

# Frequency of ABO and Rh Blood Groups in Patients with Diabetes Mellitus

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## ABSTRACT

**Background:** Diabetes mellitus is a syndrome characterized by hyperglycemia resulting from defects of insulin secretion and/or increased cellular resistance to insulin. The major human blood group system is ABO. The majority of ABO determinants are expressed on the ends of long polylactosamine chains. No disease is known to result from the lack of expression of ABO blood group antigens, but the susceptibility to a number of diseases has been linked to a person's ABO phenotype.

**Methodology:** This cross sectional study of 250 diabetic patients was conducted at Shaikh Zayed Hospital, Lahore from 20-11-2015 to 20-05-2016. Patients were either admitted in the department of Medicine or visiting the out-patient department. 3ml of blood was taken from every patient after obtaining informed consent. Blood grouping was performed for the ABO, Rh phenotypes and labeled as per operational definition.

**Results:** Out of 250 cases, 45(18%) were between 15-40 years of age while 205(82%) were between 41-70 years of age and mean age was calculated as 54.11±9.81 years, 130(52%) were male and 120(48%) were females, frequency of ABO and Rh blood groups in patients with diabetes mellitus in the local population group was recorded as 52(20.8%) in A+, 55(22%) in B+, 23(9.2%) in AB+, 97(38.8%) in O+, 2(0.8%) in A-, \*(3.2%) in B-, 3(1.2%) in AB- and 10(4%) in O-.

**Conclusion:** We conclude that the prevalence of diabetes is higher in patients with Rh+ blood groups as compared to the Rh- blood groups and diabetes is most prevalent in patients with O+ blood group.

**Keywords:** Diabetes mellitus, ABO, Rh Blood groups, Frequency.

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## INTRODUCTION

The ABO blood group was first described by Karl Landsteiner in 1900.<sup>1</sup> Blood grouping is based on antigenic property of red blood cells (RBC). The major human blood group system is ABO. The blood group of a person depends upon the presence or absence of two genes A and B. The majority of ABO determinants are expressed on the ends of long polylactosamine chains<sup>2</sup>. The gene for ABO group is present on chromosome 9 and on chromosome 1 for Rh system. According to the presence or absence of Rh antigens, blood group is classified into Rh positive or negative<sup>3</sup>.

The ABO system consists of complex carbohydrate molecules. The A and B Glycosyl transferase encoded by A and B alleles converts H antigen into A and B determinants. This enzyme is deficient in the group O individuals who continue to express H antigen<sup>4</sup>. Ever since the discovery of blood groups in 1900, there have been efforts to discover possible associations between ABO and Rh blood groups and different diseases<sup>5,6</sup>. Diabetes mellitus is

a multifactorial trait. The etiology of diabetes mellitus is complex and appears to involve interactions of genetic, immunological and environmental factors.<sup>7</sup> Identification of a positive association with blood groups might reflect increased susceptibility and a negative association might reflect protection against diabetes mellitus<sup>5</sup>. McConnell's in 1955 suggested an increased frequency of blood group A among diabetic patients<sup>8</sup>. In Copenhagen, blood group O was found to be more prevalent in male diabetics<sup>9</sup>.

## MATERIAL AND METHODS

In this cross sectional study a total of 250 diabetic patients of both genders between the ages of 15 to 70 years were enrolled. Diabetic patients who were on treatment for diabetes for more than one year either admitted in the Department of Medicine or visiting for follow up in the Out-Patient Department of Shaikh Zayed Hospital, Lahore were enrolled in the study. The procedure was explained to the patients and informed consent was taken. Blood samples 3ml were obtained from each diabetic patient. These samples were tested immediately following collection. Anti-A, anti-B and anti-D monoclonal blood grouping reagents were used to determine the ABO and Rh (D) phenotype by slide method at room temperature.

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ABO and Rh blood groups were evaluated for all patients and labeled as per operational definition.

## RESULTS

Out of the total 250 diabetic patients, 45(18%) were between 15-40 years of age while 205(82%) were between 41-70 years of age, mean±SD was calculated as 54.11±9.81 years (Table 1). Patients were distributed according to gender and 130(52%) were male and 120(48%) were females (Table 2). Frequency of ABO and Rh blood groups in patients with diabetes mellitus in the local population group was recorded as 52(20.8%) in A+, 55(22%) in B+, 23(9.2%) in AB+, 97(38.8%) in O+, 2(0.8%) in A-, 8(3.2%) in B-, 3(1.2%) in AB- and 10(4%) in O – blood groups (Table 3). The data was stratified for gender and family history of diabetes. Post stratification chi-square test was used (Table 4 & 5).

Table 1: Age distribution (n=250)

Age (years)	n	%age
15 – 40	45	18
41 – 70	205	82
Mean±SD	54.11±9.81	

Table 2: Gender distribution (n=250)

Gender	No.	%
Male	130	52
Female	120	48

Table 3: Frequency of ABO and Rh blood groups in patients with diabetes mellitus in the local population (n=250)

ABO/ Rh blood group type	No.	%
A+	52	20.8
B+	55	22
AB+	23	9.2
O+	97	38.8
A-	2	0.8
B-	8	3.2
AB-	3	1.2
O-	10	4

Table 4: Stratification for gender (n=250)

Rh blood group type	Male (n=130)	Female (n=120)
A+	24	28
B+	29	26
AB+	13	10
O+	51	46
A-	2	0
B-	5	3
AB-	2	1
O-	4	6

P value: 0.64

Table 5: Stratification for family history of diabetes mellitus (n=250)

Rh blood group type	Positive family history (n=93)	No family history (n=157)
A+	23	29
B+	26	29
AB+	9	14
O+	32	65
A-	1	1
B-	1	7
AB-	0	3
O-	1	9

P value: 0.07

## DISCUSSION

The major human blood group system is ABO. No disease is known to result from the lack of expression of ABO blood group antigens, but the susceptibility to a number of diseases has been related to a person's ABO phenotype. Our study was planned with the view to determine frequency of ABO and Rh blood groups in patients with diabetes mellitus in local population as there lies a controversy in the published literature and paucity of data locally.

In our study diabetes is prevalent in patients with O + and Rh+ blood groups. Al-Ali HS<sup>10</sup> in their study of 259 diabetics (95 males and 164 females) described the prevalence of diabetes in blood groups to be as; 25.6% in blood group A, 26.57% in blood group B, 8.5% in blood group AB and 39.31% in group O. The frequency of diabetes in Rh-negative blood group was 8.54% and in Rh-positive as 91.45%. The findings of our study are in agreement with the study conducted by Al-Ali.

Another study by Shrestha showed a higher prevalence of blood group AB in the diabetic group (14.92%) as compared to controls (9.87%). Blood groups A and B were less common in diabetic group as compared to controls (20.37% vs. 27.4% and 28.86% vs. 33.5% respectively). Blood group O had same distribution among both groups. Rh negative blood group was more frequent in diabetic group (12.44% vs. 7.73%).<sup>11</sup> Our findings are in contrast with these results of Shrestha as in our study diabetes was frequent in Rh + patients.

Qureshi et al<sup>3</sup> studied the frequency of ABO blood groups among Type 2 diabetics and concluded that Type 2 diabetes and blood groups are interrelated because of the broad genetic immunologic basis in both according to them the frequency of blood groups B and O is significantly higher and lower respectively in Type 2 diabetics when compared to the general population.

In another study by Forouhi<sup>12</sup> who in their study of 224 diabetics and 221 non-diabetics (control) described that Blood group O- and A+ are significantly ( $p < 0.01$ ) higher among the diabetics than non diabetics. Blood group O+ was significantly ( $p < 0.01$ ) lower in diabetics than in the control population. According to them, population with Blood group O- and A+ thus appear to be more susceptible to diabetes mellitus.

The controversy still exists as different ABO / Rh blood groups have been reported to be common in diabetic populations in various international and national studies. The limitation of our study is that we did not include a control group which could have cleared the results. However in coming trials inclusion of control group could be further helpful to clarify this ambiguity in our population.

## CONCLUSION

We conclude that the prevalence of diabetes is higher in population with Rh+ blood groups as compared to the Rh- blood groups and diabetes is most prevalent in population with O+ blood group.

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