



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

Zahra Naseri¹, Masoud Sabouri Ghannad^{2*}, Seyed Mostafa Hosseini², Ghodratollah Roshanaei³, Amir Sasan Mozaffari Nejad² and Afshin Mohammadi¹

¹*Blood Transfusion Research Centre, High Institute for Research and Education in Transfusion Medicine, Hamadan, Iran*

²*Research Center for Molecular Medicine, Department of Microbiology, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran*

³*Modeling of Noncommunicable diseases Research center, Department of Biostatistics and Epidemiology, School of Public Health, Hamadan University of Medical Sciences, Hamadan, Iran*

* Corresponding E-mail address: sabouri@umsha.ac.ir

ABSTRACT

People with certain blood groups and Rh positive are more prone to infections transmitted by blood transfusion. The aim of this research was to survey the of accompaniment of ABO Blood Group System and Rh type with infection to hepatitis B virus and hepatitis C virus in Hamadan Blood Transfusion Organization, Iran. This was a retrospective study in patients during years 2006-2013 in Hamadan blood transfusion Organization. The population of blood donors were tested for blood borne infections, including HBsAg and HCV. Logistic regression was used and collected data were analyzed using SPSS version 16. The number of 1036 cases of referred population had a background of infected hepatitis B and C. Different blood groups had not a significant effect on the incidence of hepatitis B and C viruses. But the Rh difference had a significant effect so that people with Rh-negative, had the risk of incidences to hepatitis B as 0.53 folds than positives while people with Rh-positive, had the risk of incidences to hepatitis C as 1.87 folds than Rh-negatives. This study emphasizes that there is a more possibility for transmission of HBV and HCV infections for people with negative and positive Rh more than others do but it cannot be referred to a specific blood group. It is recommended that in planning of disease prevention in the country, broad spectrum of research will perform about the role of ABO system and Rh in afflicting to viral infections as the priority for sanitation authorities.

Keywords: HCV, HBsAg, Rh, ABO Blood groups

INTRODUCTION

Blood-borne pathogens such as HIV, HBV and HCV can be transmitted to the people in the process of blood transfusion [1]. There is low probability [1%] that pathogens will transmit in 1 blood unit transfusion [2]. Study of the possible relationship existing between blood groups and blood borne diseases has been attracted much attention in recent years. There are evidences suggesting that blood groups play a role in proneness to diseases such as

stomach ulcer, stomach cancer, eritroblastosisfetalis, coronary artery disease, venous thromboembolism, endocrine tumors in men, and epithelial ovarian [3,4].

Evidences collected by Ansteeet *al.*[3] have shown the association between infectious diseases in humans with ABO blood groups and genes secreting them, but according to the report, other blood group antigens appear to be more influenced by fundamental effects like polymorphism of blood groups. For example, a study conducted in Thailand showed that the plurality of people with ABO blood groups were similar to others in the primary dengue virus infection, however, in the secondary infections, people with A and B blood groups were more vulnerable to grade 3 dengue hemorrhagic fever in comparison with grade 1 and 2 ones [5]. Another study carried out in Bam, Kerman, Iran, demonstrated that, in the same age, gender, and living-environment groups, people with O blood group are 8.3 times vulnerable to Cholera than others. Moreover, the probability of having Cholera for people with Rhesus blood group types[Rh⁻] were 3.2 times higher than people with Rh⁺[6]. Mourant and *et al.* reported that the differences between the frequency of people with blood group A and those with blood group B is due to random genetic variation, fundamental effects, and natural selection among various blood groups [7]. Furthermore, the interaction between microorganisms and red blood cell membrane probably is due to antigenic similarity, adhesion through specific receptors, or regulation of antibody responses [8]. Human red blood cells have surface antigens A, B, and AB that determine the types of blood groups.

There is no antigen in the red blood cell surface of people belonging to the O blood group. But they have antibodies against blood groups A and B. People with A blood group have antibodies against the B antigen, and vice versa, while people with AB blood group do not have any antibodies against blood group antigens in their serum [9]. These facts have a pivotal role in determining the natural resistance of human body against agents of infectious diseases with the same surface antigens.

People with blood group AB are more sensitive to infectious agents who contain A, B or both antigens. This issue is because there are no antibodies against A and B antigens of blood groups in the people with AB blood group. According to the undeniable importance of this issue and considering that there is no previous study that assess the associations between people with A, B, O, and Rh blood groups with people with hepatitis B and C in this specific area of Iran, the aim of the present study was to investigate the potential role of blood groups and Rh and infection to HBV and HCV infections among people referring to Blood Transfusion Organization of Hamadan.

MATERIALS AND METHODS

This retrospective study was performed among patients referring to Blood Transfusion Organization of Hamadan, a western province in Iran during the years 2006 and 2013. Moreover, all ethical consideration for keeping the personal information of patients was performed.

Data collection and laboratory tests

All personal and demographic information of patients including age, sex, marital status, location, occupation, education level, and blood group and Rh blood donors have been documented by the Blood Transfusion Organization. All blood donors were tested for the presence of blood borne diseases such as HBV, HCV and HIV infections. HBsAg Enzygnostic 6-0 kit manufactured by Siemens, Hepanostika HCV Ultra kit manufactured by Beijing United Biomedicine Company, and Vironostika HIV Ag-Ab manufactured by Biomerieux Company was used for testing HBsAg, anti-HCV and HIV Ag-Ab, respectively. Initial tests were performed by ELISA method. In the cases with positive results HBcAb, RIBA, Western Blotting-P24 tests were applied for proving the results obtained for HBS Ag, HCV Ab, and HIV Ag-Ab respectively. The distribution of ABO and Rhesus blood group types was investigated in the aforementioned infected people with HBV and HCV.

Statistical Analysis

SPSS software version 16 was utilized for performing statistical analysis. Descriptive statistics was applied for summarizing data and in order to assess the effects of variables on the type of viral infection, logistic regression was used. Moreover, the significant level was set at 0.05.

RESULTS

A total number of 228409 people referred to the organization for donating blood during aforementioned years. Of these, 1036 people had a history of hepatitis B and C diseases, including 197 unmarried persons and the rest were married. Nine hundred and sixty six individuals were males and 70 persons were females. People who had viral diseases were comprised of 84 persons with negative Rh and 952 positive persons with Rh. The seroprevalence rate of diseases investigated in the present study based on the blood group and Rh factor of people are indicated in Table 1. According to this table, among those who were infected by blood borne viruses, 396 people were positive HCV and 640 people were positive HBs Ag. O+, A+, and B+ in order, were the most widespread blood groups among the people with positive HCV. Likewise, these three blood groups were the most common ones among people with positive HBs Ag. Moreover, AB- was the least prevalent blood group among both people with positive HCV and positive HBs Ag. However, by comparing the percentages of various blood groups, it can be seen that the positive HCV had the highest prevalence among people belonging to the B+, O+ and A+ respectively. Furthermore, A-, B+ and A+ blood group in order had the highest percentage of positive HBs Ag.

Table 2 shows the assessment of risk ratio for people with various blood group and Rh that are infected with viral infections. Based on the analyzed data which are shown in this table, there was no significant association between blood groups and hepatitis B or C [*p-value*>0.05]. However, a significant association was found between Rh type and affliction to disease [*p-value*<0.05] so that people with negative Rh have 47% less chance than others to have hepatitis B and people with positive Rh were 1.87 times more likely to have hepatitis C.

Table 1. The distribution of healthy and infected people among various blood groups in Hamadan Blood Transfusion Organization during 2006-2013.

Blood group	HCV	HBS Ag	Total patients	Total Donors
	Number (%)	Number (%)		
A+	110(0.136)	178(0.273)	288	65666
A-	9(0.132)	30(0.440)	39	6817
B+	97(0.199)	168(0.346)	265	48839
B-	4(0.083)	12(0.250)	16	4791
AB+	22 (0.141)	39(0.251)	61	15563
AB-	0(0.000)	3(0.177)	3	1692
O+	145(0.189)	193(0.254)	338	76706
O-	9(0.108)	17(0.204)	26	8335
Total	396(0.17377)	640(0.281075)	1036	228409

Table 2, the association of blood groups and Rh type among donors infected by viral diseases referring to Hamadan Blood Transfusion Organization during 2006-2013.

Dependent Variables	Independent Variables	P-value	Odds ratio	95% confidence interval	
				Lower limit	Upper limit
Hbs Ag	Rh	0.04	0.53 ^{1*}	0.32	0.89
	group	0.14	0.93	0.84	1.03
HCV	Rh	0.016	1.87 ^{2*}	1.12	3.13
	group	0.17	1.08	0.97	1.2

*1** and *2** indicate the odds ratio of people with positive Rh in comparison with people with negative Rh in infection to HBV and HCV.

DISCUSSION

Several studies have attempted to explain the relationship between transmissions of infection with ABO blood groups. There are evidences that people with O blood group and positive Rh are more vulnerable to blood borne infections [10]. To address this issue in the current research, we presented evidence that the effects of blood group types on the hepatitis B and C were insignificant. However, it is notable that based on our data a significant effect was observed for Rh type so that people with negative Rh had have 47% less chance than others to have hepatitis B. This observation is in keep with a research that declared the highest percentage of HBsAg, in negative Rh patients [11]. Moreover, people with positive Rh were 1.87 times more likely to have hepatitis C. This is not according to the aforementioned research that showed the highest percentage of Anti HCV in negative Rh [1]. Our results might suggest that there is a more possibility for HBV and HCV infections for people with negative and positive Rh respectively more than others but it cannot be referred to a specific blood group. Larger scale investigations are required to develop the knowledge of this feature

These findings are partially compatible with the results reported in another study that was carried out in Babol, another city in Iran. In that study, they did not find a significant association between chronic hepatitis B and its treatment and ABO blood groups, but they found that the association between Rh type and chronic hepatitis B was significant so that 97.9% of chronic carriers had positive Rh [12].

Although, in the present study, a significant correlation was not observed between being infected and blood group types. However, the prevalence of HCV and HBV among people with O+ [338], A+ [288], and B+ [265] blood groups were higher than others. Also, in another study conducted by Behalet *et al.* [13], no significant association between positive HBsAg status and blood group types was pointed out. Consistent with the data already presented a study which carried out in Iraq showed that HBsAg and HCVAb were prevalent among people with O blood group and were scarce among people with AB blood group. Moreover positive Rh factor was more common among people with hepatitis infection than people without infection [14]. Furthermore, Kumar *et al.* had reported that the highest rate of hepatitis were among people belonging to O and positive Rh blood groups [15]. In another study in Nepal, no significant association was found between HBV and blood groups, but a higher tendency to these diseases was observed among people with positive O blood group [16]. No consistent association between the results published by Shavakhiet *et al.* [17] and our findings was found. They illustrated that having blood groups except the O blood group are a genetic risk factor in progressing liver fibrosis. This can be due to the higher probability of venous thrombosis among patients infected by HCV. Although there are evidences that support the association between positive Rh and diseases, nevertheless, a study conducted on 6000 blood donors, who were apparently healthy in India demonstrated that blood borne infections were more prevalent among people with negative Rh, so that people with negative A blood group had a higher rate of HBsAg. In addition, most people with HCV infection belonged to negative B blood group [18]. A study conducted in China revealed that people with AB and B blood groups were more infected by hepatitis B virus than people with other blood groups [20]. However, in another study conducted in Iran, it was indicated that the percentage of CD4⁺[T] lymphocytes in people with B blood group were higher than in people with other blood groups. As a result, it can be inferred that the risk of viral and infectious disease are low among people who belong to B blood group.

In conclusion, the picture that has emerged from numerous studies investigating the correlation between blood groups and the risk of infectious diseases has identified a complicated association in this regard. Different published results in this subject, makes it difficult to make firm conclusions. Thus, the real association between blood group and infectious diseases remains the subject of debate. It is speculated that there are other possible factors, such as national and racial differences, that may have an influence on this complicated correlation [19]. Besides, it is clear that more research is needed to clarify a better understanding on the subject. According to the findings of the present study, it is recommended that future goals be included investigations on blood groups and Rh types in order to prevent the transmission of blood borne diseases. Moreover, undertaking further research to determine the special blood groups as increased risk for categorized donors is recommended.

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