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RESEARCH ARTICLE

Association of ABO and Rh blood groups with type 2 diabetes mellitus in Muzaffarnagar city

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ABSTRACT

Background: The "ABO" blood group system is associated with some diseases including gastric and duodenal ulcer, hepatitis B1, vascular diseases, abdominal aortic aneurism, and cancers. Some epidemiological studies demonstrated the linkage among the "ABO" blood group and the risk of type 2 diabetes mellitus (DM). **Aims and Objective** -This study aimed to find out the possible linkage between "ABO" and "Rhesus" blood groups with type 2 DM. **Material and Methods:** This study was carried out in Department of Physiology, Muzaffarnagar Medical College and Hospital, Muzaffarnagar from April 2017 to June 2017. This study included total 1316 individuals in which 104 were diabetic patients, and 1212 individuals were non-diabetic apparently healthy controls. Diabetic patients were taken from diabetic outpatient clinics, and the controls were taken from healthy individuals coming for blood donation at blood bank of Muzaffarnagar Medical College and Hospital, Muzaffarnagar. Standard slide agglutination test for the determination of ABO and Rh blood groups was used. Data thus obtained were analyzed by applying Chi-square test to determine any association between DM and different ABO and Rh blood groups. Data were expressed as percent and absolute number of frequency. **Results:** Increased frequency of blood group AB and blood group O (18.26% vs. 10.31%, 34.61% vs. 29.31%) were found in diabetes. On applying Chi-square test, statistically significant association was found between blood groups AB and O and DM (Chi-square value - 8.24, $P < 0.04$). Increased frequency of Rh positive blood group in diabetic (96.15% vs. 95.54%) but association between Rh blood group and diabetes was not statistically significant. (Chi-square value - 0.021, $P = 0.88$). **Conclusion:** Blood group might be a risk factor and it can be helpful for the evaluation of the disease.

KEY WORDS: ABO Blood Group; Rh Blood Group; Type 2 Diabetes Mellitus

INTRODUCTION

The phenotypic ABO blood groups are polymorphic, inherited antigenic substances found on the surface of RBCs in addition to other tissues. The "ABO" blood group was first discovered by Karl Landsteiner in 1900. "ABO" and "Rhesus" blood group antigens are major human blood group system antigens with prime importance in transfusion medicine.[1] The blood type of an individual defined by small carbohydrate epitopes depends on the presence or absence of genes "A" and "B". The gene is positioned on chromosome 9q34 and consists of 7 exons spread over 18kb called "ABO" blood groups.[2] The "ABO" system contains 4 major "ABO" phenotypes "A", "B", "O", and "AB". The "ABO" blood group system is associated with some diseases including gastric and duodenal ulcer,[3] hepatitis B1, vascular diseases,[4] abdominal aortic aneurism,[5] and cancers.[6,7] Some epidemiological studies demonstrated the linkage among the "ABO" blood group and the risk of type 2 diabetes mellitus (DM), although, the findings were no consistent and not yet clearly clarified.

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The incidence of DM has broken all the previous incidence records. The current global numbers of diabetic patients are 382 million and the number is likely to rise to 592 million by the year 2035. Moreover, about 183 million people are unaware that they have diabetes.[8] The incidence of DM has been linked with many factors such as genetic, environment, diet, obesity, and lack of exercise. However still, limited studies are added in the current science literature regarding the correlation of "ABO" and "Rhesus" blood groups with type 2 DM. Therefore, this study aimed to find out the possible linkage between "ABO" and "Rhesus" blood groups with type 2 DM.

Objective

This study aimed to find out the possible linkage between "ABO" and "Rhesus" blood groups with type 2 DM.

MATERIALS AND METHODS

This study was carried out in Department of Physiology Muzaffarnagar Medical College and Hospital, Muzaffarnagar from April 2017 to June 2017. This study included total 1316 individuals in which 104 were diabetic patients, and 1212 individuals were non diabetic apparently healthy controls. Diabetic patients were taken from diabetic outpatient clinic of Muzaffarnagar Medical College and Hospital, Muzaffarnagar. These patients were already diagnosed to have diabetes, were under treatment, and coming for follow-up to hospital for their management. The controls were taken from healthy individuals coming for blood donation at blood bank of Muzaffarnagar medical college, Muzaffarnagar over this study period.

Inclusion Criteria

All diabetic patients who consented to be included in study were enrolled irrespective of their age, sex, socioeconomic status, or duration of disease.

The study protocol was approved by the ethical review committee of Muzaffarnagar Medical College. The risk and benefit of the study were explained to all individuals and informed written consent was obtained. After a thorough clinical examination of each individual, the information was recorded in a data schedule. Standard Slide Agglutination test for the determination of ABO and Rh blood groups was used.

Statistical Analysis

Data thus obtained were analyzed by applying Chi-square test to determine any association between DM and ABO and Rh blood groups. Data were expressed as percent and absolute number of frequency. The $P < 0.05$ was considered to be statistically significant.

RESULTS

The distribution of ABO and Rh blood group among healthy individuals and diabetic patients is shown in Tables 1 and 2. As shown in Table 1, on comparing with control, we found increased frequency of blood group AB and O (18.26% vs. 10.31% and 34.61% vs. 29.31%) in diabetic. The association between blood group ABO and DM was statistically significant (Chi-square value - 8.24, $P < 0.04$). As shown in Table 2, on comparing with control, we found increased frequency of Rh+ blood group (96.15% vs. 95.54%) in diabetic but no statistically significant association was found among Rh blood group and DM (Chi-square value - 0.021, $P = 0.88$).

DISCUSSION

Many investigators have tried to identify a possible association between ABO and Rh blood groups and DM. The results have been variable, inconsistent, and differed from one region to other. Some people have identified an association between blood group and diabetes but there are studies where are studies where no association could be established.

Results of this study indicate that individuals with blood group AB and O were more likely to have DM. The association of blood group ABO and DM was statistically significant. Individual with Rh positive blood group are more likely to have diabetes, but the association between Rh blood group and diabetes was not statistically significant.

Table 1: Distribution of ABO blood groups in diabetics as compared to controls

Blood group	Diabetics (%)	Control (%)
A	17 (16.19)	278 (22.93)
B	32 (30.76)	446 (36.7)
AB	19 (18.26)	132 (10.31)
O	36 (34.61)	356 (29.37)
Total	104 (100)	1212 (100)
Chi-square value	8.24	
Degree of freedom	3	
P	0.04	

Table 2: Distribution of Rh blood groups in diabetics as compared to controls

Blood group	Diabetics (%)	Control (%)
Rh+	100 (96.15)	1158 (95.54)
Rh−	04 (3.80)	54 (4.45)
Total	104 (100)	1212 (100)
Chi-square value	0.021	
Degree of freedom	1	
P	0.884	

We found that blood group AB, has high risk of developing DM. Our results are also similar with Karagoz et al.[9] Waseem et al.,[10] who found high percentage of blood group AB in diabetics and positive association b/w Rh negative blood group and diabetic. Bibawi and Khatwa[11] who found the frequency of blood groups A and AB increased in DM patients. Sidhu et al.[12] has increased association of blood group AB with diabetis mellitus. Wherever decreased association of blood group AB with diabetis mellitus found in study of Buckwalter,[13] Zhang et al.[14]

Our study has increased association of blood group O with DM. This results are similar with Karagoz et al.,[9] Zhang et al.,[14] and dissimilar with Kamil et al.,[15] Fagherazzi et al.[16] Bener and Yousafzai,[17] Qureshi and Bhati.[18]

Our study has decreased association of diabetes with blood group B. This finding is similar to Qi et al.[19] but different from Kamil et al.[15] and Bener and Yousafzai,[17] Joseph,[13] Hadeal and Ali,[20] Moinzadeh et al.[21]

The possible explanation of conflicting results regarding the association between ABO blood groups and DM could be racial and geographical variations playing role in the genetic expression of the disease.

The possible mechanism in the development of an association among "ABO", Rhesus blood types and incidence of type 2 diabetes is still not well defined. The recent genome-wide association studies suggest that the "ABO" blood group antigen enhances the general body inflammatory state. Single nucleotide polymorphisms at the "ABO" locus are linked with two serum markers of inflammation, tumor necrosis factor (TNF)-alpha and soluble intercellular adhesion molecule - 1.[22,23] Increased expression of TNF-alpha has been associated with inflammation.[24] It is well known that the systemic inflammation is the main cause of insulin resistance and ultimately plays a role in the development of type 2 diabetes.[25,26] The experimental and epidemiologic studies suggest that "ABO" blood groups b and type 2 diabetes may be interrelated because of broad genetic and immunologic basis.

Limitations

The possible explanation of these conflicting findings is that probably racial and geographical factors have a role in genetic expression of disease. Moreover, most of the studies conducted in this regards have small size. Probably studies on larger scale and a meta-analysis of work done so far will provide a solution to this dilemma.

CONCLUSION

The evolution of the type 2 diabetes in a dramatic way in the developing countries as epidemic made to find new risk factors. In our study, the results showing that increased frequency of blood group AB and blood group O in DM. We may conclude that blood group might be a risk factor and it can be helpful for the evaluation of the disease.

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