

## **ABO Blood Groups Distribution and Cardiovascular Major Risk Factors in Healthy Population**

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### **Abstract**

**Background:** This study was designed to investigate whether there was an association between ABO blood groups and cardiovascular risk factors in healthy population.

**Methods:** In this cross-sectional study, risk factors screening for cardiovascular disease(CVD) on 5000 healthy persons of Golestan Province, northern Iran, in 2005 was estimated by a questionnaire that included age, sex, physical activity, smoking status, blood group type (if they had blood laboratory tests), weight, height, blood pressure and family history of coronary artery disease (CAD). Data were analyzed with SPSS version 11.5 and by using Chi Square and ANOVA tests. A p-value less than 0.05 were considered as statistically significant.

**Results:** Amongst 5000 subjects, 2920 had blood laboratory tests and their types of blood group were known. Of the total of 2920, 57.4% were male, 70% were inactive, 14% were smoker, 25% were hypertensive, 23% obese, 21% had family history of CAD and mean age was 41.52±12.317. Blood group O(32.9%), A(30.1%), B(23.3%) and AB(13.7%), respectively had most frequency. Amongst cardiac risk factors, only frequency of family history of CAD in individual with different blood groups was different ( $P < 0.01$ ) and individual with A blood group reported more family history of CVD versus other blood groups.

**Conclusion:** Amongst cardiovascular risk factors, only family history of CAD had significant relation with ABO.

**Keywords:** ABO blood group, cardiovascular risk factors, Iran

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### **Introduction**

Cardiovascular diseases (CVDs) are the most important causes of morbidity and mortality in many developing countries, including Iran (1). Sex, age, obesity, smoking, diabetes mellitus, hypertension and family history are considered as major cardiovascular risk factors (2).

Several studies have revealed that ABO blood groups particularly non-O blood groups are associated with the risk of cardiovascular disease (3-5). Although there are inconsistent results, majority of studies attributed higher risk of CAD in non-O individuals to increased level of von Willebrand factor (VWF) (5-12). Framingham study result and British regional heart cohort study have suggested that in A blood group subjects the incidence of ischemic heart disease may be higher than

other blood groups (10, 13). In obvious contradiction, cardiovascular disease might be fatal in subjects with blood group O in Britain (9). In addition, results a study could not demonstrate any association between ABO blood groups and major cardiovascular risk factors (14).

In the majority of previous studies, subjects who were understudy were known case of CAD and we had not enough information about ABO blood groups association and major cardiovascular risk factors (i.e. hypertension, smoking, physical activity and obesity) in healthy population, therefore we used data from Golestan Province cardiovascular risk factors screening study to clarify the relation between ABO blood groups and cardiovascular major risk factors in healthy population.

## Materials and Methods

A cross-sectional population base study was conducted in the Golestan Province (northern of Iran) in 2005. Five thousand inhabitants of this province, aged 25-75 yr were selected via the random sampling method for data collection in the cardiovascular risk factors screening Golestan province, North of Iran, "2005" study. Risk screening for cardiovascular disease was assessed by questionnaire, via personal interview. Each person who agreed to enter into the study filled informed consent. Interviews were performed by trained health professionals. The questionnaire included self-reported information about age, sex, physical activity, smoking status, type of ABO blood groups (if they had blood laboratory tests and their type of blood group were known), body weight and height, two result of systolic and diastolic blood pressure (BP) and family history of CAD. The BP was measured by trained health professionals under standard circumstance (in setting position, after 10min resting time). We used WHO criteria for classified persons as hypertensive, if their two results of systolic blood pressure were at or above 140 mmHg or diastolic blood pressure at or above 90 mmHg or if they used antihypertensive medications. The body mass index were calculated ( $BMI = \text{weight (kg)} / \text{height (m}^2\text{)}$ ). Persons were classified as obese if their BMI was higher than  $30 \text{ kg/m}^2$ . If person reported not participating in activities

such as running, jogging, swimming, bicycling or walking at least 30 min at a time per day, we classified their as inactive person. Smoking status and physical activity were considered as binary variables. ABO blood group types of subjects were according to their previous blood laboratory tests. Age is expressed as mean $\pm$ SD and categorical data are expressed as percentage. The distribution of age was assessed by kolomogrov-Smirnov test and it demonstrated a normal distribution. The analysis of variance (ANOVA) was used for comparing age and chi square test was used to analyze categorical data. Analysis was done with SPSS version 11.5 software.

## Results

Amongst 5000 participants, 2920 had blood laboratory tests and their blood group types were known, therefore analysis was performed for their data. 32.9% of subjects had blood group O, 30.1% A, 23.3% B and 13.7 AB. The relation between cardiovascular major risk factors and ABO blood groups in term of physical activity, smoking, hypertension, obesity, family history of CAD, sex and age in healthy population are presented in Table 1. The distribution of physical activity, smoking, hypertension obesity, sex and age was similar between ABO blood groups; however, the subjects with blood group A reported more family history of CAD than the subjects with other blood groups ( $P=0.004$ ).

**Table 1:** The relation between cardiovascular major risk factors and ABO blood groups in healthy population

	<b>Blood groups overall</b>	<b>A</b>	<b>B</b>	<b>O</b>	<b>AB</b>	<b>P</b>
Inactive (%)	1991 (70.1)	596 (21)	477 (16.8)	668 (23.5)	250 (8.8)	0.09
Smoking (%)	389 (14.1)	116 (4.2)	97 (3.5)	115 (4.2)	61 (2.2)	0.419
Hypertension (%)	748 (25.6)	229 (7.8)	154 (5.3)	251 (8.6)	114 (3.9)	0.163
Obesity (%)	688 (23.6)	219 (7.5)	154 (5.3)	231 (7.9)	84 (2.9)	0.395
Family history of CAD (%)	612 (21)	196 (6.7)	122 (4.2)	189 (6.5)	106 (3.6)	0.004
Male (%)	1677 (57.4)	494 (16.9)	379 (13)	564 (19.3)	240 (8.2)	0.425
age (years)	41.52 $\pm$ 12.317	41.55 $\pm$ 11.876	41.19 $\pm$ 11.836	41.87 $\pm$ 12.77	41.71 $\pm$ 13.16	0.659

## Discussion

In our study, blood groups O, A, B and AB had most frequency respectively that was concordant with the official data from Blood Transfusion Organization (BTO) of Iran. According to official data of BTO of Iran, blood group O predominates (33.6%) in the Iranian population, followed by group A (30.2%), B (24.4%) and AB (11.8%) (14).

Numerous previous studies have demonstrated the association between ABO blood groups particularly non-O blood groups and cardiovascular major risk factors. This association is attributed to lower activated partial thromboplastin time (APTT) ratio, fragment 1+2 of prothrombin and levels of VWF factor in non-O blood group subjects (15-18). The results of present study revealed that prevalence of cardiovascular major risk factors were similar in subjects with different blood groups; however, we found that the subjects with blood group A had more family of CAD. The prevalence of cardiovascular major risk factors of CAD in patients who underwent CABG was identical in patients with different blood groups (14). The prevalence of cardiovascular major risk factors was equal in different blood groups, except for subjects with blood group A, who were younger than the subjects with other blood groups were, which was in concordance with our results (8, 19).

We acknowledge several limitations of the study. In the present study, determination of blood group types of subjects was based on their previous blood laboratory tests and was self reported, which is limitation in our study; however this limitation could not induce bias in our results and we had not all subjects ABO blood group types, which obliged us to limit our analysis to present sample. The sample size of our study was relatively large and we can extend easily our results to the general population. Association between ABO blood groups distribution and cardiovascular major risk factors in healthy population needs to be clarified in multicenter studies. In conclusion, our results show that amongst cardiovascular risk factors only family history of CAD had significant relation with ABO.

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