

## Relation Between ABO Blood Groups, Cardiovascular Risk Factors and Acute Myocardial Infarction

<sup>1</sup>Farnaz Sepasi, <sup>2</sup>Azin Alizadeh Asl and <sup>3</sup>Rasoul Azarfarin

<sup>1</sup>Cardiovascular Research Center, <sup>2</sup>Department of Cardiology, <sup>3</sup>Department of Anesthesiology, Cardiovascular Research Center, Tabriz University of Medical Sciences, Madani Heart Hospital, Tabriz, Iran

**Abstract:** Different risk factors affect development of atherosclerosis and Coronary Artery Disease (CAD). These factors are believed to be of value in prediction and prevention of coronary events. Here in we report the relation between blood groups, cardiovascular risk factors and Myocardial Infarction incidence. Measurements were made in samples obtained from 500 patients who had admitted to Cardiac Care Unit (CCU) of Madani heart center of Tabriz, Iran due to first Acute Myocardial Infarction (AMI) from Jan 2005 to April 2007. Participants provided blood samples for Cholesterol, Glucose (Fasting Blood Sugar (FBS)), Cardiac enzymes and Blood Groups (BG). Standard 12-lead electrocardiograms were obtained immediately after admission. Patients were also asked about current smoking history, Hypertension (HTN) and Diabetes Mellitus (DM) history. Analysis showed significant differences between the frequency of ABO blood groups and AMI, Smoking, Serum Cholesterol, but non significant relation with HTN, DM and the location of MI. In individuals the incidence of AMI was higher in those with BG A; while, *sleeping MI was higher in group O*. AMI was less frequent in BG AB. The mean serum cholesterol level and positive current smoking history were significantly higher in AMI patients with BG A. Blood group A is related to the higher incidence of AMI, hypercholesterolemia and positive current smoking history, but the findings don't support the view that ABO blood groups and AMI are related to HTN, DM and location of MI.

**Key words:** Blood group, coronary artery disease, acute myocardial infarction, hypertension, diabetes mellitus, cholesterol, glucose

### INTRODUCTION

During the last few decades few reports have suggested that ABO blood groups are associated with the risk of ischemic heart disease and of developing severe manifestations of atherosclerosis. Studying different risk factors affecting development of atherosclerosis leads us to more efficient ways of preventing CAD because CAD is the main cause of death in adults in most countries (Whincup *et al.*, 1990; Alireza *et al.*, 2006; Garrison *et al.*, 1976; Nydegger *et al.*, 2003). Some of previous studies show no significant differences between the frequency of blood groups and coronary artery events (Alireza *et al.*, 2006). On the other side, results from the Farmingham study and several other reports indicated that the incidence of ischemic heart disease may be higher in subjects of blood group A or its subgroups. Stakisaitis found that the B blood group may be related to coronary atherosclerosis in Lithuanian

women. In apparent contradiction, Mitchell showed that towns with a higher prevalence of blood group O had higher rates of cardiovascular mortality (Nydegger *et al.*, 2003). It was suggested that cardiovascular disease might be more lethal in subjects with blood group O. Here in we report a study on the distribution of ABO blood groups and cardiovascular risk factors such as HTN, DM, Smoking, Hypercholesterolemia among documented AMI patients with different ABO blood groups.

### MATERIALS AND METHODS

A total of 500 patients: 333 males, 167 females with a mean age of 65.2 years, who admitted to Cardiac Care Unit (CCU) of Madani heart center of Tabriz, Iran due to first Acute Myocardial Infarction (AMI) during the study from Jan 2005 to April 2007. Patients provided blood samples for FBS, cholesterol, cardiac enzymes and ABO blood groups. They were measured by routine lab tests.

Table 1: Distribution of AMI, Sleeping MI and major risk factors in patients with CAD regarding to their ABO blood groups groups

Blood groups overall		A (%)	B (%)	AB (%)	O (%)	p-value
Patients	500	233 (46.6)	53(10.6)	10(2.0)	204 (40.8)	0.01
<b>Major cardiac risk factors</b>						
Smoking	291	159(68.3)	28(52.0)	1(4.0)	103(50.3)	0.041
Diabetes	107	58(25.0)	11(20.2)	2(22.4)	36(17.6)	0.21
Hypercholesterolemia	216	112(48.2)	21(40.0)	3(35.1)	80(39.3)	0.035
Hypertension	303	148(63.4)	32(60.0)	6(59.32)	117(57.2)	0.08
Sleeping MI	167	74(31.8)	12(22.7)	1(6.1)	80(39.4)	0.032
Location of MI (Ant-Lat-Anterolat)	269	133(57.0)	29(55.6)	5(53.3)	102(50.1)	0.093

AMI was defined as the presence of typical chest pain lasting for more than 30 min; ST-segment elevation of more than 0.1 mV or 1-mm in at least 2 continuous leads on the baseline Electrocardiogram (ECG) and a serum creatine kinase concentration that was more than twice the upper limit of the normal range by a cardiologist's diagnosis. Standard 12-lead electrocardiograms were obtained immediately after admission. The current smoking history was asked because it is a strong predictor of risk of ischemic heart disease (Whincup *et al.*, 1990). They were also asked about HTN and DM history. All these were determined to find any correlation between blood groups and cardiovascular risk factors.

**Statistical analysis:** Differences in the AMI incidence between ABO blood groups were assessed using the chi-square test by SPSS software, version 13. ABO differences in cardiovascular risk factors were examined using 1 way analysis of variance comparing 1 group with the other 3. A  $p < 0.05$  was considered to be statistically significant.

## RESULTS

In the present study 46.6% (233) of patients with AMI had blood group A, 10.6% (53) had blood group B, 2% (10) had blood group AB and 40.8% (204) had blood group O. In individual subjects the incidence of AMI was higher in those with blood group A than in those with other blood groups; while, sleeping MI was higher in group O. AMI was less frequent in blood group AB. Table 1 demonstrates the cardiovascular risk factors and their distribution according to different ABO blood groups.

Positive association between the proportion of subjects with blood group A and higher mean serum cholesterol level and higher positive smoking history was shown, but the findings don't support the view that ABO blood groups and AMI are related to HTN, DM and location of MI.

## DISCUSSION

The relation between ABO blood groups and development of atherosclerosis is still unclear despite

the fact that several studies are addressing this issue (Alireza *et al.*, 2006; Biancari *et al.*, 2002; Erikssen, 1980). Some of previous studies show no significant differences between the frequency of blood groups and coronary artery events (Alireza *et al.*, 2006). On the other side, some show excess of CAD in blood group A and its deficit in blood group O (Whincup *et al.*, 1990; Akhund *et al.*, 2001; Tarjan *et al.*, 1995). Maybe due to some special genetic make up it is of great importance for future genetic studies to give a clear picture of excess and deficit of CAD in particular blood groups of the ABO systems (Alireza *et al.*, 2006; Akhund *et al.*, 2001). Our results demonstrate marked differences in distribution of blood groups and cardiovascular risk factors in development of AMI in individualized patients.

## CONCLUSION

We concluded that blood group A is related to the incidence of AMI, high serum cholesterol and positive current smoking history; while the results did not provide convincing evidence that any of blood groups were strongly associated with HTN, DM and location of MI.

## REFERENCES

- Akhund, I.A., I.A. Alvi, A.K. Ansari, M.A. Mughal and A.A. Akhund, 2001. A study of relationship of ABO blood groups with myocardial infarction and angina pectoris. J. Ayub Med. Coll. Abbottabad, 13: 25-26.
- Alireza, A., M. Salarifar, S. Sadeghian, G. Davoodi, C. Darbanian and H. Goodarzynejad, 2006. Correlation between ABO blood groups, major risk factors and coronary artery disease. Int. J. Crdiol., 110: 256-258.
- Biancari, F., J. Satta, R. Pokela and T. Juvonen, 2002. ABO blood group distribution and severity of coronary artery disease among patients undergoing CABG in Northern Finland. Thromb. Res., 108: 195-196.
- Erikssen, J., E. Thaulow, H. Stormorken, O. Brendemoen and A. Hellen, 1980. ABO blood groups and Coronary Heart Disease (CHD). A study in subjects with severe and latent CHD. Thromb. Haemost., 43: 137-140.

- Garrison, R.J., R.J. Havlisk, R.B. Harris, M. Feinleib, W.B. Kannel and S.J. Padgett, 1976. ABO blood group and cardiovascular disease: The Framingham Study. *Atherosclerosis*, 25: 311-318.
- Nydegger, U.E., W.A. Wuillemin, F. Julmy, B.J. Meyer and T.P. Carrel, 2003. Association of ABO histo-blood group B allele with myocardial Infarction. *Eur. J. Immunogenet*, 30: 201.
- Tarjan, Z., M. Tonelli, J. Duba and A. Zorrandi, 1995. Correlation between ABO and Rh blood groups, serum cholesterol and ischemic heart disease in patients undergoing coronarography. *Orv. Hetil.*, 136: 756-759.
- Whincup, P.H., D.G. Cook, A.N. Phillips and A.G. Shaper, 1990. ABO blood group and ischemic heart disease in British men. *BMJ.*, 300: 1679-1682.