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Original Research Article

To determine the association of ABO & Rh blood groups with Type 2 Diabetes Mellitus

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Abstract:

Introduction: Human ABO blood groups antigens exhibit alternative phenotypes and genetically derived glycoconjugate structures that are present on the surface of red blood cells and play an active role in the cellular Physiology and Pathology. Blood groups antigens are thought to be among hereditary determinate and play a vital role to understand genetics and disease susceptibility.

Materials and Methods: The blood groups of diagnosed diabetic patients were taken from their case- history records. Detail demographic information including age, gender, address, socio-economic status and medical history including duration of disease, diabetic complications, and diabetic history in family was collected from the subjects.

Results: shows highest prevalenceT2DM patients having blood group B followed by blood group O, A & AB and Table.7 show prevalence of blood group in general population.

Conclusion: The present study had concluded that blood group B is more frequent than any other blood groups in both cases and controls, while Rh+ve blood group is found to be more common among both cases and control.

Keywords: Blood Groups, Sample, Rh.

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Introduction

Human ABO blood groups antigens exhibit alternative phenotypes and genetically derived glycoconjugate structures that are present on the surface of red blood cells and play an active role in the cellular Physiology and Pathology. Blood groups antigens are thought to be among hereditary determinate and play a vital role to understand genetics and disease susceptibility. The pathophysiological mechanisms for the association between ABO blood group phenotypes with type 2 diabetes mellitus and associated factors are not well understood. There are several possible assumptions that show the presence of association of ABO and Rh blood groups distribution among population with type 2 diabetes mellitus. It has been reported that ABO & Rh blood groups are linked to specific molecules related to type 2 diabetes mellitus. Genome-wide association studies documented that variants at ABO gene loci, especially A and B antigens, are associated with increased levels of plasma lipid and inflammatory markers such as soluble intercellular adhesion molecule 1 (ICAM-1), E-selectin, P- selectin, and tumor necrosis factor-2 (TNF-2), and these are well known risk factors of diabetes mellitus. These molecules are well-known mediators of inflammation that affects insulin secretion and its receptors and contributed to the development of diabetes mellitus. ABO blood groups may also be associated with gut bacteria composition, which may be linked to type 2 diabetes mellitus.(B.V Naresh et al, 2020)[1]. In type 2 diabetes mellitus, gut dysbiosis contributes to the onset and maintenance of insulin resistance. According to International Diabetes Federation, Diabetes is one of the largest global health emergencies of the 21st century. According to American Diabetic Association (ADA), 2004 “Diabetes mellitus is a group of metabolic condition characterized by increase blood sugar which results from defect in insulin secretion, insulin mechanism of action or both[2]. Diabetes mellitus is related with dysfunction and damage of different organs especially the eyes, kidneys and nerves. As per World Health Organization (WHO), 422 million people around the world have diabetes mellitus, increasing from 30 Million cases in 1985

to 382 Million cases in 2013. If current trends continue, more than half of the world's population will be diabetic by 2035. (International Diabetic Federation ATLAS 7th edition)[3]. Type 2 Diabetes Mellitus is thought to occur in genetically predisposed persons who are exposed to a series of environment influences that precipitate the onset of clinical disease. Sex, age and ethnic background are key factors in determining the risk of developing type 2 Diabetes Mellitus. T2DM is seen as a result of hyperglycemic state due to defects in insulin secretion, insulin action or both and the interplay of environmental and genetic factors. Diabetes mellitus indicates to a group of several common metabolic diseases that share the phenotype of increased blood sugar. Poorly managed Diabetes leads to serious complication (International Diabetic Federation ATLAS 7th edition). The major human blood group system is ABO, and the incidence of ABO groups differs noticeably in different races ethnic groups and socioeconomic categories around the world. Blood group antigens are determined by heredity factors and play a vital role in understanding of genetic inheritance pattern and disease susceptibility. The presence and absence of blood group antigens have been associated with various diseases. (Anstee DJ, 2014), (Farhud D, 2013)[4,5]. Diabetes Mellitus and blood groups are interrelated because of the wide common genetic and immunological basis. Several studies findings and hypothesis have highlighted the importance of identifying the different susceptibility of blood groups to Diabetes mellitus and accordingly adopt possible preventive measures to decrease the prevalence of diabetes mellitus in general population.

Materials and Methods

Type of Study: Cross –Sectional study(131 Cases was included in the study).

Biological Sample: Human Blood

Inclusion Criteria

1. Subjects (Males or Females) diagnosed with Type II Diabetes Mellitus as per (WHO) norms.
2. Subjects within the age group of 30 to 60 years.
3. Subjects who have signed the informed consent form.

Exclusion Criteria

1. Subjects with Type 1 Diabetes Mellitus
2. Subjects below the age of 30 years and more than 60 years Pregnancy

Collection of Data: Subjects in the age group of 30-60 years, attending the OPD, IPD. These subjects were selected on the basis of inclusion and exclusion criteria of the study. Along with the written and informed consent form. The blood groups of diagnosed diabetic patients were taken from their case-history records. Detail demographic information including age, gender, address, socio-economic status etc. and medical history including duration of disease, diabetic complications, and diabetic history in family was collected from the subjects.

Results

After analysing the collected data, we identified that in our study using the Chi-square test, the p value is > 0.05, indicating that no statistically significant association exists between cases and controls in relation to blood groups with T2DM; however, using the odds ratio, we discovered a high relative risk with patients having blood group B, as the odds ratio was >1 in the B type of ABO Blood group, compared to other blood groups. Table no. 1 shows highest prevalence T2DM patients having blood group B followed by blood group O, A & AB and Table. 2 show prevalence of blood group in general population.

Table 1: Percentage of ABO &Rh blood groups in patients suffering from DM (n = 132)

Blood Gropes	Total No. of Case (%)
O +	32 (24.24%)
O-	8 (6.06%)
A+	27(20%)
A-	5(3.7%)
B+	39(29.54%)
B-	6(4.5%)
AB+	12(9.09%)
AB-	3(2.27%)
TOTAL	132

Table 2: Percentage of ABO &Rh blood groups in control group (n= 671)

Blood Group	No. of Control Group (%)
O+	160 (23.84%)
O-	49 (7.30%)
A+	133 (19.82%)
A-	32 (4.7%)
B+	190 (28.35%)
B-	37 (5.5%)
AB+	62 (9.23%)
AB-	8 (1.19%)
TOTAL	671

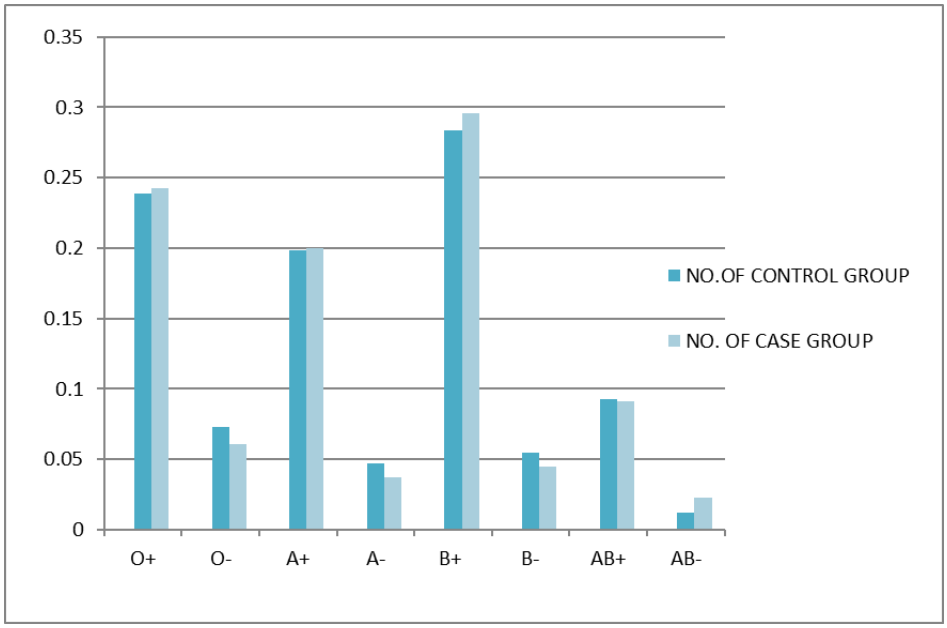


Figure 1: comparative graph of case and control

Table 2: distribution of ABO blood group among cases and control

Blood Group	Case Group	Control Group	p-value/chi square value
O	40	209	
A	32	165	
B	45	227	
AB	15	70	
Total	132	671	>0.05

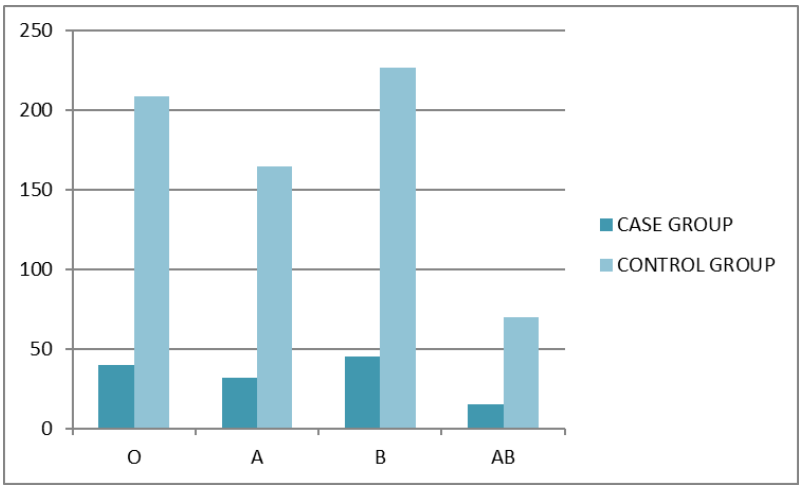


Figure 2: Shows odds ratio between case and control

Discussion

In the present study the whole study population was divided into two groups; Cases (Diagnosed diabetes mellitus participants) and Control (Healthy participants).The most prevalent blood group in diabetic population was blood group B+, 29.54% percent. Subsequently blood group O+, with 24.24%, A+ with 27%, AB+ with 9.09%. Blood group B+ was also predominantly present with 28.35% in control population. Simultaneously the other blood group was O+ with 23.84%, A with 19.82%, AB+ with 9.23% and there was no statistically significant association between blood group and diabetes mellitus. It was in accordance with (Geetika Gupta et al) who has reported that blood group 'B' has a highest prevalence among diabetes population. In Control blood group 'A' was predominantly present with 58.88%. Distribution of cases and controls was equal for blood group 'O'. No statistically significant difference were found between cases and controls for different blood group[6].A study reported by (Al - Ani et al) concluded that in Diabetic patients percentage were 5.17%, 5.42%, 4.96% and 3.91% distributed in groups of O, A, B, AB. Allele 'A' frequency was the maximum in the tested population. Whereas allele frequency for allele AB blood group was the lowest. Persons having O+ve blood group has minimum chance of developing T2DM whereas subject with AB +ve blood group are more vulnerable to develop T2DM. No significant relationship with any microvascular complications of Type 2DM and any blood group was observed. In regard to blood grouping in the control group, maximum subjects were B (40%) followed by O (29%), A (22%) and AB (9%)[7] (Biplab Mandal et al).Contradictory to these findings, the highest ABO blood groups in both Diabetes and control in the whole population considered was Blood group O[8]. It was found that the association with T2DM and blood group A and O were more common blood groups and AB and B blood groups were less common. The possible reason for these contradictory findings is the effect of genetic expression of diabetes that might be influenced by the racial and geographical factors.

Conclusion

The present study had concluded that blood group B is more frequent than any other blood groups in both cases and controls, while Rh+ve blood group is found to be more common among both cases and control. T2DM is one of the largest health emergencies of the 21st century. The etiopathogenesis of diabetes mellitus is multi-factorial & complex and appears to involve interactions of various genetic, immunological and environmental factors. Positive association with blood groups may show increased susceptibility and a negative association may show protection against diabetes mellitus. Thus the impact of knowing the association between ABO blood groups with type 2 diabetes mellitus would develop preventive strategies for early diagnosis, treatment and prevent fatal complications of Diabetes Mellitus.

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