Distribution of ABO and Rh Blood Groups among Diabetes Type 2 Patients in Yazd Diabetes Research Center (2015-2016)

Reyhane Azizi[1], Simin Manoochehry[2], Seyd Kazem Razavi-Ratki[3], Seyed Mostafa Seyed Hosseini[4], Mahmoud Vakili[5], Nasim Namiranian[6*]

1. Assistant Professor of Endocrinology, Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
2. Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
3. Assistant Professor of Nuclear medicine, Department of Radiology, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
4. Assistant professor of Cardiology, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
5. Associated Professor of Community Medicine, Health Monitoring Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
6. Assistant Professor of Community Medicine, Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

***Correspondence:**
Nasim Namiranian, Assistant Professor of Community Medicine, Diabetes Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
Tel: (98) 353 728 0217
Email: Namiranian.Nasim@gmail.com

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Abstract

Objective: Blood group as a genetic trail can be associated with type 2 diabetes. The aim of this research was to determine the distribution of ABO frequency and RH blood groups in type 2 diabetic patients referred to Yazd diabetes center.

Materials and Methods: In this research 1502 type 2 diabetes patients of Yazd diabetes center were selected and checked for blood group ,age, sex, duration of diabetes, nephropathy, retinopathy ,diabetes control and familial history of diabetes. Data were analyzed on SPSS-21.

Results: From 1502 patients participated in this study 995 were male (66.2%) and 507 female (33.8%). The mean age (standard deviation) of patients was 52±10.46. About 541 participants (36%) had O blood group, 431 (28%) A, 379 (25%) B, and 150 (10%) AB. About 90.8% patients were RH. The most frequency was observed in blood group O+ (30.9%) and the patients with blood group of AB- had the lowest frequency (0.5%) among patients. The various blood groups were not different in following subgroups; Familial History (*P*=0.6), diabetes duration (*P*=0.32), retinopathy (*P*=0.64), nephropathy (*P*=0.69), and hypertension (*P*=0.33). But HbA1c<7 and blood groups were significantly different (*P*=0.03).

Discussion: The blood group O+ was the most frequent and AB- was the least frequent among blood groups in this study .But for evaluation of relationship between blood group and diabetes the prospective studies are suggested.

Keywords: Diabetes, Blood group, ABO.

Introduction

Type 2 diabetes mellitus (T2DM) is a most common metabolic disorder that characterized by hyperglycemia. T2DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system. With an increasing incidence worldwide, T2DM will be a leading cause of morbidity and mortality for the predictable future. There is considerable ethnic and geographic variation in the incidence of T2DM (1). The average of

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T2DM prevalence in Iran is 7% and in Yazd is 16%. (4)

T2DM has a strong genetic component. T2DM is a polygenic and multifactorial disease. Environmental factors such as obesity, nutrition, and physical activity modify the phenotype. The genes that predispose to T2DM are incompletely identified, but recent genome-wide association studies have identified a large number of genes that convey a relatively small risk for T2DM (>20 genes, each with a relative risk of 1.06–1.5 While the genetic susceptibility to type 2 diabetes is under active investigation .blood groups as a genetic trails with easy access can help in this field. (1)

More than 100 blood groups were identified but the ABO system is the most important. The blood group genes are located on p9 and inherited in codominant pattern. Also the gene of Rh factor located on chromosome 1 and inherited as haplotypes (5). Distribution of blood groups is different between various races and nations and even in different provinces of IRAN. The most prevalence of blood group is B and lowest frequency of blood group is O in Yazd. (9)

The susceptibility to a number of diseases has been interrelated to ABO phenotype. For example, gastric cancer is found to be more common in blood group A individuals, whereas gastric and duodenal ulcers or Schizophrenia occur more commonly among the O blood group individuals (6).

Some studies was done in relation between diabetes and blood group for example some of them introduced O blood group as protective factor against d T2DM (7) but some studies did not find any relationship between blood group and T2DM. (6)

The mechanisms of these observations association are unknown. It may be related to impact of unrelated but adjacent genes together. Therefore blood group can affect several body systems from digestive enzymes to chemical neuro transmitters. (6) It has been suggested that the human ABO locus might influence endothelial or inflammation markers, such as the factor VIII–von Willebrand factor (vWF) complex, which is highly presented in non-O individuals .In addition, the ABO blood groups have been associated with plasma soluble intercellular adhesion molecule 1 (ICAM-1) and TNF receptor 2 (TNF-R2) levels. These markers have been associated with an increased type 2 diabetes risk, thus providing a potential explanation for the observed relationships. Finally, a recent paper suggested that the ABO blood group is one of the genetically determined host factors that modulate the composition of the intestinal microbiota which participates in metabolism by affecting the energy balance, glucose metabolism and low-grade inflammation. (7) In this study we aimed to determine the distribution of blood groups in patient with T2DM in Yazd diabetes center.

Materials and Methods

In this cross sectional study, 1502 T2DM patients of Yazd diabetes center were selected. The patients were randomly selected among 34000 diabetic patients of Yazd diabetes center. The patients were checked for age, sex, age on diabetes onset, familial history of diabetes, Cerebrovascular accident (CVA), Ischemic heart disease (IHD), retinopathy, nephropathy (micro-albuminuria more than 30 mg.dl), serum low-density lipoprotein (LDL), level of fasting blood sugar (FBS), Hb A1c and ABO blood group and Rh. All of included patients were DM type 2 and older than 20 years.

The study exclusion criteria was diabetes due to metabolic disease (Cushing, glucagonoma and acromegaly), medication induced diabetes and past history of pancreas surgery, and pregnancy.

Data were collected and analyzed on SPPS version 22.0. All of findings were expressed as Mean±Standard deviation (SD) or frequency and precents. To determine the normal distribution of data the Kolmogrov-Smirnov test was run. Chi square test and Fisher's exact test were applied on qualitative variables between groups. To compare the study

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variables student t-test and analysis of variance (ANOVA) was used. $P<0.05$ was considered significant.

Results

Totally 1502 T2DM patients were studied. The mean age of patients was 52 ± 10.46 (range: 26-90). Most of them were male 996 (66.2%) and 507 (33.8%) were female. Table 1 shows the ABO blood groups and Rh distribution in male and female diabetic patients.

The O+ blood group was most frequent (30.9 %) and AB- was the least (0.5%) in this population. The frequencies of blood groups were not statistically different between men and women (*P*-value:0.11). Also family history of diabetes (*P*-value:0.6), hypertension (*P*-value:0.33), ischemic heart disease (*P*-value:0.21), nephropathy (*P*-value:0.69) and retinopathy (*P*-value:0.64) were not statistically different in blood groups. Also ANOVA testing showed that there were not any significant differences on the mean of age which diabetes occurred with blood groups (*P*-value:0.32).

Table 2 shows the prevalence of some diseases associated with diabetes in studied population in correlation with blood group.

The means of HbA1c in various blood groups were not statistically different (*P*-value:0.68) but with chi2 test after dividing to good control (HbA1c<7) and poor control group (HbA1c>7) significant difference was observed between blood groups and HbA1C control ($P=0.037$).

Discussion

In this study only T2DM patients were studied but other types of diabetes ignored. From 1502 patients (995 men and 507 women), 541 participants (36%) had O blood group, 431 (28%) A, 379 (25%) B blood group and 150 (10%) had blood group AB. 1364 participants (90.80%) with Rh+ and 137 participants (9.2%) had Rh-. Blood groups were not statistically different in: nephropathy, retinopathy, hypertension, IHD, age of diabetes onset, familial history of diabetes different groups.

Distributions of blood groups in various populations are different. Distribution of blood groups in general population of Yazd according to blood transfusion organization center study which published in 2001 was as follow: blood group of O 33.7%, B 30.8 %, A 26.5 %, AB 8.85%, with Rh+ 87.01 % and Rh–12.9% (9).

Table 3 shows the frequency of blood groups in previous studies in other diabetic

Table 1. Distribiution of ABO and Rh blood groups according to gender

Blood groups	Male	Female	Total
A+	276(27.2%)	133(26.2%)	409(27.2%)
B+	225(22.6%)	125(24.7%)	350(23.3%)
AB+	104(10.5%)	38(7.5%)	142(9.5%)
O+	305(30.7%)	159(31.4%)	464(30.9%)
A-	15(1.5%)	7(1.4%)	22(1.5%)
B-	23(2.3%)	7(1.4%)	30(2%)
AB-	6(0.6%)	2(0.4)	7(0.5%)
O-	41(4.1%)	36(7.1%)	77(5.1%)
Total	995(66.2%)	507(33.8%)	1502(100%)

Table 2. prevalence of chronic diseases in correlation with blood group

Chronic diseases	Frequency	*P*-value*
Nephropathy	16.2%	0.69
Retinopathy	7.8%	0.64
Hypertension	27.7%	0.33
Ischemic heart disease	13.2%	0.21
Hyperlipidemia	21.4%	0.13
Hypothyroidism	6.9%	0.91
Cerebrovascular accident	8%	0.18
Nephrolithiasis	5.45	0.26

*: chronic diseases in correlation with blood group

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populations.

Most previous studies are comparative. However, some of them reported they found relationship between blood groups and T2DM such as Bener et al (8) who reported in Qatar and Qureshi et al (17) introduced blood group of B as a risk factor for T2DM. Okon et al (10) reported the same for A+ and O-. Emam et al (2) in Ahvaz and Sidhu et al (18) in India introduced AB and Rh- as T2DM risk factor. In many studies including large prospective E3N study of Fagherazzi et al (7), O blood group of was introduced as a protective factor against T2DM but some studies did not find any correlation between blood group and T2DM such as Kashfi et al (6) and koley et al (13). The review study published in 2016 by Meo et al (15) reported B blood group has the most relationship and O blood group has the least relationship with T2DM. However ,they Suggested Further large sample sized study from both experimental and epidemiological type is needed for better analysis of correlation between "ABO" and "Rh" blood groups with T2DM risk.

This study is not case control and therefore cannot investigate the correlation between T2DM and blood groups.

Appropriate sample size and assessment of important aspects of diabetes including age of diabetes onset, complications and diabetes in relation with blood groups were reported. No statistical differences were seen in different blood groups and age of diabetes onset. Therefore it can be concluded that blood group is not a risk factor for early occurrence of diabetes. Various blood groups were not different in prevalence of nephropathy and retinopathy. There were different in control of diabetes according to HbA1c<7 and>7. It seems that important aspects of diabetes had no significant relationship with blood group.

Some studies have been done only in one sex to find possible effect of gender on the interpretation of the results. (7) or in Bener et al (8) study B blood group was more common in male diabetic but in this study frequency of blood groups in both sex were similar which is consistent with other previous studies (Koley etal (13), Kashfi et al (6)).

Prevalence of hypertension and IHD was similar in different blood groups in accordance with Amirzadegan et al (16) who studied in Tehran with 2026 samples from patients with coronary artery disease.

Further large sample sized prospective multicenter studies are needed to investigate the relationship between diabetes and blood groups. The case-control study on non-diabetic people more than 70 years old is recommended.

Conclusions

The O+ blood group was the most frequent and AB- least frequent blood groups in this study. However, for evaluation of relationship between blood group and T2DM, more prospective large sample size is suggested. In this study we also did not find any correlation between blood group and familial history, age of diabetes onset, nephropathy, retinopathy, hypertension and ischemic heart disease.

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Table 3. The frequency of blood groups in past studies in diabetic populations

Study	A	B	AB	O	Sample size
Yazd(present study)	28.8%	25.2%	10%	36%	1502
Shiraz (6)	32.19%	19.78%	5.8%	42%	379
Ahvaz (2)	20.3%	27.5%	18.5%	32.7%	523
Qatar (8)	29%	25.7%	6.8%	38.5%	1633
Nigeria (10)	33.3%	11.6%	5.3%	52.6%	224
Iraq (11)	35.9%	16.3%	4.1%	43.5%	920
Japan (12)	33.7%	26.9%	6.7%	32.7%	114
India (13)	24.4%	9%	38.5%	27.9%	511
Pakistan (14)	20.3%	28.8%	14.9%	30.8%	201

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References

1. Braunwald E, Fauci AS, Kasper DL, Hauser SL, Jameson JL, editors. Harrison's principles of internal medicine. 18th edi. New York: Mc Graw–Hill 2012;2969.
2. Emam SJ, Asgari M, Hosseini A, Shahbazian B, Veisi E, Vali M, et al. The Relationship Between Blood Group and Type 2 Diabetes. Medical Laboratory Journal 2012;6(2):47-50.
3. Esteghamati A, Gouya M, Abbasi M, Delavari A, Alikhani S, Alaedini F, et al. Prevalence of Diabetes and Impaired Fasting Glucose in the Adult Population of Iran National Survey of Risk Factors for Non-Communicable Diseases of Iran. Diabetes Care 2008;31:96-8.
4. Afkhami-Ardakani M, Vahidi S, Vahidi A, Ahmadi MH. Epidemiological survey of type 2 diabetes in people over 30 years old in Yazd province. Journal of Shahid Sadoughi University of Medical Sciences and Health Services. 2002;9(1):22-7. (in Persian)
5. Braunwald E, Fauci AS, Kasper DL, Hauser SL, Jameson JL. Harrison's principles of internal medicine. 18th edi. New York: Mc Graw–Hill 2012;951.
6. Kashfi SM, Khani Jeihooni A, Afshariani R, Tabatabaei SHR, Yazdankhah M. frequency distribution of blood groups in diabetic patients and non diabetic patients in Shiraz Nader Kazemi clinic and the relationship between blood groupsand diabetes (2010-2011). Journal of Fasa University of Medical Sciences. Winter 2012;2(4):297-3021.
7. Fagherazzi G, Gusto G, Clavel-Chapelon F, Balkau B, Bonnet F. ABO and Rhesus blood groups and risk of type 2 diabetes: evidence from the large E3N cohort study. Diabetologia. 2014;23:8-13.
8. Bener A, Yousafzai MT. The distribution of the ABO blood groups among diabetes mellitus patients in Qatar. Niger J Clin Pract. 2014;17(5):565-8.
9. Pourfathollah AA, Oody A, Honarkaran N. Geographical distribution of ABO and Rh (D) blood groups among Iranian blood donors in the year 1361 (1982) as compared with that of the year 1380 (2001). Scientific Journal of Iran Blood Transfus Organ. 2004;1(1):11-7.
10. Okon UA, Antai AB, 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(1-2):1-3.
11. Jassim WE. Association of ABO blood group in Iraqis with hypercholesterolaemia, hypertension and diabetes mellitus. East Mediterr Health J. 2012;18(8):888-91.
12. Kanazawa Y, Furusho T, Nakajima H, Amemiya S, Akanuma Y, Kosaka K. Blood groups and diabetes mellitus: A possible tool in the analysis of the hereditary background of diabetes mellitus. Tohoku J Exp Med 1983;141:295-9.
13. Koley s.the distribution of the ABO blood types in patients with diabetes mellitus. Antropologist. 2008;10(2):129-32.
14. Waseem AG, Iqbal M, Khan OA, Tahir M. Association of Diabetes Mellitus with ABO and Rh Blood Groups. Ann Pak Inst Med Sci 2012;8:134-6.
15. Meo SA, Rouq FA, Suraya F, Zaidi SZ. Association of ABO and Rh blood groups with type 2 diabetes mellitus. European Review for Medical and Pharmacological Sciences. 2016;20:237-42.
16. Amirzadegan A, Salarifar M, Sadeghian S, Davoodi G, Darabian C, Goodarzy Nejad H. Correlation between ABO blood groups, major risk factors, and coronary artery diseaseInt. J Cardiol. 2006;110(2):256-8.
17. Qureshi MA, Bhatti R. Frequency of ABO blood groups among the diabetes mellitus type 2 patients.J Coll Physicians Surg Pak. 2003;13(8):453-5.
18. Sidhu LS, Malhotra P, Singh SP. ABO and Rh blood groups in diabetes mellitus. Anthropol Anz. 1988;46(3):269-75.

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