Original Article

Association of Ischemic Heart Disease with ABO Blood Groups

Farah Shafi, Khawaja Farhan Zahid and Samina Akram

Objective: To study the association between various ABO blood groups and ischemic heart disease.
Material & Method: In this study three hundred subjects with IHD and an equal number of healthy subjects as a control group were selected and their respective blood groups were identified.
Results: It showed predominance of blood group A (47%) followed by blood group O (21%), AB (19%) and B (13%) .This result was highly statistically significant.
Conclusion: A greater prevalence of ischaemic heart disease was observed in patients with blood group A.
Keywords: ABO blood groups, ischaemic heart disease

Aims & Objectives

To study the association between various ABO blood groups and ischemic heart disease. An age matched control group was also selected to have its ABO blood group tested to see if the results differed significantly from the study group.

Material and Methods

Subjects:

300 patients suffering from ischemic heart disease diagnosed on the basis of history, clinical examination, ECG and lab parameters were included in the study. In addition 300 healthy individuals (attendants or relatives of patients) were taken in the control group.

Apparatus:

It consisted of light microscope, glass slides, ECG strip, blood group determining reagents, 1 ml blood of individuals, any previous medical record and a questionnaire to get the demographic data and know about the various risk factors to which the individual was exposed.

Study Design:

It was a case control, comparative study.

Setting:

Out patient, Coronary Care Unit and Medical Unit-III, Sir Ganga Ram Hospital, Lahore.

Duration of Data Collection:

1 Year

Sample Size:

Three hundred patients with ischemic heart disease and a similar number of healthy subjects were taken as control group.

Sampling technique:

Purposive.

Inclusion Criteria

1. Patients with clinically established acute myocardial infarction or old myocardial infarction on the basis of history, examination, ECG and cardiac enzymes.
2. Patients with clinically established angina pectoris on the basis of history, examination, ECG and lab parameters.
3. Subjects of both sexes above 35 years of age with no ethnic, religious, cast, creed or class differentiation.
4. Patients with arrhythmias (secondary to cardiac ischemic insult).
5. Perfectly healthy individuals without any medical ailment as control group.

Exclusion Criteria

1. Patients in heart failure (due to non coronary causes) were not included, as we wanted to study the association of ABO blood groups with ischemic heart disease.
2. Patients with valvular heart disease, congenital abnormalities, infective endocarditis, left or right atrial myxoma or cardiac myopathies were considered ineligible for the study.

Method

300 patients suffering from ischemic heart disease diagnosed on the basis of history, examination, ECG and cardiac enzymes were taken from the outpatient, emergency and coronary care unit of the Sir Ganga Ram Hospital. 300 healthy individ uals were selected in a control group.

Blood groups of all subjects were tested. Health

professionals (lab attendants/nursing staff or the doctor himself) drew about 1 ml of blood sample using strict aseptic technique.

Three drops of blood were immediately placed on glass slide at significant distance from each other. A drop of anti A, anti B and anti D reagents was put on the blood drops and then they were mixed with a matchstick.

The blood grouping was done by simple agglutination method. Agglutination was observed within two minutes to avoid drying. After two minutes the glass slide was observed under the microscope to look for agglutination.

If agglutination was observed in that drop of blood in which anti A reagent was put, then the blood group was A. If agglutination occurred in the drop of blood in which anti B reagent was put, then the blood group was B. Blood group AB was identified if agglutination was seen in both drops of blood and if no agglutination was seen in them then the blood group was O.[1] Agglutination observed in drop of blood in which anti D reagent was put showed that the subject was Rh positive and vice versa.

In addition, patients with ischemic heart disease had all other tests done that were required for their diagnosis e.g. ECG, measurement of cardiac enzymes and serum cholesterol level from the lab using micro 2000 apparatus. These patients received symptomatic and specific therapy depending on their presentation and time of arrival.

Statistical methods:

Odds ratio for various blood groups was calculated after making 2 x 2 table and applying formula a x d / b x c.

Relative risk was also calculated in a similar way by applying the formula a/ (a+b) divided by c/(c+d). The available data was entered in the SPSS version 8 to obtain the chi square value, p value, 95% confidence limits and frequency distribution for various blood groups.

Results

The results of this study were analyzed after feeding the data in SPSS version 8. Odds ratio, relative risk value for various blood groups with 95% confidence limits and p value for different blood groups was calculated by applying chi square test.

In this study three hundred subjects with IHD and an equal number of healthy subjects as control group were selected and their respective blood groups were identified. No subject was dropped out or lost at any point in the study. The results of this study are summarized in the **Table1**.

As evident from the **Table 4**, Odds ratio for A blood group was 2.45 followed by blood group AB 1.52, Blood group O 0.56 and Blood group B 0.39 respectively. Similarly the risk ratio for A blood group was 1.52 (95% confidence limit ranging from 1.30 to 1.78) followed by that of AB 1.22, O 0.74 and B 0.58 respectively.

The chi square value for A blood group was 26.76 (p value = 0.0000002) and of AB blood group 3.55 (p value = 0.0594). We also found out that the level of serum cholesterol in subjects with A blood group was slightly higher as compared to the patients of the other blood groups. Further studies need to be carried out on the possibility of genetic predisposition of high cholesterol levels in subjects with blood group A .

The frequency distribution of ABO and Rh blood groups in study participants having Coronary artery disease (CAD) are also presented in the **Table 1**. It shows predominance of blood group A (47%) followed by blood group O (21%), AB (19%) and B (13%) .

Distribution according to sex showed males with O group were 15.3%, A group 32%, B group 8.6% and AB 12.6%. The frequency distribution in females showed O blood group 5.6%, A blood group 14.6%, AB blood group 6.3% and B blood group 4.6%.

Table-1: Frequency distribution of ABO blood groups in subjects of IHD.

Groups	Patients with IHD	Percentage
Blood Group A	140	47
Blood Group B	40	13
Blood Group AB	57	19
Blood Group O	63	21

Table-2: Frequency distribution of ABO blood groups in control group.

Groups	Healthy controls	Percentage
Blood Group A	79	26
Blood Group B	85	29
Blood Group AB	40	13
Blood Group O	96	32

Table-3: Frequency distribution of ABO and Rh blood group systems in study population

Groups	Controls		Patients with IHD	
	Subjects	% age	Patients	% age
Blood Group A	79	26	144	47
A+	74	94	126	90
A-	05	06	14	10
Blood Group B	85	29	40	13
B+	77	91	35	88
B-	08	09	05	12
Blood Group AB	40	13	57	19
AB+	36	90	52	91
AB-I	04	10	06	09
Blood Group O	96	32	63	21
O+	85	88	53	84
O-	11	112	10	16

Table-4: Statistical data.

Blood Group	Odds Ratio (OR)	Relative Risk (RR)	Confidence Limits (CI)	Chi Square	p value
A	2.45	1.52	1.30 - 1.78	26.766	0.0000002
B	0.39	0.58	0.45 - 0.76	20.46	0.0000061
AB	1.52	1.22	1.01 - 1.47	3.55	0.0594
O	0.56	0.74	0.60 - 0.91	9.32	0.00226

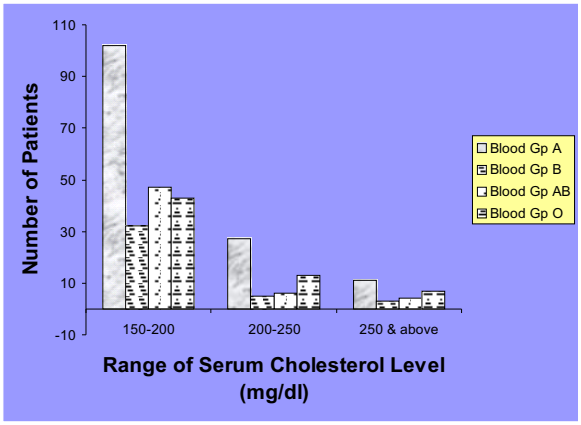

Fig-1: Relationship of cholesterol and blood groups in subjects of IHD.

Discussion

The present study was aimed at finding out the association between various ABO blood groups and IHD. The study included sufficient number of subjects with IHD and an equal number of subjects in control group to calculate odd ratio and for other statistical tests to be applied.

The inclusion criteria were designed in such a way to include only those subjects who had complicated or uncomplicated IHD only due to coronary causes. Subjects with IHD due to non ischemic causes were excluded so that their inclusion might not affect the study results. The blood groups of subjects with CAD and of controls were determined by slide agglutination method. Odd ratio, risk ratio with 95% confidence limits, chi square value and p values for various blood groups were calculated.

As evident from the **Table 4** odd ratio for A blood group is 2.45. This means a person with A blood group showed a risk of CAD 2.45 times that of a person with blood group other than A. We can also see that odds ratio for A blood group is highest followed by that of blood group AB (1.52), O (0.56) and B (0.39) respectively.

Similarly the risk ratio for A blood group is 1.52 (95% confidence limit ranging from 1.30 to 1.78) and that

for B group 0.58 **(Table-4).** This shows that individuals with A blood group are 1.52 times at greater risk of developing IHD than persons with non A blood group. Since risk ratio for B blood group is lowest so an individual with B blood group has the lowest risk of getting IHD.

The chi square value for A blood group is 26.76 (p value = 0.0000002) **Table 4**). As any value equal to or less than 0.05 is statistically significant therefore results for Blood group A (p value = 0.0000002), Blood group B (p value = 0.0000061) and Blood group O (P value = 0.00226) are all statistically significant but P value for blood group A is highly significant.

This means that any patient with blood group A is much more likely to develop CAD than any other blood group. On the other hand P value for blood group AB is 0.0594, which is not that significant as compared to all the other blood groups. We also found out that the level of serum cholesterol in subjects with A blood group was slightly higher as compared to the patients of the other blood groups(**Fig 1**).

This may imply that persons with A blood group are more prone to develop CAD due to higher levels of serum cholesterol, which is an integral part of atheromatous plaques.

Our study results clearly indicate that individuals with A blood group have the highest risk of developing IHD, which is followed by blood group B, O and AB respectively.

Mourant et al[2] showed an excess of IHD in the results among patients with blood groups A and B, compared with blood group O. The excess was larger in those of blood group A than for B but the data were not obtained for those with group AB.

In one of the largest studies on myocardial infarction, Bronste Stewart et al[3] also found a greater incidence of myocardial infarction in blood group A and B compared with O. Havlik et al[4] concluded that the incidence of angina pectoris might be associated with blood group A whereas for myocardial infarction there appeared to be no difference between blood groups A and O.

Nefzger and Denbrough[5] also observed a higher A and B incidence as compared to O for patients with both myocardial infarction and angina pectoris. Present study is compatible with the above studies as the highest occurrence of IHD was observed among blood group A patients (p value = 0.0000002) followed by B blood group (p value = 0.0000061). But the third most common occurrence was found in group O (p value = 0.00226). In this respect our study is in contrast with above studies. Our results are also in contrast with the results obtained from the studies done by Havlik et al[4] who found no difference for CAD between blood group A and O.

Another apparent contradiction is that Israr Ahmed Akhund[6] & Medalie et al[7] found higher incidence of IHD in those patients with blood group AB. Regarding this our study has shown that the blood group AB was on the fourth number (p value = 0.0594).

The findings presented here reflect that the occurrence of CAD was maximum in patients of blood group A than for B or O. The highest occurrence of IHD in group A patients and lowest in blood group AB seen in this study may be due to the difference in the genetic make up of well established polymorphic ABO system of genes i.e. persons who have A antigen are more susceptible to develop IHD. However, the combination of B and O (who lack A or B antigens) groups takes an intermediary position. While persons with blood group AB is somewhat protected from IHD, it could be regarded as a genetic effect. Pakistanis have a very high occurrence of group O and B genes but the occurrence of IHD was highest in A and lowest in O.[8-11]

Conclusion

Blood group A is related to the development of IHD. This may be related to the higher cholesterol levels seen in patients with blood group A, but further studies need to be carried out on this subject.

This study therefore carries great importance for future studies on the issue discussed. The main objective in the past has been to establish whether ABO blood groups, particularly A antigen influences the onset of IHD; any involvement of these groups in IHD by some other mechanisms remains suggestive.

Department of Medicine Unit-III
SIMS/Services Hospital Lahore
theesculapio@hotmail.com
Www.sims.edu.pk/esculapio.html

References

1. Lewis M. Blood group terminology. Vox Sang 1990; 58:152.
2. Mouran. Thrombosis, hemorrhage and other disorders of the circulatory system. Blood groups and diseases. 1978; 2: 35.
3. Bronte-Stewart B, Botha MC, Krut LH. ABO blood groups in relation to ischemic heart disease. BMJ 1962; 1:1646-50.
4. Havlik RJ, Feinleib M, Garrison RJ, Kannel WB. Blood groups and coronary heart disease. Lancet 1969; 11: 269-70.
5. Denborough MA. Blood groups and ischemic heart disease. BMJ 1962; 2: 927
6. Akhund IA, Ahkhund AA, Alvi IA, Hafeezullah, Ansari AK. ABO blood groups in relation to ischemic heart disease. J Ayub Med Coll Abbottabad 1998; 10 (1): 14-15.
7. Medalie JH. Blood groups, myocardial infarction and angina pectoris among 10000 adults. N Engl J Med 1971; 285: 1348- 53.
8. Hussain A, Shaikh SA, Haider M, Rashied T, Malik MR. Frequency distribution of ABO and Rhesus blood groups in population of Balochistan. Pak Armed Forces Med J 2001; 51 (1): 22-26.
9. Khaskheli DK, Akhund AA, Qureshi AH. Distribution of ABO and Rhesus blood groups in the residents of Sindh. Pak J Health 1994; 31: 45-50.
10. Benhard W. Distribution of ABO and Rh blood groups in North West Pakistan. Anthrop Anz 1967; 30: 128.
11. Bhatti R. Frequency of ABO and Rh blood groups in human population of Southern Sindh. Ann King Edward Med Coll 1998; 4 (2): 432.