Original Article

Risk Factors in ABO Blood Group for Coronary Artery Disease

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Abstract

Introduction: There are many reports regarding the association between ABO and Rhesus blood groups and coronary artery disease. ABO blood groups, in particular non-O blood groups, have been suggested to be associated with several cardiovascular risk factors, and even higher risk of ischemic heart disease, cerebral ischemia of arterial origin, and of developing severe manifestations of atherosclerosis.

Aim: The aim of this study was to study the prevalence of risk factors in ABO blood group of coronary artery disease and to study immediate prognosis and mortality.

Materials and Methods: This study was conducted in the Department of Cardiology and Medicine, Government Rajaji Hospital, Madurai. Patients admitted with clinical features of acute myocardial infarction confirmed by electrocardiogram and patients admitted with angina pectoris clinically were included in the study. Detailed history, general examination, cardiovascular examination, and relevant investigations were done in all patients.

Results: The incidence of coronary artery disease is predominant in "A" Group. The incidence of diabetes mellitus (DM) and hypertension (HT) is 40% and 30% in "A" Group which constitutes about 21.2% among the population. In female population, menopause is the main risk factor. Here, also the incidence of DM, HT, and hypercholesterolemia is most commonly found in "A" Group individuals. About 66% contribution is from the smoker. DM contributes to 22%.

Conclusion: The type of ABO blood group seems to have an impact on the risk of coronary artery involvement and the type of blood group effects on the severity of CAD. Smoking affects the prognosis whichever blood group they belong. About 66% incidence of left ventricular clot is seen among smokers.

Key words: ABO blood group, Association, Ischemic heart disease

INTRODUCTION

Coronary artery disease is also known as ischemic heart disease (IHD) is a common cause of death in the adults. It may present as sudden death, but more usually causes angina pectoris, myocardial infarction (MI) (heart attack), or heart failure. It can also lead to the change of heart rhythm. Factors associated with an increased risk of developing coronary artery disease include diabetes, cigarette smoking, high blood pressure, obesity, and a raised concentration of cholesterol in the blood.[1] Compared to other illnesses, IHD causes more deaths and disabilities and incurs greater economic costs in our modern world. IHD is the common, serious, chronic, and life-threatening disease in the United States, where more than 12 million people have IHD, more than 6 million have angina pectoris, and more than 7 million have a sustained MI.[2]

The ABO blood group system consists of three main alleles (two codominant [A and B] and one recessive [O]).[3,4] The A and B alleles of the ABO locus encode A and B glycosyltransferase activities, which convert precursor H antigen into either A or B determinants, the A and B antigens having an extra saccharide unit to the O

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unit (N-acetylgalactosamine and galactose, respectively). Group O individuals lack such transferase enzymes and express basic unchanged H antigen.[5] Notably, the ABO antigens are expressed not only on the surface of red blood cells but also on a variety of human cells and tissues including epithelia, platelets, vascular endothelia, and neurons.[6]

Aim

The aim of this study was to study the prevalence of risk factors in ABO blood group and to study immediate prognosis and mortality.

MATERIALS AND METHODS

This study was conducted in the Department of Cardiology and Medicine, Government Rajaji Hospital, Madurai. The patients for the study were taken from those admitted as inpatients or those attending outpatient departments of Medicine and cardiology.

Inclusion Criteria

Patients admitted with clinical features of acute MI with electrocardiogram (ECG) confirmation, patients admitted with angina pectoris clinically also ECG wise, and patients getting drugs for IHD from the Department of Medicine and cardiology were included in the study.

Exclusion Criteria

Those patients having congenital heart disease and rheumatic heart disease were excluded from the study. Detailed history, general examination, and cardiovascular examination were done in all patients.

RESULTS

Our study group consisted of males 84% (97 patients) and females 16% (18 patients). This shows male dominance in the prevalence of coronary artery disease.

The age group of patients ranged from 28 years to 75 years. Majority of patients were in the age group above 50, and they contributed 64% of the total. The prevalence of young IHD patients was 11% that is 13 patients out of 75.

MI forms the major part of our study group. They contribute 74% of the total with 86 patients. Other patients included were clinical angina 15.6%, asymptomatic but with ECG evidence of IHD 5%, and symptomatic but normal ECG five patients [Table 1].

In the total of 115 patients, 40 patients were of "B" Group among that 36 were male, and 4 were female. Group B

is the common blood group in our part of the country. Next was the "O" Group which constituted 37 patients in total. "A" Group and "AB" Group contributed 28 and 10 patients, respectively.

Anterior and inferior walls MI were common in four groups of patients. The clot was found in only one patient who belonged to A Group with diabetes mellitus (DM) as the risk factor in postmenopausal stage. Her ejection fraction (EF) was 34%. In O Group, two patients had the EF <40 [Tables 2 and 3].

The incidence of DM and hypertension (HT) is 40% and 30% in "A" Group which constitutes about 21.2% among population. In female population, menopause is the main risk factors. Here, also the incidence of DM, HT, and hypercholesteremia is most commonly found in "A" Group individuals [Table 4].

Among the 18 patients, 12 patients are smokers. Six patients, who are smokers, are found to have EF 40%–42%, two patients presented with NYHA Class III symptoms are diagnosed to have postinfarction angina, and they are detected to have left ventricular (LV) apical clot. One belongs to "O" Group who is a smoker. Other belongs to "B" Group in whom except age and sex no other risk factors are made out. Among the seven patients, who belong to "B" Group, three are found to have ischemia of right coronary artery territory, and one patient is detected to have left anterior descending artery territory [Figures 1 and 2].

Out of 86 MI cases, eight patients expired – they were male patients. They belong to various blood groups. Among the

Table 1: Acute coronary syndrome

Acute coronary syndrome	Number of patients (%)
MI	86 (74)
Clinical angina	18 (15.6)
Asymptomatic but with ECG evidence of IHD	6 (5)

IHD: Ischemic heart disease, ECG: Electrocardiogram, MI: Myocardial infarction

Table 2: Blood group and region of infarct

Region of infarct	A	AB	B	O
Anterior wall MI	2	1	1	1
Inferior wall MI	3	1	1	1

MI: Myocardial infarction

Table 3: Analysis of myocardial infarction

Type of infarction	A1+ve	B+ve	A1B+ve	O+ve
Anterior wall MI	11	1	5	19
Inferior wall MI	9	11	4	10

MI: Myocardial infarction

Table 4: LV clot in relation to blood group

Risk factors	A1+ve		B+ve		A1B+ve		O+ve	
	Male	Female	Male	Female	Male	Female	Male	Female
Smoking	12	-	28	-	6	-	18	-
Alcoholism	4	-	7	-	1	-	7	-
Obesity	5	-	10	-	5	-	6	-
DM	8	2	6	2	2	-	7	-
HT	6	2	5	-	-	-	2	-
Family history	4	1	4	-	2	-	2	1
Hypercholesterolemia	7	1	11	1	2	-	3	-

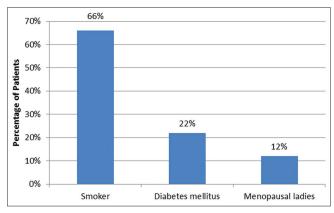LV: Left ventricular, HT: Hypertension, DM: Diabetes mellitus

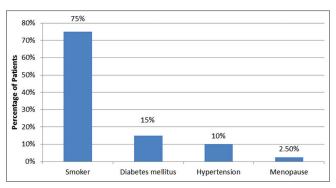**Figure 1: Left ventricular clot in relation to risk factor**

Figure 2: Left ventricular dysfunctions (EF <40%) in relation to risk factors

eight patients, three belong to "O" Group, two belong to "B" Group, 1 belongs to "AB" Group, and two belong to "A" Group.

DISCUSSION

The association between ABO blood groups and the development of atherosclerosis is still unclear, despite several studies addressing this topic. There is a very distinct difference among the blood types with regard to the incidence of heart disease. Platt *et al.* studied the correlation between blood group and cardiac infarction in two different age groups. The patients were divided into two groups as follows: those who were older than 65 years and younger. The predominance of blood group A in patients with cardiac infarction was highly significant in both age groups ($P < 0.005$).[7]

The association between ABO blood group and coronary heart disease (CHD) risk was not significantly modified by other known risk factors for CHD including age, sex, alcohol consumption, smoking, physical activity, or DM history. The mechanisms underlying the associations between ABO blood group and CHD risk remain unclear. However, several lines of evidence support its potential cardiovascular effects. In the analyses of the relationship between the ABO blood group and major cardiovascular risk factors, the only association of note was that O blood group, probably by association with lower HDL-c levels, smoking habit, and family history, significantly increases the risk of CHD, and contributes substantially to the incidence of CHD in the studied populations, in the two previous reports.[8,9]

CONCLUSION

Controversies between the association of blood group and CAD can be due to several confounding factors such as DM, HT, and smoking. Another important factor is of race and genetics which may have different impact on relationship between blood groups and coronary artery involvement among the Asian population. In addition, socioeconomic condition, environmental, and lifestyle may have some effect on the correlation of ABO blood group and CAD.

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