

ABO Blood Group Distribution and Ischaemic Heart Disease

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Abstract

Objectives: To study the association of ABO blood groups with ischaemic heart disease (IHD) in our setting.

Study Design: Analytic comparative study.

Setting: Department of Cardiology, Mayo hospital, Lahore over a period of two years from January 2008 to December 2009.

Subjects and Methods: The study group included 907 patients of IHD. The distribution of ABO blood groups in IHD patients was compared with the control group of 907 non-IHD individuals. Data was analyzed using SPSS 16. Chi-square test for significance was used. P-value less than 0.05 was taken as significant.

Results: In this study, the following pattern of ABO blood groups was observed in IHD patients and non-IHD patients respectively : Blood group A 251 (27.67%) and 248 (27.34%); Blood group B 329 (36.27%) and 358 (39.47%); Blood group O 235 (25.90%) and 240 (24.46%); Blood group AB 92 (10.14%) and 61 (6.72%), P-value = 0.06.

Conclusion: There is no association of ABO blood groups and ischaemic heart disease.

Key Words: Ischaemic heart disease, ABO blood group, Atherosclerosis.

Introduction

Ischaemic heart disease (IHD) is a major threat to human life and health.¹ It is responsible for more than 50% deaths in developed countries and becoming an important cause of mortality and morbidity in the developing and underdeveloped countries. IHD is almost always due to atherosclerosis and its complications.^{1,2}

With the initiation of Framingham Heart study in 1948 a number of different parameters were correlated with the development of IHD. With the evolution of modern science certain parameters became established risk factors of IHD.³ Age, sex, family history of IHD and height are non-modifiable risk factors.^{1,2,4} Smoking, hypertension, diabetes mellitus, obesity and hyperlipidemia are major modifiable risk factors.^{1,4}

The ABO blood group system was the first human blood group system to be discovered by Landsteiner in 1901.⁵ Later, blood group was studied as a risk factor for many diseases like peptic ulcer,⁶ carcinoma of stomach,⁶ periodontal diseases⁷ and diabetes mellitus.⁸ Blood group as a non-modifiable minor risk factor of IHD was first studied in 1954, by Gertler and White,

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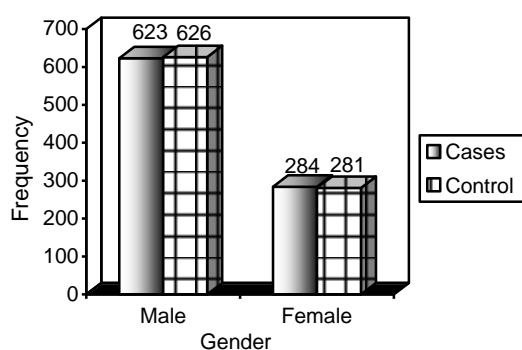
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as mentioned by Bronte – Stewart et al.⁹ Many earlier studies⁹⁻¹⁹ have suggested a small but significant higher risk of IHD in patients having blood group A (or non-O blood group) as compared with O group. Gertler and White,⁹ Pell⁹ (1961) and Bronte – Stewart et al⁹ (1962) observed in their studies that patients having blood group A and B are at higher risk of IHD than those with blood group O. On the other hand Spe-edby⁹ (1959), Allen TM¹¹ (1968), Havlic RJ¹² (1969), Rosenberg¹³ (1983), Tarjan¹⁶ (1995), Imam F¹⁷ (2000), Khan IA et al¹⁸ (2005), Wazirali¹⁹ (2005) found increased prevalence of IHD in patients having blood group A as compared with blood group O. Mead TW et al (1994) in their Northwick Park Heart Study showed higher incidence of IHD in AB blood group.¹⁵ In their prospective study of 7665 men in 24 British towns Whincup¹⁴ noticed higher incidence of IHD in towns with high prevalence of blood group O. In individual subjects, however the incidence of IHD was slightly higher in blood group A. Stakishaitis^{20,21} found relationship of blood group B with IHD in Lithuanian women. Nydeggar UE¹⁰ also observed similar relationship. In a recent cross – sectional study of 2026 patients, who underwent coronary artery bypass graft at Tehran Heart Center, analysis did not show any significant difference between the frequencies of ABO blood groups in coronary artery disease patients as compared to the Iranian general population.²

With the background of these conflicting results, the present study was done to evaluate association of ABO blood group with IHD in our setting.

Material and Methods

This analytic comparative study was done at the department of Cardiology, Mayo hospital, Lahore. Total 1814 persons were included in the study. Out of them, 907 were of IHD group and 907 were of non-IHD (control) group. The study was conducted over a period of two years from January 2008 to December 2009. Continuous sampling method was used. All the diagnosed cases of IHD admitted in Cardiology department on the basis of ECG changes (significant Q waves, ST segment depression or elevation, t wave inversion, new left bundle branch block), echocardiographic evidence, cardiac enzymes or coronary angiographic evidence were included in the study. Blood sample was collected by finger prick method. Agglutination was noted after mixing drop of blood with anti-A, anti-B and anti-D sera on glass slide. All cases of non-cardiac chest pain, congenital heart disease, rheumatic heart disease, severe renal failure and malignancy were excluded from the study. Control group was selected from healthy blood donors with no symptoms of IHD and patients admitted for non-cardiac



IHD = ischaemic heart disease
Graph 1: Gender distribution in IHD and Controls group.

Table 1: Blood groups vs. cases and controls.

| | | Cases n (%) | Control n (%) | Total n (%) |
|-------------|----|--------------|---------------|--------------|
| Blood Group | A | 251 (27.67%) | 248 (27.34%) | 499 (27.51%) |
| | B | 329 (36.27%) | 358 (39.47%) | 687 (37.87%) |
| | O | 235 (25.90%) | 240 (24.46%) | 475 (26.8%) |
| | AB | 92 (10.14%) | 61 (6.72%) | 153 (8.43%) |
| Total | | 907 (100%) | 907 (100%) | 1814 (100%) |

p-value = 0.06
 n = Number % = percentage

| Blood Group | A n (%) | B n (%) | O n (%) | AB n (%) | Total | p-value |
|-------------|-------------|--------------|--------------|------------|-------|---------|
| IHD Cases | 130 (29.8%) | 157 (36%) | 106 (24.3%) | 43 (9.9%) | 436 | 0.120 |
| Control | 248(27.34%) | 358 (39.47%) | 240 (24.46%) | 61 (6.72%) | 907 | |

Table 2: Blood group distribution in Angiographically proven CAD cases.

CAD = Coronary artery disease, n = number, % = percentage

Table 3: Severity of coronary artery disease and blood group distribution.

| | | Blood group | | | | Total | p-value |
|-------------|---------------|-------------|-----|-----|----|-------|---------|
| | | A | B | O | AB | | |
| Angiography | Not Done | 121 | 172 | 129 | 49 | 471 | 0.773 |
| | Ectatic | 5 | 6 | 5 | 3 | 19 | |
| | Mild atheroma | 6 | 9 | 2 | 1 | 18 | |
| | DVD | 30 | 41 | 24 | 11 | 106 | |
| | TVD | 50 | 56 | 48 | 20 | 174 | |
| | LMD | 13 | 16 | 4 | 3 | 36 | |
| | SVD | 26 | 29 | 23 | 5 | 83 | |
| | Total | 251 | 329 | 235 | 92 | 907 | |

DVD = double vessel disease,
TVD = triple vessel disease,
LMD = left main disease,
SVD = single vessel disease.

surgery without any history of IHD, normal ECG and echocardiogram. An informed consent was taken in every case and data was entered in the Performa of the study. Data was analyzed using SPSS 16. Chi-square test for significance was used. P-value less than 0.05 was taken as significant.

Results

In this study we analyzed 907 cases (623 males and 284 females) and 907 controls (626 males and 281 females) to determine any relationship between the blood groups and IHD. The mean age of study group and controls were 53.39 ± 10.962 years and $49.40 \pm$

10.802 years respectively. There were 352 males and 147 females who had blood group A, in 478 males and 209 females the blood group was B, in 307 males and 168 females the blood group was O and 153 people had AB blood group in which 112 were males and 41 were females. According to this study there is no statistical significant difference between gender and blood groups distribution, i.e. p-value 0.106 (Graph 1).

In our study among, the numbers and frequencies of IHD patients and control group respectively were as follows: Blood group A 251 (27.67%) and 248 (27.34%); Blood group B 329 (36.27%) and 358 (39.47%); Blood group O 235 (25.90%) and 240 (24.46%); Blood group AB 92 (10.14%) and 61

Table 4: ABO Blood groups distribution in different presentations of IHD.

| | | ABO Blood Groups | | | | Total |
|-----------|---------------|------------------|-------------|-------------|------------|-------------|
| | | A; n (%) | B; n (%) | O; n (%) | AB; n (%) | n; (%) |
| Diagnosis | Stable angina | 15 (3%) | 25 (3.6%) | 19 (4%) | 7 (4.6%) | 66 (3.6%) |
| | USA | 85 (17.0%) | 91 (13.2%) | 72 (15.2%) | 29 (19.0%) | 277 (15.3%) |
| | AMI | 126 (25.3%) | 156 (22.7%) | 120 (25.3%) | 44 (28.8%) | 446 (24.6%) |
| | Non STEMI | 5 (1.0%) | 7 (1.0%) | 3 (.6%) | 3 (2.0%) | 18 (1.0%) |
| | ICMP | 10 (2.0%) | 28 (4.1%) | 10 (2.1%) | 5 (3.3%) | 53 (2.9%) |
| | old MI | 10 (2.0%) | 22 (3.2%) | 11 (2.3%) | 4 (2.6%) | 47 (2.6%) |
| | Non-IHD | 248 (49.7%) | 358 (52.1%) | 240 (50.5%) | 61 (39.9%) | 907 (50.0%) |
| Total | | 499 (100%) | 687 (100%) | 475 (100%) | 153 (100%) | 1814 (100%) |

p-value = 0.283

n = No. % = percentage, USA = unstable angina, AMI = acute myocardial infarction, STEMI = ST elevation myocardial infarction, ICMP = Ischaemic cardiomyopathy, MI = Myocardial infarction, Non-IHD = Control group.

(6.72%). We found no statistical association between IHD and blood groups, p – value = 0.06 (table 1). Angiography was done in 471 patients. The association of angiographically proven CAD (coronary artery disease) with ABO blood groups was insignificant (p -value = 0.120), table 2. In those patients whom angiography was done, there were ectatic coronary arteries, mild atheroma, double vessel disease (DVD), triple vessel disease (TVD), left main disease (LMD), severe single vessel disease (SVD) in 19, 18, 106, 174, 36 and 83 patients respectively. The severity of CAD has no significant association with ABO blood groups, p -value = 0.773 (table 3).

Among the different presentation of IHD, the frequencies of stable angina, unstable angina (USA), acute myocardial infarction (AMI) and non ST elevation myocardial infarction (Non – STEMI) were higher in AB group (4.6%, 19%, 28.8% and 2% respectively). Ischaemic cardiomyopathy (ICMP) was more frequent in blood group B (4.1%). The difference was statistically insignificant, p -value = 0.283 (table 4).

Discussion

In different regions of the world, there is specific ABO blood group distribution.^{1,19,22-25} Even among the same country as in Pakistan slight variation has been observed.^{17,18,22,24,25} Blood group B is the most common group in Pakistan in all the studies done in Punjab.^{17,18} While in Sind²⁶ and Balouchistan²⁵ blood group O is the most common group in normal population. Blood group B and O is present in more than 60% of the population in Pakistan. The least common group is AB blood group. Similar pattern was seen in our control group. While in USA, England, Africa, Australia and Saudi Arabia majority of the people belong to blood group A and O.^{14,22,23,25} Variations in different areas may reflect racial differences. Genetic factors along with environmental factors play a role in the development of IHD.⁹ Several studies have revealed that ABO blood groups particularly non-O blood (A, B and AB) groups are associated with the increased risk of IHD.⁹⁻¹⁹ As mentioned by Bronte – Stewart,⁹ et al in the earliest studies done by Gertler (1954), Speedby (1959) and Pell et al (1961) only 81, 140 and 226 patients of IHD, respectively were included. So the number of the patients was small and the control group was unmatched. They reported that blood group A and B is associated with higher risk of IHD as compared to group O. The results were within the limits of sampling

error.⁹ Bronte – Stewart,⁹ et al in 1962 observed association of ABO blood group and myocardial infarction but find no such association in patients of Angina. Allen TM, et al,¹¹ Havlic RJ, et al,¹² Rosenberg L, et al,¹³ Tarjan Z, et al¹⁶ and Wazirali H, et al¹⁹ all reported higher risk of IHD with blood group A as compared to group O. The present study showed the 0.33%, 3.42% and 1.5% increase in the prevalence blood group A, AB and O respectively. But difference was statistically not significant ($P = 0.06$). Amirzadegan A, et al² in 2006 found no association of IHD and ABO blood group and their results were comparable to our study. Khan I A et al¹⁸ showed strong association of blood group with IHD but they included only patients undergoing coronary bypass surgery. Whincup, et al¹⁴ in their prospective study of 7665 men in 24 British towns noticed higher incidence of IHD in towns with high prevalence of blood group O. In individual subjects, however the incidence of IHD was slightly higher in blood group A (relative risk 1.21, 95% confidence limits 1.01 – 1.46). Estimated relative risk further fell to 1.16 when elevated cholesterol level in blood group A was taken into account. So the association with IHD was not very strong. Mitchell²⁷ and Mead TW et al¹⁵ in different studies suggested IHD might be more lethal in subjects with blood group O and AB respectively. This study found no association with severity of CAD and blood group.

Conclusion

The results of the present study failed to show any association of ABO blood group with IHD, its different presentations and severity of the CAD in our setting. Although the frequencies of stable angina, USA, AMI and non STEMI were higher in AB group, the difference was statistically insignificant. Considering controversial results of the previous studies it is of great importance that extensive studies should be done to find any definite higher risk of IHD with particular blood group.

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