

The Distribution of the ABO Blood Types in Patients with Diabetes Mellitus

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ABSTRACT The present study deals with the distribution of the ABO blood types in patients with diabetes mellitus (n = 511). All the samples were collected from Varny Pathology Clinic, Sagar Madhya Pradesh during March, 1989 to July, 1991. An adequate number of controls (n = 475) were also taken adjusting all the conditions except the disease, for comparisons. For the ABO blood types, standard serological procedures were followed using the anti-A, anti-B and anti-D antisera. The results suggest no association between the ABO blood types and diabetes mellitus.

INTRODUCTION

Diabetes mellitus is a multi-factorial trait. The etiology of diabetes mellitus is complex and appears to involve inter-actions of genetic, immunological and environmental (Ekoe et al., 2001). In fact, human chromosome 1q21-q23 showed well replicated linkage to type-2 diabetes mellitus (Elbein et al., 2005). The ABO blood group genes are mapped at 9q34.2 region in which genetic alteration is common (Guleria et al., 2005). The rationale behind this study was that there might be an association between the ABO blood group and diabetes mellitus. It is reported that the ABO blood group distribution varies in different geographical and ethnic groups, and socio-economic groups (Beardmore and Karimi-Booshehri, 1983). In India, the ABO blood group frequency is variable, the frequency for B ranges from 6% in negritos of Andamans to 48% in Birijas of Bihar while group A is 20-30% in Western and Eastern Himalayas (Barua, 2002). The blood group frequency in North India is B > O > A > AB (Bhasin et al., 1992).

The distribution of the ABO blood group in peptic ulcer and gastric cancer patients was studied by Aird et al. (1954), Clarke et al. (1955, 1959), Buckwalter et al. (1956), Brown et al. (1956), Doll et al. (1960), Beasley (1960), and Sharara et al. (2006). However Rahman (1976) studied on 2312 confirmed cases of diabetes mellitus for the frequency of the ABO blood groups along with 8936 controls. No association was apparent in the subjects studied with the ABO blood groups. Sidhu et al. (1988), Iyengar et al. (1989) and

Qureshi and Bhatti (2003) studied in the same direction. In the present study, an attempt has been made to investigate any association with the ABO blood types and diabetes mellitus.

MATERIALS AND METHODS

A total of 511 blood samples from patients with diabetes mellitus (Type 2) were collected from the Varny Pathology Clinic, Sagar, Madhya Pradesh. The samples represented adequately the Brahmin (n=146), Bania (n=127), Kayasth (n=52), Shudra (n=59) and Muslim (n=51). For comparisons, 475 unrelated normal healthy individuals were sampled randomly from the same area matching age, sex, socio-economic status etc. except the disease condition. Since sex differentiations are known not to exist in the ABO blood type system, the samples collected from both males and females were pooled for the various analyses.

For the ABO blood types, standard serological procedures were followed using the anti-A, anti-B and anti-D antisera. Statistical calculations were done using the chi-square test.

RESULTS AND DISCUSSION

In Table 1 the distribution of the ABO blood types in patients with diabetes mellitus and controls is shown. Blood group A is more common (27.98%) in patients than controls (26.74%). Blood group B is also found oftener in patients (38.55%) than controls (37.47%). But in blood group O, the controls are more numerous (26.32%) than patients (24.46%). In blood group AB also, the

controls outnumber (9.47%) the patients (9.00%). These differences, however, are not significant statistically ($P>0.05$). The allele frequencies in both the patients and the controls are in the order $O>B>A$.

Table 2 gives the distribution of the ABO blood types and their allele frequencies in patients with diabetes mellitus. Blood group A has the largest phenotypic frequency (35.29%) in the Muslim while the Bania with 23.62% display the lowest frequency for this blood group. For blood group B, the Shudra has the highest frequency (49.15%) and the Kshatria has the lowest (26.32%) of it. The Kshatria has the highest frequency (28.95%) and the Shudra the lowest (16.95%) of blood group O. For blood group AB, the Bania has the highest frequency (12.60%) and the Shudra the lowest (5.08%). The allele frequencies have the order $O>B>A$ in the Brahmin, Bania and the Shudra and have the order $O>A>B$ in the Kshatria, Kayasth and the Muslim.

The distribution of the ABO blood types and their allele frequencies in controls is given in Table 3. The Muslim has the highest phenotypic frequency (35.42%) of blood group A and the Bania with 20.87% display the lowest frequency of it. For blood type B, the Brahmin has the highest frequency (39.42%) and the Shudra the lowest (33.96%). The Brahmin has the highest frequency (29.93%) of blood type O and the

Kayasth the lowest (17.78%). For blood group AB, the Shudra has the highest frequency (13.21%) and the Brahmin the lowest (5.84%). The allele frequencies have the order $O>B>A$ in all the controls (except the Muslim).

When the comparisons were made regarding the distribution of the ABO blood types between the diabetic patients from central India (Sagar) and north India (Patiala) (Table 4), it was found that, patients from central India had the higher mean values in blood type A (27.98%) and AB (9.00%) than their north Indian counterparts (19.06% and 7.93% respectively). Patients from north India had the higher mean values in blood type B (42.06%) and O (30.95%) than the patients from central India (38.55% and 24.46% respectively). However, no significant differences ($P>0.05$) were noted among them ($\chi^2_3 = 5.18$).

Table 5 shows the distribution of the ABO blood types in controls from central India (Sagar) and north India (Patiala) (Table 5). Controls from central India had the higher mean values in blood type A (26.47%), B (37.47%) and AB (9.47%) than their north Indian counterparts (22.16%, 35.10% and 8.62% respectively), whereas, in blood type O, controls from north India had the higher mean value (34.13%) than the controls from central India (26.32%). Nonetheless, no significant differences ($P>0.05$) were found between them ($\chi^2_3 = 7.63$).

Table1: Distribution of the ABO blood types in patients with diabetes mellitus and controls.

Sample	n	Phenotype frequency				Allele frequency			
		A	B	O	AB	A	B	O	
Patients	511	Abs. No.	143	197	125	46			
		%	27.984	38.552	24.462	9.002	0.2086	0.2790	0.5122
Controls	475	Abs. No.	127	178	125	45			
		%	26.737	37.474	26.316	9.474	0.2027	0.2735	0.5236

$\chi^2_{(3)}$: 0.6074; $P>0.05$; H.W. equilibrium = Hardy Weinberg equilibrium.

Table 2: Distribution of the ABO blood types and allele frequencies in patients with diabetes mellitus.

Population	n	Phenotype frequency				Allele frequency			
		A	B	O	AB	A	B	O	
Brahmin	146	Abs. No.	36	62	39	9			
		%	24.657	42.466	26.712	6.164	0.1710	0.2878	0.5413
Bania	127	Abs. No.	30	53	28	16			
		%	23.622	41.732	22.047	12.598	0.2019	0.3250	0.4732
Kshatria	76	Abs. No.	25	20	22	09			
		%	32.895	26.316	28.947	11.842	0.2555	0.2127	0.5317
Kayasth	52	Abs. No.	17	16	14	05			
		%	32.692	30.769	26.923	9.615	0.2420	0.2293	0.5286
Shudra	59	Abs. No.	17	29	10	03			
		%	28.813	49.152	16.949	5.085	0.1943	0.3361	0.4681
Muslim	51	Abs. No.	18	17	12	04			

Table3: Distribution of the ABO blood types and allele frequencies in controls.

Population	n	Phenotype frequency				Allele frequency			
		A	B	O	AB	A	B	O	
Brahmin	137	Abs. No.	34	54	41	08	0.1694	0.2634	0.5670
		%	24.817	39.416	29.927	5.839			
Bania	115	Abs. No.	24	44	33	14	0.1805	0.2940	0.5254
		%	20.870	38.261	28.696	12.174			
Kshatria	77	Abs. No.	22	28	20	07	0.2124	0.2639	0.5236
		%	28.571	36.364	25.974	9.091			
Kayasth	45	Abs. No.	15	17	08	05	0.2596	0.2906	0.4494
		%	33.333	37.778	17.778	11.111			
Shudra	59	Abs. No.	15	18	13	07	0.2348	0.2727	0.4925
		%	28.302	33.962	24.528	13.207			
Muslim	51	Abs. No.	17	17	10	04	0.2554	0.2554	0.4886
		%	35.417	35.417	20.833	8.333			

Table 4: Comparison of the distribution of the ABO blood types in diabetic patients from Sagar and Patiala.

Sample	n	Phenotype frequency				Allele frequency			
		A	B	O	AB	A	B	O	
Patients from Sagar*	511	Abs. No.	143	197	125	46	0.2086	0.2790	0.5122
		%	27.984	38.552	24.462	9.002			
Patients from Patiala**	126	Abs. No.	24	53	39	10	0.1504	0.2973	0.5522
		%	19.057	42.063	30.952	7.935			

$\chi^2_{(3)}$: 5.1798; P>0.05; * Present study; **Data from Kaur, (1983).

Table 5: Comparisons of the distribution of the ABO blood types in controls from Sagar and Patiala.

Sample	n	Phenotype frequency				Allele frequency			
		A	B	O	AB	A	B	O	
Controls from Sagar*	475	Abs. No.	127	178	125	45	0.2135	0.2839	0.5024
		%	26.737	37.474	26.316	9.474			
Controls from Patiala**	510	Abs. No.	113	179	174	44	0.1662	0.2481	0.5855
		%	22.156	35.098	34.127	8.619			

$\chi^2_{(3)}$: 7.626; P>0.05; * Present study; **Data from Kaur, (1983).

Table 6: Comparisons of the distribution of the ABO blood types in pooled patients and controls from Sagar and Patiala.

Sample	n	Phenotype frequency				Allele frequency			
		A	B	O	AB	A	B	O	
Pooled patients	637	Abs. No.	16	250	164	56	0.1957	0.2819	0.5223
		%	26.217	39.246	25.746	8.791			
Pooled controls	985	Abs. No.	240	357	299	89	0.1843	0.2609	0.5547
		%	24.365	36.244	30.355	9.035			

$\chi^2_{(3)}$: 4.365; P>0.05;

Finally, comparisons were made regarding the distribution of the ABO blood types in pooled patients and pooled controls from central India (Sagar) and north India (Patiala) (Table 6). Pooled patients had the higher mean values in blood type A (26.22%) and B (39.25%) than their pooled control counterparts (24.36% and 36.24% respectively), whereas, pooled controls had the

higher mean values in blood type O (30.35%) and AB (9.03%) than the pooled patients (25.75% and 8.79% respectively). However, no significant differences (P>0.05) were noted between them ($\chi^2_3 = 4.36$).

The findings of the present study suggest that there is no association between the distribution of the ABO blood types and diabetes

mellitus. Non-association of the ABO blood groups and diabetes mellitus was also studied by Sidhu et al. (1988), Iyengar et al. (1989) and Qureshi and Bhatti (2003).

REFERENCES

- Aird, I., Bentall, H.H., Mehigan, J.A. and Roberts, J.A.: The blood groups in relation to peptic ulceration and carcinoma of colon, rectum, breast and bronchus; an association between the ABO blood groups and peptic ulceration. *Br. Med. J.*, **2**: 315-321 (1954).
- Barua, S.: *Human Genetics: An Anthropological Perspective*. Classique Books, Kolkata (2002).
- Beardmore, J.A. and Karimi-Booshehri, F.: ABO genes are differently distributed in socio-economic groups in England. *Nature*, **303**: 522-524 (1983).
- Beasley, W.H.: Blood groups of gastric ulcer and carcinoma. *Br. Med. J.*, **7**:1167-1172 (1960).
- Bhasin, M.K., Walter, H. and Danker-Hopfe, H.: *The Distribution of Genetical, Morphological and Behavioral Traits Among the Peoples on Indian Region*. Kamla-Raj Publishers, Delhi (1992).
- Brown, D.A.P., Melrose, A.G. and Wallace, J.: The blood groups in peptic ulceration. *Br. Med. J.*, **2**: 135-138 (1956).
- Buckwalter, J.A., Wohlwend, E.B., Colter, D.C., Tidrick, R.T. and Knowler, L.A.: Peptic ulceration and ABO blood groups. *J.A.M.A.*, **162**:1215-1220 (1956).
- Clarke, C.A., Cowan, W.K., Edwards, J.W., Howel, A.W., Evans, A.W., McConnell, R.B., Woodrow, J.C. and Sheppard, P.M.: The relationship of the ABO blood groups to duodenal and gastric ulceration. *Br. Med. J.*, **2**: 643-646 (1955).
- Clarke, C.A., Evans, D.A.P., McConnell, R.B. and Sheppard, P.M.: Secretion of blood group antigens and peptic ulcer. *Br. Med. J.*, **15**:603-607 (1959).
- Doll, R., Swynnerton, B.F. and Newell, A.C.: Observation on blood group distribution in peptic ulcer and gastric cancer. *Gut*, **1**:31-35 (1960).
- Ekoe, J.M., Zimmet, P. and Williams, R.: *The epidemiology of Diabetes Mellitus: An International Perspective*. John Wiley, Chichester (2001).
- Elbein, S.C., Craig, R. and Wang, H.: Association of SMPs in Tandem Genes SCAMP3 and CLK2: Positional and functional candidates for type 2 diabetes (T2DM). *Abstract Book, 65th Scientific Sessions*. Organized by A Journal of the American Diabetes Association, California, pp. A286 (2005).
- Guleria, K., Singh, H.P., Kaur, H. and Sambyal, V.: ABO blood groups in gastrointestinal tract (GIT) and breast carcinoma patients. *Anthropologist*, **7**: 189-192 (2005).
- Iyengar, S., Hamman, R.F., Marshall, J.A., Baxter, J., Majumder, P.P. and Ferrell, R.E.: Genetic studies of type 2 (non -insulin dependent) diabetes mellitus: Lack of association with seven genetic markers. *Diabetologia*, **32**: 690-693 (1989).
- Kaur, K.: *The LH Red Blood Cell Membrane Specificity in Man and Some Selected Animals*. Ph.D. Thesis (unpublished), Punjabi University, Patiala (1983).
- Qureshia, M.A. and Bhatti, R.: Frequency of ABO blood groups among the diabetes mellitus type 2 patients. *J. Coll. Physicians Surg. Pak.*, **13**: 453-455 (2003).
- Rahman, M.: Non-association of ABO blood groups with diabetes mellitus in Bangladesh. *Bangladesh Med. Res. Counc. Bull.*, **2**: 144-146 (1976).
- Sharara, A.I., Abdul-Baki, H., Elhaji, I., Kreidieh, N. and Kfoury- Baz, E.M.: Association of gastroduodenal disease phenotype with ABO blood group and Helicobacter pylori virulence - specific serotypes. *Dig. Liver Dis.*, **38**:829-833 (2006).
- Sidhu, L.S., Malhotra, P. and Singh, S.P.: ABO and Rh blood groups in diabetes mellitus. *Anthropol. Anz.*, **46**: 269-275 (1988).