

Association of ABO Blood Group B with Myocardial Infarction

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ABSTRACT

Objective: The purpose of this study was to find out the association between blood group B and Myocardial Infarction (MI) in sample population in Malaysia.

Study Design: A case-control study.

Place and Duration of Study: The study was conducted at Hospital Kepala Batas, Penang, Malaysia, from 2006 to 2007.

Methodology: The study was approved by the Research and Ethics Committee, School of Medical Sciences, University Sains Malaysia. The study included 170 patients with confirmed MI as cases and 170 subjects without MI were taken as controls. After ethical approval, patients were recruited for the study from Hospital Kepala Batas after informed consent. Blood sample around 2 ml was collected from each patient and control.

Each blood sample was tested by ABO gel card test for the blood group. Sample size was calculated using a power and sample size software, whereby power of study was 80%, Confidence Interval (CI) was 95%, odds ratio was 2 and ratio of control to case was 1. Odds ratio and the CI were used to describe the association between MI and group B.

Results: A total of 170 MI patients and 170 controls were tested for ABO blood groups. Statistical analysis showed that among 170 MI subjects, 54 (31.8%) were blood group B and among 170 controls, 51 (30%) were blood group B. Simple logistic regression analysis showed no association of MI with blood group B ($p=0.824$, crude OR 0.95, 95% confidence interval 0.62-1.47). Multiple logistic regression analysis also did not show association of blood group B with MI ($p=0.222$, adjusted OR 0.68, 95% confidence interval 0.37-1.26).

Conclusion: This study failed to demonstrate any association of blood group B with MI in sample population in Malaysia compared to few studies reporting positive association, however, we suggest further studies to elaborate on this finding in Malaysian population.

Key words: Myocardial infarction. Myocardium. Blood group B. ABO gel card.

INTRODUCTION

Myocardial infarction or heart attack is a grave outcome of coronary artery disease. Coronary artery disease occurs from atherosclerosis, when arteries become narrow or hardened due to cholesterol plaque build-up. Further narrowing may occur from thrombi or blood clots that form on the surfaces of plaques. The Coronary Heart Disease (CHD) mortality in Malaysia was 8.0 per 100,000 population for all ages in 1965 and this rate has been on the rise, reaching 23 per 100,000 in 1991.¹

Besides these risk factors, like diabetes mellitus, hypertension, dyslipidemia and ABO blood group phenotypes have been found as a predictor of coronary artery disease. Researchers have found that blood group phenotypes represent an important genetic make up in certain diseases. There is increasing evidence showing an association with ABO blood group

phenotypes and MI. Association between patients carrying the B allele and MI has been shown. The prevalence of the B allele was 2.5 times higher amongst patients with MI than among controls (16.3 vs. 6.7%; $p=0.034$), in a study by Nydegger UE *et al.*² Numerous studies since the mid 1960s have shown that blood group O and B have higher levels of intestinal alkaline phosphatase, an enzyme manufactured in the small intestine. Nature has provided blood group O and B individuals with this enzyme to benefit from higher protein levels. Blood group A and AB have lower levels of this enzyme. Recent studies suggest that it is the inability to break down dietary fat which in part predispose blood group A and AB to higher cholesterol and more heart attack, while the opposite is true for blood group O and B.³

vWF antigen levels correlated with the number of O1 alleles. Carriage of the O1 alleles is associated with a decreased risk of MI, with homozygosity providing the greatest protection.⁴ In a retrospective study in 3100 patients of different ages, the relationship between blood group and cardiac infarction was investigated in 450 patients. The patients were divided in two groups: group 1; 65 years old and above, group 2; age less than 65 years old. The predominance of blood group A in patients with myocardial infarction was highly significant in both age groups.⁵

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The relationship between blood type and total cholesterol level in Japanese show that cholesterol levels were significantly elevated in blood group A compared to other blood groups.⁶ The frequency of B gene is increased in patients with acquired heart disease.⁷ The incidence of ischemic heart disease was significantly higher in those of blood group AB than in those of groups O or B, particularly for fatal events.⁸

From the review of related literature, the existence of a relationship between ABO blood group and heart disease has been shown. Since MI is a serious result of coronary artery disease, the current study is carried out to identify blood group B as a possible risk factor for myocardial infarction in Malaysian population. No such study has been carried out in Malaysia on this subject.

METHODOLOGY

The study was conducted at Hospital Kepala Batas, Penang, Malaysia, from 2006 to 2007. It was approved by the Research and Ethics Committee, School of Medical Sciences, University Sains Malaysia.

A total of 170 patients with confirmed MI were taken as cases. Similarly, 170 subjects without MI were taken as controls. All the cases and controls were volunteers. About 2 ml blood was collected by veni puncture from all cases and controls.

The determination of ABO blood group was performed using a freshly drawn sample. Blood samples were drawn into anticoagulant container with EDTA.

Data on each case and control subject was recorded. Each blood sample was tested by ABO gel card test for the blood group. ABO gel card test was simple to perform and effective.

Statistical analyses was performed according to Statistical Package for the Social Sciences (SPSS) version 12. All probability values were two-tailed and probability values below 0.05 were considered statistically significant. Sample size was calculated using a power and sample size software, whereby power of study was 80%, confidence intervals (CI) was 95%, odds ratio was 2 and ratio of control to case was 1. Odds ratio and the CI were used to describe the association between MI and group B.

ABO blood group typing, using anti-A and anti-B test sera, is known as the direct or forward grouping test.

Reverse grouping uses red cell reagents of known ABO antigen specificity to indicate the presence or absence of anti-A and anti-B isoagglutinins, the results of which determine the reverse grouping. Discrepancies between forward and reverse grouping require further investigation. Classification of blood groups must be based on both forward and reverse grouping. The ID-Card "ABO/D + reverse grouping" (Diamed Ag, Switzerland)

allows combined testing of forward and reverse grouping as well as Rh D determination.

RESULTS

The frequency and mean difference of ABO blood group are presented in Table I. The mean and \pm SD for non-MI and MI were 47 ± 8.66 and 59.9 ± 9.89 respectively.

Simple logistic regression analysis (Table II) showed no association of MI with blood group B ($p=0.824$, crude OR 0.95, 95% confidence interval 0.62-1.47). Multiple logistic regression analysis (Table III) also showed no association of blood group B with MI ($p=0.222$, adjusted or 0.68, 95% confidence interval 0.37-1.26).

Table I: Distribution of blood group in MI subjects and controls.

Variable	Total number	Non-MI Frequency (%)	MI Frequency (%)	χ^2 statistic ^a (df)	p-value
ABO blood group					
A	76	23 (13.5)	53 (31.2)	18.821 (3)	< 0.001
B	105	51 (30.0)	54 (31.8)		
O	130	79 (46.5)	51 (30.0)		
AB	29	17 (10.0)	12 (7.1)		

MI = Myocardial infarction cases (170); Non-MI = Non-Myocardial Infarction controls (170).

Table II: Simple logistic regression analysis showing association of MI and blood groups B and Non B.

Variable	Number	Crude OR (95% CI)	LR Statistic (df)	p-value
Blood group recorded				
Non B	206	1.00	0.005 (1)	0.824
B	134	0.95 (0.62-1.47)		

MI= Myocardial infarction; LR=Logistic regression.

Table III: Multiple logistic regression analysis showing association of MI and blood groups B and Non B.

Variable	Number	Adjusted OR (95% CI)	LR statistic (df)	p-value
Blood group recorded				
Non B	206	1.00	0.005 (1)	0.222
B	134	0.68 (0.37-1.26)		

MI= Myocardial infarction.

DISCUSSION

The purpose of this study was to find out the association between group B and MI. The study showed no association between ABO blood group B with MI in the sample population compared with the study performed by Nydegger *et al.*, which showed that group B allele was significantly associated with MI.² In this study, we found that there was no difference of ABO blood group distribution among sample population and among the Malaysian population from others' studies Mwangi.⁹ The results from various studies are conflicting, Sari *et al.* found that the distribution of ABO blood groups in patients with MI was quite similar to that in control group and that of general Turkish population, which supports the idea that ABO blood group might not be significantly associated with the development of MI.¹⁰

Amirzadegan reported that there was no correlation between various ABO blood groups and development of coronary artery disease in Iranian population.¹¹

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.¹² The blood group A was the commonest among myocardial infarction and angina pectoris patients while these diseases were least in blood group O patients, as reported by Akhund.¹³

Von Beckerath showed that carriage of the O1 allele is associated with a decreased risk of myocardial infarction, with homozygosity providing the greatest protection.¹⁴ Mitchell showed that towns with a higher prevalence of blood group O had higher rates of cardiovascular mortality.¹⁵ Stakishaitis *et al.* showed that A and B blood groups are one of the genetically based risk factors in the link of atherosclerosis pathogenesis.¹⁶ Suadcani *et al.* showed that ABO phenotype was not a confounder for the association of socioeconomic status with the risk of ischaemic heart disease.¹⁷

Fausto Biancari *et al.* showed that ABO blood groups have no impact on the development of coronary artery disease.¹⁸ Stakishaitis *et al.* found that the blood group B can be related with coronary atherosclerosis in women. The blood group O can possibly serve as a protective antiatherogenic factor in women. The blood group A is not a risk factor for atherosclerosis in women in Lithuanian population.¹⁹ Whincup found that in individual subjects, the incidence of ischaemic heart disease was higher in those with group A than in those with other blood groups.²⁰

In this study, the frequency of blood group O Rh D positive was higher (38.2%) and blood group AB positive was lower (8.5%) than in the study by Nydegger blood group A Rh positive was higher (49.2%) and blood group AB Rh positive was lower (4.5%) among his sample population. The percentage of blood group B Rh positive subjects in the study by Nydegger was 16.4% but in this study, it was 30.9%, which was about 2 time higher than Nydegger sample population. This could be the strongest evidence to support that in our sample population there was no association between group B and MI, though group B is higher in our sample population compared to the study by Nydegger *et al.* Sample population in this study included mostly (300 out of 340 subjects both controls and cases Malay population. So the study results cannot be generalized to other races as sample does not include significant number of other races i.e, Chinese and Indians. In this study, blood group A was significantly associated with MI subjects compared to non-MI controls ($p < 0.001$). After going through the multiple logistic regression analysis no association of blood group B with MI was found. We believe that the results could be of

importance to researchers who may be interested to find out an association of ABO blood group with MI.

CONCLUSION

The study showed no association of blood group B with myocardial infarction, however, there was statistically significant association between blood group A and myocardial infarction.

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