



## Evaluation of the Relationship between ABO Blood Groups, Rh Factor and Diabetes Mellitus Type 2

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### ABSTRACT

**Objective:** To find out the association of type II diabetes mellitus (DM) with different ABO and Rh blood groups. **Materials and methods:** The study included 300 people including 150 patients with type 2 diabetes who attended the Imam Hussein Medical City and 150 healthy people as controls who attended the blood bank to donate blood for the time from October 2016 to September 2017. Group 1 (diabetics) and Group 2 (healthy controls), both groups were examined for ABO and Rh. **Results:** Blood groups O and AB showed a more common association, whereas patients with blood group A were associated less commonly with diabetes mellitus (DM), as compared to controls. Blood group B showed similar distribution among both groups. The higher percentage of controls than diabetics had Rh-positive blood group (93.3% vs 88.0%), whereas more percentage of diabetics showed Rh-negative blood group (12.0% vs 8.7%). The higher percentage of diabetics with blood group O and B were positive, whereas controls with blood group A and B were with a higher percentage. **Conclusion:** Our study concluded that there is no relationship between ABO/Rh and diabetes mellitus in this group of the Iraqi population.

**Keywords:** ABO blood groups, Rh factor, Diabetes mellitus

### INTRODUCTION

The "ABO" system consists of 4 major "ABO" phenotypes "A", "B", "O", and "AB". Phenotypic ABO blood categories are polymorphic, inherited, antigenic chemicals found on the top of red blood cells in addition to cells of other tissues. The "ABO" blood sort was initially determined by Karl Landsteiner in 1900. "ABO" and "Rhesus" blood kind antigens are major human blood kind system antigens with the best importance in transfusion treatments [1]. The blood class of a person identified by small carbohydrate epitopes is determined by the occurrence or absence of genes "A" and "B". The gene is put on chromosome 9q34 and contains 7 exons distributed pass on disperse over 18 kb called "ABO" blood classes [2]. The main human blood group system is ABO and their groups vary significantly in several races, ethnic groups and socio-economic groups in several parts of the world [3]. All human masses share the same blood group systems, although they differ in the rate of recurrence of certain species. Blood group antigens are specific genetic and play an essential role in disease susceptibility [4]. The absence and occurrence of antigens with the blood group have been associated with some diseases that screen a strong relationship with ABO/Rh blood classes, notably peptic ulcer and gastric tumor. ABO also safely related with pancreatic tumor [5,6]. Various data also display that colorectal malignancy, duodenal ulcer, an ovarian tumor comes with a connection with ABO blood type. Cardiovascular system disease such as disease is also related to ABO blood group [7]. Diabetes is the most worldwide problem in public health. Diabetes is a major global health problem and is one of the most important contributing factors to early morbidity and mortality around the world [8]. The existing global amounts of diabetics are 382 million, and the quantity will probably be 592 million by the entire year 2035. Additionally, about 183 million people are unaware they have diabetes [9]. Diabetes has been substantive as a recent prevalent that is improving swiftly in producing countries. The causes of diabetes are complicated, but there are factors such as genetic, immunological and environmental factors which are involved. Diabetes has a genetic proneness, although environmental factors do play their role in its gene expression [10]. But still, limited studies are added in today's science literature about the relationship of "ABO" and "Rhesus" blood categories with type 2 DM [11]. Furthermore, this research endeavored to determine the possible relation between "ABO" and "Rhesus" blood classes with type 2 diabetes mellitus.

DM and blood groups are related to the broad hereditary immunoglobulin base [12]. Identify a positive relationship between DM and blood groupings may reflect a greater susceptibility and an adverse affiliation for protection against diabetes. Researches by Penner, et al., reported that the presence of a family background of diabetes has led to an early onset of the illness to the offspring [13-15]. Recently, the romantic relationship between ABO blood types and disease susceptibility has made a lot of attention [16]. Thus, we made an effort to discover the relationship between DM and ABO blood sets among the general population.

### MATERIALS AND METHODS

This is a case-control research and was conducted in the Medical Al Hussien Emam City in the holy province of Karbala, Iraq from October 2016 to September 2017. The analysis included 300 individuals, including 150 patients with type 2 diabetes and 150 healthy people. The patients were taking medication for diabetes during the analysis. Healthy people were taken as controls who visited the blood bank of Karbala Health Administration to donate blood during the study period. The blood samples were gathered by venipuncture, with 2 ml in EDTA containers. Determination of blood groups and Rh factor use the method of a clinical method based on antibody and antigen interaction [17]. Statistical evaluation was performed by Chi-square test, using SPSS software (version 18).

### RESULTS

The allocation of the ABO/Rh blood types amongst patients and the healthy group is shown in Table 1. ABO blood classes O and AB were overabundant in patients group than in a healthy group. The estimates were 43.3% and 23.3% for patients for blood kinds O and AB separately, and 36.7%, 20.0% for the healthy group. With reference to blood group, B was similar in patients and healthy group (19.3%). None of these differences were statistically significant ( $p=0.160$ ,  $\chi^2=5.165$ ).

The frequency of Rh+ positive subjects in the diabetic group was higher than in the control group (88.0%) and (12.0%) respectively. The frequency of Rh-negative subjects in the diabetic group was higher than in the control group (12.0%) and (8.7%) respectively, however, there were no significant differences ( $p=0.343$ ) in these samples ( $\chi^2=0.899$ ).

**Table 1 Distribution of blood groups and Rh factor within diabetes and healthy groups**

Groups		Total	Blood Groups				Rh Factor	
			A	B	AB	O	Rh+	Rh-
Patients	N	150	21	29	35	65	132	18
	%	100.0%	14.0%	19.3%	23.3%	43.3%	88.0%	12.0%
Healthy Group	N	150	36	29	30	55	137	13
	%	100.0%	24.0%	19.3%	20.0%	36.7%	91.3%	8.7%

Table 2 shows the apportionment of ABO/Rh blood species among both genders of both diabetic and healthy group. Percentages of blood groups O, B and A were more prevalent in the diabetic group among males (43.6%), (20.5%) and (15.4%) respectively, than females (43.1%), (18.1%) and (12.5%) respectively. While the healthy subjects, the B (25.7%) and O (43.2%) blood groups were more dominant in females than males (13.2%) and (30.3%) respectively. While the healthy subjects, the B (25.7%) and O (43.2%) blood groups were more dominant in females than males (13.2%) and (30.3%) respectively. There was no significant difference in the gender distribution of the patient's group ( $p=0.826$ ,  $\chi^2=0.896$ ) but there was a significant difference in gender distribution among healthy groups ( $p=0.008$ ,  $\chi^2=11.775$ ). The phenotype frequency of Rh+ subjects in the test group was higher in males (88.5%) than in females (87.5%). Conversely, in the control group, the female subjects appeared a higher frequency (93.2%) than the male subjects (89.5%). For Rh blood group, no significant difference in gender distribution was noted between the patients ( $p=0.856$ ,  $\chi^2=0.033$ ) and the healthy groups ( $p=0.412$ ,  $\chi^2=0.673$ ).

Table 2 Propagation of Diabetic mellitus through the foundation of gender

	Gender		Total	Blood groups				Rh factor	
				A	B	AB	O	Rh+	Rh
Patients	Male	N	78	12	16	16	34	69	9
		%	100.0%	15.4%	20.5%	20.5%	43.6%	88.5%	11.5%
	Female	N	72	9	13	19	31	63	9
		%	100.0%	12.5%	18.1%	26.4%	43.1%	87.5%	12.5%
Healthy Group	Male	N	76	21	10	22	23	68	8
		%	100.0%	27.6%	13.2%	28.9%	30.3%	89.5%	10.5%
	Female	N	74	15	19	8	32	69	5
		%	100.0%	20.3%	25.7%	10.8%	43.2%	93.2%	6.8%

Table 3 shows the distribution of combined ABO and Rh blood group. There seems to be no significant difference in AB and B blood groups. Percentage of B group was the same among the 2 groups of the subjects. In the combination of ABO blood group and Rh factor is deemed, it can be spotted that O+ group was more common in patients individuals than in control individuals. Blood group A negative was less prevalent in diabetic individuals. Blood group O was elevated within case group succeed by blood Group AB, B and A. Frequencies for the diabetes group was in order O>AB>B>A. Blood group frequencies order for the control group was O>A>AB>B.

Table 3 Distribution of combined ABO and Rh blood group in case group as compared to the control group

Blood groups	Groups			
	Patients		Healthy Group	
	N	%	N	%
A+	20	15.2%	32	23.4%
A-	1	5.6%	4	30.8%
B+	25	18.9%	26	19.0%
B-	4	22.2%	3	23.1%
AB+	30	22.7%	26	19.0%
AB-	5	27.8%	4	30.8%
O+	57	43.2%	53	38.7%
O-	8	44.4%	2	15.4%

### DISCUSSION AND CONCLUSION

The results of the present study provide support to the hypothesis that hereditary factors related to the apportionment of some blood groups may not exactly be involved in the expansion of type 2 diabetes mellitus. Blood group apportionment in different population communities can be an important awareness of healthcare [18]. The present research showed that blood group O and AB were overabundant in patients group than in a healthy group. Diabetes sufferers were more numerous 43.3% and 23.3% than control was 36.7%, 20.0% for the healthy group. With reference to blood group, B was similar in patients and healthy group (19.3%).

The results are very close to those of the 3 previous studies carried out on the same Iraqi population [19-21]. Some studies have assessed the possible relationship between diabetes mellitus and Rh blood group; however, the populations differ and the findings are conflicting [18]. Our study proved no association between the ABO group and diabetes mellitus in the holy Karbala province, Central Iraq. The present outcomes were in a similar arrangement with those of several other studies, for example, the main one Dali conducted in Algeria with an example size of 280 patients and 271 controls which mentioned that there was no association among the ABO blood groupings and diabetes mellitus [22]. Another study by Rahman in Bangladesh with an example size of 2312 patients and 8936 control, which concluded that there was no association among the ABO blood groupings and diabetes mellitus [23]. Also, the study that was carried out in India, which included 511 patients with type 2 diabetes mellitus and 454 healthy control topics, discovered there was no connection between ABO blood groups and type 2 diabetes mellitus [24]. Additionally, studies from Germany, Glasgow, Oslo, and the USA, the latter on the population of mainly Black descent, discovered that the incidence of diabetes mellitus was not related with the allocation of the ABO blood groups in these areas [25-28].

In the present study, there was no association between A, B, AB and O phenotype rate of recurrence and type 2 diabetes mellitus ( $p>0.05$ ). No significant outcomes appeared when the information was subdivided by gender source. Many studies have explained the same results [24,29]. The O blood group was more dominant in the diabetes patients than in the control topics; this variance in the rate of recurrence seems entertaining. Qureshi and Bhatti confirmed that DM type 2 and ABO blood categories are linked; they discovered that among 70 patients with DM, blood group B was more common and symbolized 35.71% in comparison to that of control, which symbolized only 22.14% of the sample people but statistical value had not been achieved ( $p>0.05$ ) [12].

The current study has shown the distribution of ABO and Rh group combined in diabetic as compared to control. When the blend of ABO blood group and Rh factor is recognized, it can be noticed that the O+ group was more prevalent in diabetic individuals than in normal individuals. A+ is less prevalent in diabetic individuals. This modern study is similar to the study of Hadeel and Krishnendu and his co-worker's study where it was shown that the O+ class is the most common group of type 2 diabetics [20,30].

### CONCLUSION

In this study, we wanted to demonstrate the theory of a relationship between blood groups (ABO/Rh) and type 2 diabetes, because of the genetic basis and overall immunity of both. However, it was concluded that blood groups did not differ significantly between type 2 diabetics and healthy individuals.

### DECLARATIONS

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#### Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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