

Study of Type 2 Diabetes Mellitus and its Correalation with Blood Groups

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ABSTRACT

Objectives: To ascertain any relation between T2 Diabetes Mellitus with Blood Groups of the patients coming in the OPD.

Study Design: Experimental / Analytical study

Place and Duration of Study: This study was carried out at Med Path Laboratories and Diagnostic Center Gulshan-e-Iqbal Karachi & KESC Medical center Karachi from August 2012 to December 2012.

Materials and Methods: The present study deals with the distribution of the ABO blood types in patients with diabetes mellitus. 500 samples were collected from Med Path Laborites and Diagnostic Center KESC Medical Center.

Results: The study shows blood group B was prevalent at a high percentage among patients with DM type 2. Blood group O+ were significantly higher among the male diabetics and blood group B+ among female diabetics. People with middle-aged group were seen to be more affected with type 2 diabetes mellitus.

Conclusion: It is highly recommended that this study may proceed further and the affiliation of T2DM can be screened at molecular level to find out the exact mechanism of action for susceptibility to these particular Blood Groups.

Key words: Diabetes Mellitus, Correalation, Blood Groups

INTRODUCTION

Diabetes Mellitus (DM) is a set of related diseases in which the body cannot regulate the amount of sugar (specifically, glucose) in the blood. The blood delivers glucose to provide the body with energy to perform all of a person's daily activities. The liver converts the food a person eats into glucose. In diabetes, glucose in the blood cannot move efficiently into cells, so blood glucose levels remain high. This not only starves all the cells that need the glucose for fuel, but also harms certain organs and tissues exposed to the high glucose levels.¹

Classification of Diabetes Mellitus: Diabetes Type 1 Patients produce no insulin at all. Diabetes Type 2 – Patients don't produce enough insulin, or insulin is not working properly. Gestational Diabetes - develops diabetes just during your pregnancy.

Maturity onset diabetes of the young (Monogenic Diabetes) (MODY)-Refers to any of several hereditary forms of diabetes caused by mutations in an autosomal dominant gene disrupting insulin production.

Type 1 diabetes (T1D): The body stops producing insulin or produces too little insulin to regulate blood glucose level.

Type 1 diabetes involves about 10% of all people with diabetes. Type 1 diabetes is typically diagnosed during childhood or adolescence. It used to be referred to as juvenile-onset diabetes or insulin-dependent diabetes mellitus.²

Causes of Type 1 diabetes: Type 1 diabetes can occur in an older individual due to destruction of the pancreas by alcohol, disease, or removal by surgery. It also results from progressive failure of the pancreatic beta cells, the only cell type that produces significant amounts of insulin.

Type 2 diabetes (T2D): Although the pancreas still secretes insulin, the body of someone with type 2 diabetes is partially or completely unable to use this insulin. This is sometimes referred to as insulin resistance. The pancreas tries to overcome this resistance by secreting more and more insulin.

Causes of Type 2 Diabetes: Type 2 diabetes is thought to be caused by a combination of genetic and environmental factors.

Genetic causes — Many people with type 2 diabetes have a family member with either type 2 diabetes or other medical problems associated with diabetes, such as high cholesterol levels, high blood pressure, or obesity. **Environmental conditions** — Environmental factors such as eating habits and physical activity are, combined with genetic causes, affect the risk of developing type 2 diabetes.³

Gestational Diabetes: A small number (about 3 to 5 percent) of pregnant women develop diabetes during pregnancy, called "gestational diabetes."

Maturity onset diabetes of the young: MODY is a rare form of diabetes which is different from both Type 1 and Type 2 diabetes, and runs strongly in families. MODY is caused by a mutation (or change) in a single gene.

It was reported that DM type 2 is the most common type, accounting for 90-95% of all diabetic cases.⁽⁴⁾ In 1998 it was estimated that there were almost 140 million people with diabetes and the predictions by Hilary King indicate that this figure would rise up to 300 million by the year 2025.⁵

Blood Groups: Blood groups are created by molecules present on the surface of red blood cells (and often on other cells as well). 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 ABO blood groups were the first to be discovered (in 1900) by Karl Landsteiner and are the most important in assuring safe blood transfusions. The Rh blood group system is the second most significant system for blood grouping.

Rh factor refers to Rh D antigen only. Determination of Rh factor along with ABO is essential for defining the Rh +ve or Rh -ve status of the individual. Around 85% of the human population is Rh +ve while 15% is Rh -ve.⁶

The ABO & Rh systems are the most significant blood group systems from the clinical point of view.⁷

Many researchers have made attempts to determine the significance of particular ABO phenotypes for susceptibility to disease. The relationship between the ABO/rhesus (Rh) blood groups and various diseases has generated a great deal of interest⁸. Certain diseases show a strong association with the ABO/Rh blood groups, notably peptic ulcer and gastric cancer⁹. Individuals with blood group O have been found to be at a higher risk of contracting cholera than those with other blood groups. The ratio of this risk of group O to group A individuals has been reported as 1.35:1. Oral candidiasis shows a higher incidence of group O over other ABO groups¹⁰. Small pox virus has been found to carry an A antigen-like structure, so that individuals who possess a naturally occurring anti-A (group O and B individuals) are thought to have an increased resistance to the infection.¹¹

This could be attributed to the inability of the immune system of group A individuals to recognize the A like antigen of the tumor cells as foreign and cannot destroy them, but group O and B individuals do have a naturally occurring anti-A that are most likely to destroy tumor cells.¹²

It has been reported that group O individuals are proportionately more prone to bleeding than individuals of the other blood groups; and group A individuals with highest incidence of thrombosis than in any other group.¹³

The blood groups of diabetics have been extensively studied since McConnell's suggestion in 1955 of an increased frequency of blood group A among these patients.¹⁴ In Copenhagen, an excess of blood group O was found in male diabetics.¹⁵

No diseases are known to result from the lack of

expression of ABO blood group antigens, but the susceptibility to a number of diseases has been interrelated to a person's ABO phenotype.¹⁶ Such correlations remain conflicting and include the observation that gastric cancer is more common in group A individuals, whereas gastric and duodenal ulcers occur more commonly among blood group O individuals.¹⁷ In the present study, an attempt has been made to investigate any association with the ABO blood types and diabetes mellitus type 2.

MATERIALS AND METHODS

The present study was an epidemiological study. A total no of 500 blood samples from patients with Diabetes mellitus (Type 2) were collected from the Med Path Laboratory. Since both gender differentiations are not known to exist in the ABO blood type system, the samples collected from both males and females were pooled for the analyses.

Materials:

- BSL 2 lab
- Gloves
- Lab coat
- Blood typing tiles
- 500 diabetic patients Blood samples
- Synthetic anti-Rh (D) serum
- Synthetic anti-A serum
- Synthetic anti-B serum
- Justors (50 ul)
- Mixing sticks (blue, yellow, and white)

Method:

Blood Sample Collection: For the ABO blood types, standard serological procedures were followed using the anti-A, anti-B and anti-D antisera. A blood sample drawn from a vein in the arm or a finger-prick

Abo Test:

1. Using the justor, place a drop of the blood sample in each demo created area of the blood typing tile. Replace the tip of the jester.
2. Add a drop of synthetic anti-A (blue) to the well labeled A.
3. Add a drop of synthetic anti-B serum (yellow) to the well labeled B.
4. Add a drop of synthetic anti-Rh serum (clear) to the well labeled Rh.
5. Using a different color mixing stick for each well (blue for anti-A, yellow for anti-B, white for anti-Rh), gently stir the synthetic blood and anti-serum drops for 30 seconds. Remember to discard each mixing stick in danger box after a single use to avoid contamination of your samples.
6. Carefully examine the thin films of liquid mixture. If a film remains uniform in appearance, there is no agglutination. If the sample appears granular, agglutination has occurred. Determine the blood type

of the sample. A positive agglutination reaction indicates the blood type.

7. Record the results in the data table.
8. Thoroughly rinse the blood typing tile with a disinfectant, and then repeat steps.
9. The data were entered in Microsoft excel for analysis. Further analysis was carried out using instant graphpad.

RESULTS

In Table 1 the distribution of the ABO blood types in patients with diabetes mellitus is shown including both male and female.

Table No.1: Correlation of blood groups

Blood Group	Frequency	Percentage
A+	124	24.80%
A-	9	1.80%
B+	150	30.00%
B-	6	1.20%
AB+	63	12.60%
AB-	2	0.40%
O+	131	26.20%
O-	15	3.00%
Total	500	100.00%

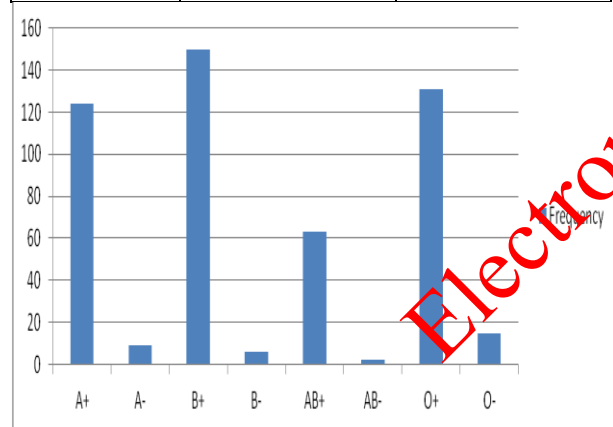


Chart: Blood group frequency

Table No.2A: Correlation of blood groups in Male

Blood Group	Frequency	Percentage
A+	71	24.83%
A-	7	2.45%
B+	66	23.08%
B-	3	1.05%
AB+	41	14.34%
AB-	2	0.70%
O+	87	30.42%
O-	9	3.15%
Total	286	100.00%

In our study, the results showed association between ABO blood groups and DM type 2. B+, O+, A+ blood group showed higher incidence of type 2 diabetes mellitus than groups which are Rh-ve signifying the higher incidence in

patients which refers to Rh+ve group. However, significant association was found between DM type 2 and blood groups A (P 24.80%) and O (P 26.20%) The frequency of B blood group (30.00%) was high among patients with DM type 2. AB blood groups showed little association with DM (P 12.60%), which implied that AB blood group patients have less chances of DM type 2. (Table 1)

In Table 2: A and 2: B the distribution of ABO blood groups between genders with diabetes mellitus is shown.

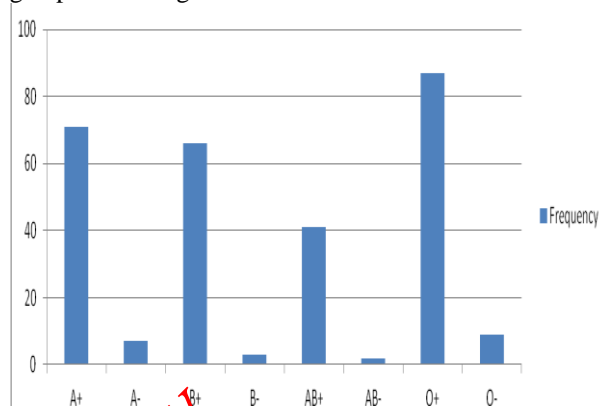


Figure No.2A: Frequency

Table No.2B: Correlation of blood groups in Female

Blood Group	Frequency	Percentage
A+	53	24.77%
A-	2	0.93%
B+	84	39.25%
B-	3	1.40%
AB+	22	10.28%
AB-	0	0.00%
O+	44	20.56%
O-	6	2.80%
Total	214	100.00%

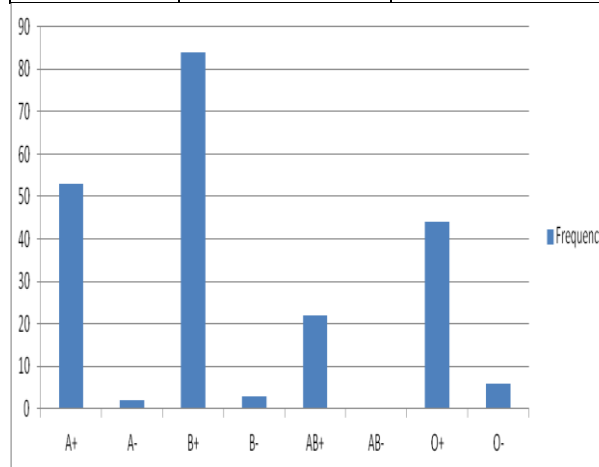


Figure No.2b: Frequency

The distribution of ABO/Rh blood groups between the genders for diabetics is shown in Table II. Blood groups O+ were more dominant in the diabetic group among men (30.42%) than women (20.56%); the type 2 DM in B+

blood groups were more common in women (39.25%) than men (23.08%). (Table 2)

Table No.3A: Correlation of blood group by Age in Male

Blood Group	20 – 40	41 - 60	61 - 80
A+	18	36	17
A-	3	4	0
B+	11	36	19
B-	1	0	2
AB+	8	21	12
AB-	0	2	0
O+	27	47	13
O-	0	4	5
Total	68	150	68

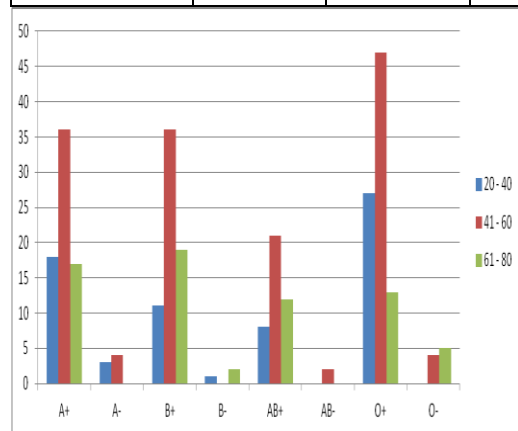


Figure No.3A:

Table No.3B: Correlation of blood group by Age in Female

Blood Group	20 – 40	41 - 60	61 - 80
A+	15	29	9
A-	0	1	1
B+	22	50	12
B-	1	2	0
AB+	7	12	3
AB-	0	0	0
O+	16	22	6
O-	1	4	1
Total	62	120	32

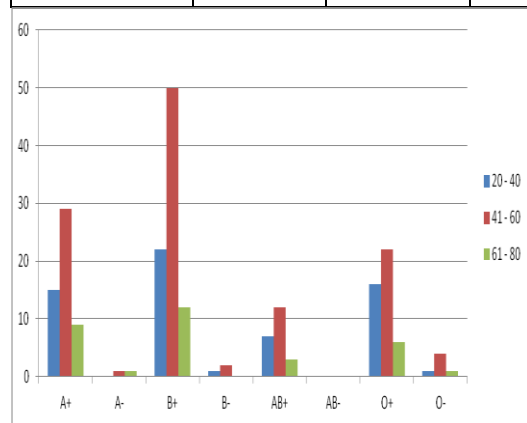


Figure No.3B:

In Table 3: A and 3: B the distribution of diabetic's blood types by age between the genders is shown.

A distinction is also drawn between diabetes in the young and in the middle-aged and in old respectively. It was observed that in middle-aged (40-60) people were more affected by DM type 2 having different blood groups. (Table 3)

DISCUSSION

It was long suggested that the ABO blood group system had evolved under a positive selection pressure in both humans and other primates.¹⁸ This implies that certain ABO groups provide a selected vulnerability to individuals possessing a particular ABO blood group. Diabetes mellitus was observed in all the ABO/Rhesus blood groups. However it was observed that the patients with type 2 diabetes mellitus were at rise in Rh+ve cases of which are A, B and O. This study clearly reveals the importance of blood group in different group of patients based on gender, age and Rh groups. This study suggests that person with Rh+ve are more prone to develop type 2 diabetes mellitus than the person with Rh -ve group.

In this study it was also found out that the following groups were more susceptible to develop type 2 diabetes mellitus in sequence of higher percentage.

Blood group	Percentage	Blood group	Percentage
B+	30.00%	B-	1.20%
O+	26.20%	O-	3.00%
A+	24.80%	A-	1.80%
AB+	12.60%	AB-	0.40%

This comparison certainly reflects that the person having B+ blood group is more likely to develop type 2 diabetes mellitus than person having blood group B.

The association of type 2 DM in male and female is somewhat equal however, in male the incidence was higher in O+ group and female shows high incidence in blood group B+.

This was also evident with regard to age which were divided in to three groups, 20-40, 41-60, 61-80 showing higher incidence in age groups of 41-60 with equal distribution of type 2 DM O+ and B+ blood groups which are more likely to develop type 2 DM in their age group.

The study of Qureshi and Bhatti demonstrated that DM type 2 and ABO blood groups are interrelated; they found that among 70 patients with DM, blood group B was more common and represented 35.71%.¹⁹ It is interesting to note that our study did show a higher percentage of blood group B (30.00%) in the diabetic group, but this failed to achieve statistical significance, and results are in agreement with Qureshi and Bhatti. In addition, there were reports from Italy and Trinidad showing an increased frequency of blood group B among diabetics.²⁰

CONCLUSION

It is concluded that the persons having these blood groups who are more susceptible to develop T2DM should take due care with reference to increased incidence of developing DM and adopt healthy life style in every respect keeping in view the danger zone in which they are living and the information they have with respect to their own blood group. It is highly recommended that this study may proceed further and the affiliation of T2DM can be screened at molecular level to find out the exact mechanism of action for susceptibility to these particular Blood Groups.

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