

Original Article

ASSOCIATION OF ABO BLOOD GROUPS WITH DIABETES MELLITUS AND ISCHEMIC HEART DISEASE IN A PAKISTANI POPULATION

Muhammad Usman Bashir, Sara Naeem and Hamid Hassan

Objective: To The objective of this study was to find out the association of ABO blood groups with type 2 diabetes mellitus and ischemic heart disease (IHD) in a Pakistani population.

Methods: A total of 109 patients suffering from diabetes mellitus, 93 patients suffering from ischemic heart disease and 122 healthy controls were selected from both of these institutes. The patients were already diagnosed cases coming for follow up. Blood group of the subjects was either determined from clinical record data or at the Physiology laboratory of CIMS after taking blood samples. Chi-square test was applied to find out any association of ABO blood groups with IHD and DM type 2.

Results: The blood group O was significantly less common in patients suffering from diabetes mellitus than healthy controls (n=31, 28.4% vs. n=51, 41.8%, p=0.027). The blood group B was more common in diabetic patients as compared to healthy controls (n=55, 50.5% vs. n= 40, 32.8%) but this difference was not statistically significant (p=0.124). No statistically significant (p>0.05) association was found between ABO blood groups and IHD.

Conclusions: Blood group O is significantly negatively associated with DM type 2, while there is no significant association between ABO blood groups and IHD in the Pakistani population we studied.

Keywords: ABO blood groups; diabetes mellitus; ischemic heart disease.

Introduction

Association between ABO blood groups and various diseases has been a topic of interest since long Maxwell et al, in 1955, tried to find association between ABO blood groups and essential hypertension, but failed to do so.¹ Since then, a lot of studies have been conducted to find association between these genetically determined blood groups and various diseases like hypertension, obesity, gastric ulcer, diabetes mellitus, leukemia, lymphoma, gastric carcinoma and so on.²⁻¹⁵ Most of the diseases with which the investigators tried to find out association of ABO blood groups are hereditary in nature.

The ABO blood groups system is the most important human blood group system. The incidence and frequency of these blood groups varies in different races and in different parts of the world.¹⁶ The 9q34.2 region of the human genome is the area at which different ABO blood group genes have been mapped. This area is said to be commonly affected by genetic alterations.¹⁷

The ABO blood groups were found to have significant association with certain diseases like peptic ulcer which is found more in O blood group individuals.⁹ On the other hand, relationship of

these blood groups with some other diseases has been conflicting till date.^{8,9} Some scientists found significant association between ABO blood groups and various diseases, while others failed to find one.^{4,6,10,11} Impact of different races, climates and life style factors plays a vital role in establishing this association.⁹

Diabetes mellitus and ischemic heart disease are major diseases which usually run in families and can have hereditary basis. The prevalence of type 2 diabetes mellitus and ischemic heart disease in urban populations of South Asia has been estimated to be 68%, and 714% respectively.¹⁸

These diseases and ABO blood groups can have strong association because of their genetic basis. A positive or negative association between these diseases and ABO blood group systems may facilitate us in early identification of individuals at increased/less risk of developing these diseases because blood grouping is generally done at early ages, usually at the time of school admission. Scientific data based upon Pakistani population and representing the relation between these major diseases and ABO blood groups is scarce.

Methods

Nishtar Medical University, Multan from January 2017 to December 2017. A total of 109 patients suffering from diabetes mellitus, and 93 suffering from ischemic heart disease were selected from outpatient departments (OPDs) of CMH Multan and Nishtar Medical University. The patients were already diagnosed cases coming for follow up. The diagnosis was confirmed from clinical history and clinical record data. It was made certain that each patient was suffering from only one of these diseases. Diabetics with IHD and IHD Patients with history of diabetes mellitus were excluded. Patients with co-morbid conditions were also excluded to prevent bias. The ABO blood groups of most of the patients were noted from the clinical records present with them. In case of any suspicion, blood sample was taken from patients after their consent and blood group determined at the Physiology laboratory of CIMS.

Age and sex matched healthy controls (n=122) were selected mostly from the staff of CIMS and Nishtar Medical University. Some of the controls were selected from out patients department of CIMS and NMU who were visiting OPD for minor diseases like cough, flu etc.

Data was analyzed using SPSS software version 17. Frequencies and percentage were used to express data. Chi-square test was employed to determine statistically significant differences between various parameters. A P value < 0.05 was considered statistically significant.

Results

Our study included 122 healthy controls, 93 patients suffering from ischemic heart disease and 109 patients suffering from diabetes mellitus. Table 1 shows the age and sex distribution among the patients and healthy controls. Most of the subjects, whether

Table-1: Age and sex distribution of patients and controls.

Characteristics		Diabetic Patients (n=109)	IHD Patients (n=93)	Ontrols (n=122)
Gender	Male	57 (52.3%)	52 (55.9%)	62 (50.8%)
	Female	52 (47.7%)	41 (44.1%)	50 (49.2%)
Age (in Yrs.)	>30	05 (4.6%)	04 (4.3%)	05 (4.1%)
	30-40	09 (8.3%)	07 (7.5%)	17 (13.9%)
	41-50	38 (34.9%) ²	19 (31.2%)	40 (32.8%)
	51-60	35 (32.1%)	34 (36.6%)	44 (35.1%)
	>60	22 (20.2%)	19 (20.4%)	16 (13.1%)

Table-2: Percentage distribution of ABO blood groups among DM patients & healthy .

Blood Groups	Control (n=122)	DM pt. (N=109)	p-value
Male	17 (13.9%)	13 (11.9%)	0.465
Female	40 (32.8%)	55 (50.5%)	0.124
>30	51 (41.8%)	31 (28.4%)	0.027*
30-40	14 (11.5%)	10 (9.2%)	0.414

Table-3: Percentage distribution of ABO blood groups among IHD patients & healthy controls.

Blood Groups	Control (n=122)	DM pt. (N=109)	p-value
A	17 (13.9%)	10 (10.75%)	0.257
B	40 (32.8%)	37(39.8%)	0.732
O	51 (41.8%)	34 (36.5%)	0.061
AB	14 (11.5%)	12 (12.9%)	0.154

controls, belonged to age group 51-60 years, while least number of subjects were less than 30 years of age.

Table 2 shows the distribution of ABO blood groups among diabetic patients and healthy controls. The blood group O was significantly less common in patients suffering from diabetes mellitus than healthy controls (n=31, 28.4% vs. n= 51, 41.8%, p= 0.027). The blood group B was more common in diabetic patients as compared to healthy controls (n=55, 50.5% vs. n= 40, 32.8%) but this difference was not statistically significant (p=0.124). No statistically significant difference was found in the distribution of blood groups A and AB among healthy controls and DM patients.

Table 3 depicts the distribution of ABO blood groups among patients of ischemic heart disease and healthy controls. Majority of the patients suffering from IHD were having blood group B (n=37, 39.8%)

($p=0.732$) when compared with blood group B in healthy controls ($n=40, 32.8\%$). On the other hand, blood group A was found in least number of IHD patients ($n=10, 10.75\%$) but this was also not statistically significant ($p=0.257$) from blood group A individuals belonging to the control group ($n=17, 13.9\%$).

Discussion

In this study, we tried to find out the relationship between ABO blood groups and two major diseases affecting Pakistani population, diabetes mellitus and ischemic heart disease. Our study included 122 healthy controls, 93 patients suffering from ischemic heart disease and 109 patients suffering from diabetes mellitus. We found that the blood group O was significantly ($p= 0.027$), less common in patients suffering from diabetes mellitus than healthy controls ($n=31, 28.4\%$ vs. $n= 51, 41.8\%$). The blood group B was more common in diabetic patients as compared to healthy controls ($n=55, 50.5\%$ vs. $n= 40, 32.8\%$) but this difference was not statistically significant ($p=0.124$, **table 2**).

Several studies done in different parts of the world found significant association between ABO blood groups and diabetes mellitus.^{7,19,21} However many investigators did not find any significant association between ABO blood groups and diabetes mellitus^{4,6}. Bener et al conducted a study in 2014, in Qatar, and found that the blood group B was significantly more common in diabetic patients as compared to healthy controls.¹⁹ Similar results were also obtained by some other researchers.^{20,21} In 2003, Quershi et al conducted a study in a Pakistani population to find out association of the ABO blood groups with DM. They also found higher frequency of blood group B in Pakistani people⁷. On the other hand, Waseem et al, in 2012, found the frequency of blood group O to be highest among Pakistani type 2 diabetics.²² However, a study conducted by Okon et al in 2008, reported a significantly negative association of blood group O with DM just like our study.²³ These differences can be due to geographical and racial variations which can play role in the genetic expression of the disease. We did not find any statistically significant difference between distribution of blood groups A and AB among healthy controls and DM patients. However Dali et al conducted a study in Algeria in 2011 and found that the frequencies of blood groups A and B were significantly lower among diabetic patients when compared to healthy controls.²⁴

We did not find any significant association between ischemic heart disease (IHD) and ABO blood groups in the Pakistani population we studied (table 3). The frequency of blood group B was highest among IHD patients ($n=37, 39.8\%$) but this was not statistically significantly ($p=0.732$) different when compared with blood group B in healthy controls ($n=40, 32.8\%$). On the other hand, blood group A was found in the least number of IHD patients ($n=10, 10.75\%$) but this was also not statistically significant ($p=0.257$) different from blood group A in healthy controls ($n=17, 13.9\%$). Amirzadegan et al conducted a study in Iran, in 2006, and found that there was no correlation between ABO blood groups and of ischemic heart disease. They also found that the prevalence of major risk factors was equal in individuals of different blood groups so they concluded that blood groups have no relation with development of IHD.²⁵

On the other hand, a study conducted by Whincup et al, in 1990, to find out association of ABO blood groups with IHD revealed higher incidence of IHD in individuals having blood group A. They also found slightly higher concentrations of total serum cholesterol in those IHD patients having blood group A.²⁶ Similarly, meta-analysis by He et al showed that non-O blood group individuals had more risk of developing IHD when compared with individuals having blood group O (relative risk =1.11; 95% CI, 1.051.18; $p=0.001$).²⁷

We conclude that individuals with blood group O have significantly less chance of developing type 2 diabetes mellitus, while there was no significant association between ABO blood groups and ischemic heart disease in the Pakistani population we studied.

Conclusions

Blood group O is significantly negatively associated with DM type-II, while there is no significant association between ABO blood groups and IHD in the Pakistani population we studied.

*Department of Physiology,
CMH Multan Institute of Medical Sciences (CIMS),
Multan*
www.esculapio.pk

References

1. Maxwell RDH & Maxwell KN. ABO Blood Groups and Hypertension. *Br Med J* 1955; 2:179-80.
2. O' Donnell J & Laffan M. The relationship between ABO histoblood group, factor VIII and von Willebrand factor. *Transfus Med* 2001; 11:343-51.
3. Arid I, Bentall H, Roberts J. A relationship between cancer of stomach and the ABO blood groups. *Br Med J* 1953; 1:799-801.
4. Rahman M. Non-association of ABO blood groups with diabetes mellitus in Bangladesh. *Bangladesh Med Res Counc Bull* 1976; 2:144-46.
5. Andersen J & Lauritzen E. Blood groups and diabetes mellitus. *Diabetes* 1960; 9:20-24.
6. Koley S. The distribution of the ABO blood types in patients with diabetes mellitus. *Anthropologist* 2008; 10:129-32.
7. Qureshi MA & Bhatti R. Frequency of blood groups among the diabetes mellitus type 2 patients. *J Coll Physicians Surg Pak* 2003; 13:453-55.
8. Alwasaidi TA, Alrasheed SK, Alhazmi RA, Alfraidy OB, Jameel MA, Alandijani AA. Relation between ABO blood groups and obesity in a Saudi Arabian population. *J Taibah Univ Med Sc* 2017; 12:407-11.
9. Liunbruno GM & Franchini M. Beyond immunohaematology: the role of the ABO blood group in human diseases. *Blood Transfuse* 2013; 11: 491-99.
10. Chandra T & Gupta A. Association and distribution of hypertension, obesity and ABO blood groups in blood donors. *Iran J Ped Hematol Oncol* 2012; 2:140-45.
11. Siva K, Umesh PL, Satyanarayana P. Correlation between obesity & ABO blood group in school going children in India. *Indian J Basic Appl Med Res* 2012; 1: 280-84.
12. Sarhan MA, Saleh KA, Bin-Dajem SM. Distribution of ABO blood groups and rhesus factor in Southwest Saudi Arabia. *Saudi Med J* 2009; 30: 116-19.
13. Wang J, Garcia-Bailo B, Nielsen DE, El-Sohemy A. ABO genotype, 'blood-type' diet and cardiometabolic risk factors. *PLoS One* 2014; 9:847-49.
14. Eweidah MH, Rahiman S, Ali Hassan, Al-Shamary AMD. Distribution of ABO and Rhesus (RHD) blood groups in Al-Jouf Province of the Saudi Arabia. *Anthropologist* 2011; 13(2): 99-102.
15. Nemesure B, Wu S, Hennis A and Leske C. Hypertension, type 2 diabetes, and blood groups in a population of African ancestry. *Ethnicity and Disease* 2006; 16:822-29.
16. Chan K. The ABO blood group frequency distribution of Singapore based on a blood donor sample. *Singapore Med J* 1962; 3:3-15.
17. Guleria K, Singh HP, Kaur H and Sambyal V. ABO blood groups in gastrointestinal tract(GIT) and breast carcinoma patients. *Anthropologist* 2005; 7: 189-92.
18. Khan MS, Khan A, Ali A, Akhtar N, Rasool F, Khan H, et al. Prevalence of risk factors for coronary artery disease in Southern Punjab, Pakistan. *Trop J Pharm Res* 2016; 15(1):195-200.
19. Bener A & Yousafzai MT. The distribution of the ABO blood groups among diabetes mellitus patients in Qatar. *Niger J Clin Pract* 2014; 17(5):565-68.
20. Jaggi S & Yadav AS. Distribution of ABO and Rh (D) Allele frequency among the type 2 Diabetes Mellitus patients. *Am Int J Res Formal Appl Nat Sci* 2014; 1:24-26.
21. Kamil M, Al-Jamal HA, Yusoff NM. Association of ABO blood groups with diabetes mellitus. *Libyan J Med* 2010; 5:484-87.
22. Waseem AG, Iqbal M, Khan OA, Tahir M. Association of Diabetes Mellitus with ABO and Rh Blood Groups. *Ann Pak Inst Med Sci* 2012; 8:134-36.
23. Okon UA, AntaiAB, Osim EE, Ita SO. The relative incidence of diabetes mellitus in ABO/Rhesus blood groups in South-Eastern Nigeria. *Niger J Physiol Sci* 2008; 23:1-3.
24. Dali Sahi M, Aour Metri A, Belmokhtar F, Belmokhtar R, Bozza F. The relationship between ABO/rhesus blood groups and type 2 Diabetes in Maghnia/Western Algeria, *S Afr Fam Pract* 2011; 53:568-72.
25. Amirzadegan A, Salarifar M, Sadeghian S, Davoodi G, Darabian C, Goodarzynjad H. Correlation between ABO blood groups, major risk factors, and coronary artery disease. *Int J Cardiol* 2006; 110:256-58.
26. Whincup PH, Cook DG, Phillips AN, Shaper AG. ABO blood group and ischaemic heart disease in British men. *BMJ* 1990; 300: 1679-82.
27. He M, Wolpin B, Rexrode K, Manson JE, Rimm E, Hu FB et al. ABO blood group and risk of coronary heart disease in two prospective cohort studies. *Arterioscler Thromb Vasc Biol* 2012;