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Frequency of ABO Blood groups in patients with Diabetes

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ABSTRACT

Background and Objectives:

The objective of this study was to evaluate the frequency of the ABO blood groups in sample of patients diagnosed with Diabetes Mellitus in Gujarat population.

Methods:

Case - control study. The study has been carried out in Patients reporting to Medicine department and donor of blood bank of Dhiraj General Hospital, SVU, Pipariya, Vadodara, Gujarat. The study included total 400 patients above 18 years of age were selected, out of which 200 were normal healthy controls (nondiabetic) and 200 patients with diabetes. Blood samples were collected from the Patients after consent had been obtained, thus giving the response rate of 82.4 %. The ABO blood groups of all subjects were determined and recorded by Slide Agglutination method at Haematology laboratory and Blood bank.

Results:

Data were analysed by "one sample chi square test". The x^2 test results showed that there was association between the frequency of ABO blood group and Diabetes Mellitus. The data revealed that the blood group B was significantly more common in diabetic patients as compared with Non-diabetic healthy population (25.5% vs. 23.5%; $P < 0.001$). Blood group O was significantly less common in diabetic patients compared with non-diabetics (38.5% vs. 44.5%; $P < 0.001$). Among diabetic men, the frequency of only blood group B was significantly higher, while on the contrary among diabetic women the frequency of both A and B (29.8% vs. 25%; $P = 0.033$ and 25.7% vs. 19.7%; $P < 0.0087$, respectively) were significantly higher as compared with nondiabetic healthy population.

Conclusion:

Our study confirms that the frequency and association exist between the blood group and type of Diabetes Mellitus in this Gujarat population. The findings in this study suggest that ABO antigens are associated with DM. DM is more common in individuals with blood group B. Therefore, a larger extensive study is needed to establish the correlation.

Key Words:

ABO Blood groups, Diabetes Mellitus, Gender, Case-control.

Introduction:

Diabetes mellitus (DM) has become one of the major public health challenges worldwide[1]. If left untreated, it can cause many complications [2,3] and is associated with reduced life expectancy, significant morbidity due to specific diabetes related complication[4,5].In 2014, the International Diabetes Federation (IDF) estimated that diabetes resulted in 4.9 million deaths.[6] The number of people with diabetes is expected to rise to 592 million by 2035.[7] , making it the 8th leading cause of death.[6] More than 80% of diabetic deaths occur in low and middle-income countries.[8] The etiology of DM is complex, but factors such as genetic, immunological, and environmental are involved. Diabetes has a genetic predisposition, although environmental factors do play their role in its genetic expression [2,4,5].

The major human blood group system is ABO and the incidence of ABO groups varies markedly in different races, ethnic groups, and socioeconomic groups in different parts of the world [9]. Blood group antigens are hereditary determined & plays a vital role in transfusion safety, understanding genetics, inheritance pattern, and disease susceptibility. DM and blood groups are interrelated because of the broad genetic immunologic basis in both. [10] Identification of a positive association between DM and blood groups might reflect increased susceptibility to and a negative association protection against diabetes. Studies by Bener *et al*., [11],[12],[13] reported a high prevalence of DM and its complications in Qatari population.

Since their discovery by Landsteiner in 1900[14], the ABO blood groups have been of great interest. Many researchers have made attempts to determine the significance of particular ABO Phenotype for susceptibility to disease. The relationship between the ABO blood groups and various diseases has generated a great deal of interest[14].Several researchers had proved in recent years suggesting an association between blood groups and DM. McConnell et al. in 1955, studied 1333 DM patients & concluded increase frequency of A blood group among these diabetic patients[15] . In Copenhagen[16], an excess of blood group O was found in male diabetics. Tedeschi and Cavazzuti, showed an increased frequency of blood group B among diabetics [17]. Sidhu et al. and Shyamal koley proved that there is no association between the distribution of the ABO blood types & diabetes mellitus[18,19] . Investigations in different countries showed varying findings regarding the susceptible of blood group as risk factor for DM in different population. Hence, we have taken the effort to determine the frequency between different ABO blood groups and DM in local Gujarat population.

Materials & Methods:

This case-control study was carried out on total 400 patients attending Medical OPD, Diabetic clinics, outdoor patients and blood donors of Dhiraj General Hospital attached to S.B.K.S Medical College, pipariya, Vadodara, Gujarat, India. Among participates, a total of 200 patients with DM diagnosed and recruited by a Simple Random method. The diagnosis of diabetes mellitus was made according to the American Diabetes Association criteria. For comparison, 200 adult non-diabetic healthy individuals were randomly selected from routine medical as control and blood donors at hospital, considering they never received any diabetic medications. None of the controls (puparia) or test subjects (diabetic) met the exclusion criteria.

The study protocol was approved by ethical review committee of SVU. Informed written concert was obtained after explaining the risk & benefits of the study to all patients. After routine clinical examination of each participant, the records were maintained in a data schedule. Standard slide Agglutination test for determination of ABO blood group into following groups: A, B, AB, O were used.

Data thus obtained were analysed statistically to assess any frequency exist between ABO blood groups and DM. Data were expressed as percent and absolute amount of frequency. 'Chi-Square test' was further applied to estimate whether any significant association exists between the frequency of a blood group in DM patients (observed) and in control (expected). Chi Square statistic and probability were determined by Epi-Info Computer software at 95% confidence limit. The level $P < 0.05$ was considered as the cut-off value for significance.

Result:

The distribution of blood groups among diabetes patients and Non-diabetic (healthy) population shown in Table 1. The blood group B was significantly more common in diabetic patients as compared to Non-diabetic population (25.5 % vs. 23.5 %; $P < 0.001$), whereas blood group O was significantly more common in Non-diabetic population (44.5% vs. 38.5%; $P < 0.001$). Blood group AB has almost similar distribution in both groups among Diabetes and Non-diabetic population (7.0% and 5.5%).

Table 1: Distribution of ABO blood groups among diabetic patients and non-diabetic healthy population

Blood group	Diabetes (n=200 (%))	Non-diabetic (n=200 (%))	P value
A	58 (29)	53(26.5)	0.231
B	51(25.5)	47(23.5)	< 0.001
AB	14(7.0)	11(5.5)	0.636
O	77(38.5)	89(44.5)	<0.001

[Table 2] Reveals the distribution of ABO blood groups among male diabetic patients & non-diabetic healthy control. Blood group B was more common in male diabetic patients (26.2%) as compared with nondiabetic males (21.1%; $P < 0.001$). Blood group O was significantly less common in male diabetic patients than in healthy nondiabetic men (37.8% vs. 45.1%; $P < 0.001$).

Table 2: Distribution of ABO blood groups among Male diabetic patients and Non-Diabetic (healthy) population:

Blood group	Male %		P value
	Diabetic Men (n=103)	Non-Diabetic Men (n=104)	
A	29(28.1)	28(26.9)	0.70
B	27(26.2)	22(21.1)	<0.001
AB	08(7.7)	07(6.7)	0.21
O	39(37.8)	47(45.1)	<0.001

Table:3 Reveals the distribution of ABO blood groups among female diabetic patients and Non-diabetic healthy control. Similarly, the frequency of blood group A, followed by group B was significantly higher among diabetic women as compared with Non-diabetic healthy women (29.8% vs. 25%; $P = 0.033$ and 25.7% vs. 19.7%; $P < 0.0087$, respectively).

Table 3: Distribution of ABO blood groups among Female diabetic patients and Non-Diabetic (healthy) population:

Blood group	Female %		P value
	Diabetic women (n=97)	Non-Diabetic women (n=96)	
A	29(29.8)	24(25)	0.033
B	25(25.7)	19(19.7)	<0.0087
AB	06(6.1)	05(5.2)	0.410
O	37(38)	48(50)	<0.001

If our study compared globally, the distribution of ABO blood groups in diabetic population, Similar to our current study (29%), the blood Group A was higher in diabetic population of Qatar (29%)[20], Iraq (35.98%)[21], Japan (33.7%)[22]. But blood group B was higher in Malaysia (35.7%)[23].Blood group O was more common in diabetic population Iraq (43.6%)[21],and Algeria (52.9%)[24].

Discussion:

The findings of the present study lend support to the hypothesis that genetic factors related to the distribution of some blood groups may play a role in the development of diabetes mellitus. The present study has supported the hypothesis that DM and blood groups are interrelated. Blood group distribution in different population groups is an important consideration in health care.

In this study, comparison of blood groups frequency between diabetic & non-diabetic population was carried out. This study demonstrated that the frequency of blood group B was significantly higher among diabetic patients as compared with nondiabetic healthy population (25.5% vs. 23.5%). Some few more studies from Qatar and Malaysia[20-23] and in addition Qureshi and Bhatti [10] from Pakistan, also reported similar observation of higher frequency and interrelationship of blood group B among diabetic patients. On the contrary, it was found that a study conducted in Algerian population reported that the frequencies of blood groups A and B were lower among diabetic patients as compared with healthy population [24]. Another study by Okon *et al*., from Nigeria observed and reported a strong association between diabetes mellitus and blood group A [25]. In the population of Pakistan,[26] it was reported that blood group O has the highest distribution among diabetics. But a negative association was found between diabetes and blood group O in the study population, showing Blood group O was significantly less common in diabetic patients (38.5%), while it was higher in non-diabetics (44.5%).

In present study, the Blood group A and AB did not show any significant difference between diabetic and healthy population. But On the contrary, in Pakistan study conducted[26] showed that blood group AB was more frequent in diabetes than blood group A and B. Previous study has reported that the frequency of ABO blood group varies across different populations.[20]
Studies regarding the association between ABO blood groups and Diabetes Mellitus are inconclusive. While some of the studies reported an association, [24],[27] there is some evidence against the presence of any association existing between ABO and DM. [5],[10]
The current study revealed that individuals with blood group B are more likely to have DM, whereas a blood group O is less likely to have DM. 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.

We found in our study with respect to gender that among male the frequency of blood group B was significantly higher among diabetics, while among female the frequency of both blood groups A and B were significantly higher as compared to healthy men and women, respectively. The frequency of blood group O was significantly lower among both male and female with DM than controls. Other population studies did not show significant differences in men and women between both groups except a study from Algeria, [24] which found that blood groups O and AB were significantly higher in the diabetic group among men compared with non-diabetic healthy controls. However, our results suggest that there is frequency of ABO blood groups and diabetes mellitus, in accordance with the results of previous studies. The mechanisms through which control of particular genes on blood glucose levels is poorly understood; therefore, future investigations are necessary to elucidate fully the genetic contributions to diabetes mellitus.
The present study had several limitations, including a relatively small sample size. Further a larger extensive study is needed to establish the correlation.

Conclusion:

The study confirms that the frequency of blood groups and DM are interrelated in Gujarat population. ABO blood group also varied according to ethnicity. Blood group B was more common in diabetic men, whereas blood groups A and B were higher in diabetic women compared with nondiabetic healthy population. It was found that blood group B was more dominant and blood group O was less common among diabetic group as compared with nondiabetic healthy population. DM is more common in individuals with blood group B.

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Conflict of Interest: NIL

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