Available from: doi.org/10.3126/saarctbv8i2.5901
33. Lao TT, Sahota DS, Chung MK, Cheung TK, Cheng YK, Leung TY. Maternal ABO and rhesus blood group phenotypes and hepatitis B surface antigen carriage. *Journal of viral hepatitis.* 2014 Nov;21(11):818-23. Available from: doi.org/10.1111/jvh.12219