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Evaluation of the relationship between ABO and Rh blood groups system with diabetes mellitus type 2 among Patients in Al-Muthanna Governorate

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Abstract

Background: The ABO blood types are linked to a number of serious chronic medical conditions. A link between the ABO blood group and risk for type 2 diabetes has been discovered in earlier investigations. The purpose of the research is to determine if type 2 diabetes and the ABO blood types are related in any way. **Methods:** A case control study that was carried out over the course of two years and eight months in the medical ward of Al-Khidhir General Hospital and a private clinic in the province of Al-Muthanna. There were 400 adults that took part, split into two groups as follows: 200 people with type 2 diabetes who were already getting treatment made up the case group, whereas 200 healthy people made up the control group. Each participant gave a blood sample, which was used for a blood group, Rh, and random blood sugar test. **Results:** Blood group O was shown to be the most likely to be protective against the development of type 2 DM (OR= 0.71) whereas blood group B was revealed to be a significant independent risk factor for increased chance of developing type 2 DM (OR= 2.07). As this research indicated, blood group B is associated with a high prevalence of type 2 diabetes, while blood group O has the least relationship, blood group is thought to be a risk factor and may help in disease assessment. Since people with blood group B are more prone to develop type 2 diabetes, clinicians should exercise more caution and close supervision of these patients.

Keywords: Type 2 diabetes mellitus, the Rh blood group, associations, and Iraq

Introduction

Diabetes mellitus (DM), one of the most significant public health problems in the world, has a detrimental effect on both socioeconomic development and public health [1, 2]. There were 463 million individuals with diabetes worldwide in 2019, according to the International Diabetes Federation. This number is anticipated to increase to 700.2 million by 2045 if appropriate preventive measures are not taken [3]. In Iraq, there are 1.4 million diabetics. IDF Type 2 DM prevalence in Iraq varied from 8.5% to 13.9% when adjusted for age [4]. Because to the functional and quality of life impairments caused by DM, there is a significant morbidity and early death rate [5]. There are several, well-known risk factors for getting DM. Furthermore, genetic and epigenetic factors could be involved [6]. The phenotypic ABO blood groups, which are polymorphic, hereditary, antigenic components, are found on the surface of tissues and red blood cells. It includes the primary "ABO" phenotypes "A," "B," "O," and "AB" [7]. It has been connected to a number of diseases, including cancer, vascular disease, hepatitis B1, gastric and duodenal ulcers, and hepatitis B1. While the findings were ambiguous and contradictory, several epidemiological research discovered a connection between the "ABO" blood group and the prevalence of type 2 diabetes [8, 9]. The pathophysiologic mechanisms underlying the association between Type 2 DM and associated factors and ABO blood group phenotypes are yet unclear. There are many options: The first is that some molecules connected to Type 2 DM are related to the ABO blood type. Increased levels of soluble intercellular adhesion molecule 1, E-selectin, P-selectin, and tumour necrosis factor-2, which are well-known DM risk factors, as well as other inflammatory markers have been linked to polymorphisms in ABO gene loci, particularly A and B antigens. These are well-known inflammatory mediators that alter insulin and its receptors, leading to the development of diabetes mellitus (DM) [10]. The makeup of gut flora, which has been connected to type 2 diabetes, and ABO blood types may also be related.

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In persons with type 2 DM, gut dysbiosis contributes to the development and maintenance of insulin resistance [11]. Conversely, several research found no connection between blood type and diabetes [12]. This research sought to determine if there was a connection between type 2 diabetes and the ABO blood types.

Patients and Methods

Timing, location, and study design: a case control study carried out over the course of two years and eight months, from February 2018 to October 2020, in the medical ward of Al-Khidhir General Hospital and a private clinic in Al-Muthanna Province. Study Sample size and population: There were 400 adult participants in the research. Two groups were created out of them: 200 individuals with type 2 diabetes who were already getting therapy made up the case group.

There were 200 healthy volunteers in the control group. They were recognised if, at the time of the trial, their venous blood glucose levels were 6.1 mmol/L and they were not using any DM medications. Individuals under the age of 18, those with known cases of thalassemia or sickle cell anaemia, people with mental conditions, and anyone who refused to participate in the research were excluded from the study. Age and gender specific data were gathered. Each participant gave a blood sample, which was used for a blood group, Rh, and random blood sugar test. The conventional slide agglutination test was used to detect the ABO and Rh blood types. These were completed at the central lab at Al-Khidhir General Hospital using standard practises.

The informed consent form that each participant completed gave us permission to study their medical records for research purposes, provided that the patient's identity and the confidentiality of their medical data were maintained. The Statistical Package for Social Sciences (SPSS), version 26, was used to examine the data. The mean, SD, and ranges of the data were reported. For categorical data, given as frequencies and percentages. The fisher exact test was used to compare study groups based on particular data when the anticipated frequency was less than 5, as opposed to the chi square test. P values of 0.05 or below were considered to be significant levels.

Results

In this study, mean age of participants was 42.9 ± 8.2 years and 59% of them were males as shown in table (1).

Table 1: Distribution of study groups by age and gender

Variable	Study group		Total (%) n= 400
	Case (%) n= 200	Control (%) n= 200	
Gender			
Male	122 (61.0)	114 (57.0)	236 (59.0)
Female	78 (39.0)	86 (43.0)	164 (41.0)
Mean ± SD		Mean ± SD	
Age (Year)	44.21 ± 7.3	41.58 ± 9.2	-

According to table (2), there were considerably more diabetes patients with blood group (B) than healthy volunteers (47.5% vs 28%, P= 0.001). Diabetes patients had a considerably lower prevalence of blood group (O) than healthy subjects (22% vs 47%, P=0.001). Rh type did not vary statistically significantly across research groups (P=0.093).

Table 2: Distribution of study groups by blood groups

Variable	Study group		Total (%) n= 400	P - Value
	Case (%) n= 200	Control (%) n= 200		
Blood group				
O	44 (22.0)	94 (47.0)	138 (34.5)	0.001
A	53 (26.5)	38 (19.0)	91 (22.8)	0.073
B	95 (47.5)	56 (28.0)	151 (37.7)	0.001
AB	8 (4.0)	12 (6.0)	20 (5.0)	0.358
Rh				
+	148 (74.0)	162 (81.0)	310 (77.5)	0.093
-	52 (26.0)	38 (19.0)	90 (22.5)	

The existence of type 2 DM was used as the dependent variable in the logistic regression analysis (table 3), and the factors that shown a significant correlation in the binary analysis were used as the independent variables. Blood group O was most likely to be protective against the development of type 2 DM (OR= 0.71), whereas blood group B was revealed to be a significant independent risk factor for a larger chance of developing type 2 DM (OR= 2.07).

Table 3: Logistic regression analysis for various risk factors with development of type 2 DM

Variables	Odd's ratio	95% C.I for odd's ratio	P - Value
Blood group B	2.07	1.05 – 3.14	0.012
Blood group O	0.71	0.37 – 2.2	0.033

Discussion

The study of blood type distribution is crucial because it has implications for genetics, blood transfusion, organ transplantation, genetic research, human evolution, and forensic pathology [13], but less is known about the blood groups' susceptibility to specific illnesses or health risks. The ABO and Rh blood types and diabetes have drawn the attention of several researchers. The results were variable, uneven, and different depending on the location. Despite the fact that some research has linked blood type to diabetes, others have not. This research found a link between blood group B and type 2 diabetes, whereas blood group O was linked with a lower risk of developing type 2 diabetes. There is no connection between the Rh blood group and the prevalence of type 2 diabetes. Studies conducted by Meo SA *et al.* in Saudi Arabia in 2016 [8], Bener A *et al.* in Qatar in 2014 [14], Qureshi MA *et al.* in Pakistan in 2003 [15], and Fagherazzi G *et al.* in France in 2015 [16] all concurred with the findings of this study when they reported an increased frequency of blood group B among diabetic patients. Various findings from research by Aggrawal T *et al.* in 2018 [9], Karagoz H *et al.* in 2015 [17], and others demonstrated a positive correlation between DM and Rh negative blood type and blood group AB and a high risk of developing DM. A 2015 research by Zhang C. *et al.* in China found a stronger correlation between blood type O and diabetes mellitus [18].

Given that race and location have an impact on how the illness is expressed genetically, these discrepancies in findings on the link between ABO blood types and DM may be explained by these factors. Further research and testing are needed to completely understand how the ABO and Rh blood types relate to diabetes. According to current genome-wide association studies, the "ABO" blood type antigen increases the overall inflammatory state of the body. Blood

markers of inflammation such as tumour necrosis factor (TNF)-alpha and soluble intercellular adhesion molecule-1 are linked with single nucleotide polymorphisms at the "ABO" locus ^[19]. Inflammation has been associated with higher TNF-alpha expression. It is widely accepted that the main factor causing insulin resistance, which in turn leads to the development of type 2 DM, is systemic inflammation ^[9]. Another hypothesis postulates that the ABO blood type is one of the genetically determined host factors that impacts the gut microbiota's composition, which has an impact on energy balance, glucose metabolism, and low-grade inflammation ^[20].

Conclusion

As this research indicated, blood group B is associated with a high prevalence of type 2 DM, but blood group O has the least relationship, blood group is thought to be a risk factor and may help in disease assessment. Since people with blood group B are more prone to develop type 2 DM, clinicians should exercise more caution and close monitoring of these patients. We advise doctors to keep a careful eye on persons with blood type "B," since they are more likely to acquire type 2 DM.

Conflict of Interest

Not available

Financial Support

Not available

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