

# Acute Myocardial Infarction and its association with ABO blood groups in the Pakistani population

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<sup>1</sup> Conception of study  
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## Abstract

**Objectives:** To determine the frequency of acute myocardial infarction in different ABO blood groups in the Pakistani population.

**Study Design:** Cross-sectional study.

**Place and Duration of Study:** Department of Interventional Cardiology, Rawalpindi Institute of Cardiology, Rawalpindi, from May 2018 to December 2018.

**Methodology:** A total of 250 subjects with acute myocardial infarction were included in the study. The study was explained to the patients and informed consent taken. All patients underwent 12 lead electrocardiography using Mortara instrument ELI 250 and were analyzed by a single trained reader unaware of the patients' blood group. Cardiac troponin levels were assessed at least three hours after the onset of symptoms. The ABO blood group was assessed by using the standard slide agglutination method in the hospital pathology laboratory and verified by the principal investigator. The data was collected on a pre-tested questionnaire by the investigator after taking informed consent from the patients.

**Results:** In our study, the mean age of patients was 57.3 years. 36.4% were between 18-50 years of age while 63.6% were between 51-80 years of age. 79.2% were male and 20.8% were females. Frequency of ABO blood groups among patients with acute myocardial infarction in our study population was recorded as 28.8% with O +ve, 26% with B+ve, 18.4% with A+ve, 13.2% with AB +ve, 5.6% with A-ve, 4.4% with B-ve, 3.2% with O-ve and 0.4% with AB -ve.

**Conclusion:** We concluded that the frequency of acute myocardial infarction in our population is higher among patients having blood group O+ve followed by a B+ve blood group.

**Keywords:** Acute myocardial infarction, ABO blood groups, frequency.

## Introduction

Myocardial infarction, mostly a consequence of coronary artery disease has high rates of morbidity and mortality.<sup>1</sup> Coronary artery disease occurs mostly from atherosclerosis, when arteries become stenosed due to the accumulation of plaques rich in cholesterol in their walls.<sup>2</sup> Many reports have appeared in recent years suggesting an association between blood groups predominantly the ABO blood groups and MI.<sup>3</sup>

Association between patients carrying the B allele and MI has been shown. In one study MI occurs 2.5 times more frequently in patients with B allele blood group.<sup>4</sup> Numerous studies have shown that blood groups 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 groups A and AB have lower levels of this enzyme.<sup>5</sup> Recent studies have shown that the absence of this enzyme predisposes blood groups A and AB to deposition of cholesterol plaques in the coronary artery walls due to their inability to breakdown dietary fat. On the contrary, the presence of this enzyme has a kind of protective role in patients with blood groups O and B.<sup>5</sup>

In Sharif et al <sup>6</sup>, a study done in Pakistan, an association between blood group A and ischemic heart disease was found in general but a study demonstrating the association between ABO blood group and myocardial infarction is lacking. Similarly in India a similar trend of association of myocardial infarction with the B blood group has been found.<sup>7</sup> In contrast in Egypt, Africa A blood group was associated with an increased incidence of myocardial infarction.<sup>8</sup> It was observed that 39% of the population under study with myocardial infarction had blood group B while 33.9% of patients had blood group O. 21 % of the patients had blood group A while only 7% of the myocardial infarction patients had AB blood groups.<sup>8</sup>

However, studies depicting the frequency of myocardial infarction in different ABO blood groups are lacking in the Pakistani population. The rationale of this study is to find the frequency of acute myocardial infarction in different ABO blood groups in the Pakistani population and to manage patients with blood groups with frequent acute myocardial infarctions more aggressively.

## Methodology

This cross-sectional study was carried out at the interventional cardiology department in Rawalpindi Institute of Cardiology, Rawalpindi, from May 2018 to December 2018.

### Inclusion criteria:

- Age > 18 years and < 80 years
- Patients presenting with acute ST-elevation myocardial infarction (STEMI) with history of chest pain in the last 12 hours, ST-segment elevation in two or more adjacent leads with elevated cardiac biomarkers

### Exclusion criteria:

- Patients with concomitant valvular heart disease

250 patients meeting the inclusion criteria, presenting in the Emergency Department with acute myocardial infarction were included in the study. The study was started after taking approval from the ethical committee. The study was explained to the patients and informed consent taken. All patients underwent 12 lead electrocardiography using Mortara instrument ELI 250. All electrocardiograms were analyzed by a single trained reader unaware of the patients' blood group. Cardiac troponin levels were assessed at least three hours after the onset of symptoms. The ABO blood group was assessed by using the standard slide agglutination method in the hospital pathology laboratory and verified by the principal investigator.

The data was collected on a pre-tested questionnaire by the investigator after taking informed consent from the patient. Each participant was allotted an identification number and the confidentiality of the participant was safeguarded. The procedure was conducted by the investigator of the study.

Data was entered and analyzed in the Statistical package for social sciences (version 18.0). Mean+S.D for quantitative variables like age of the patients. The frequency distribution of a particular blood group in MI patients was determined. For control of effect modifiers like age and gender and confounding variables like smoking, diabetes stratified analysis and for Post-stratification chi-square test was applied. P-value < 0.05 was significant.

## Results

A total of 250 cases fulfilling the inclusion/exclusion criteria were enrolled to determine the frequency of ABO blood groups among patients with acute myocardial infarction in the Pakistani population.

Patients were distributed according to age, it shows that 36.4%(n=91) were between 18-50 years of age while 63.6%(n=159) were between 51-80 years of age, mean±sd was calculated as 57.32±12.14 years. (Table 1). Patients were distributed according to gender showing that 79.2%(n=198) were male and 20.8%(n=52) were females.

Frequency of ABO blood groups among patients with acute myocardial infarction in Pakistani population was recorded as 18.4%(n=46) with A+ve, 13.2%(n=33) had AB+ve, 0.4%(n=1) had AB-ve, 5.6%(n=14) had A-ve, 26%(n=65) had B+ve, 4.4%(n=11) had B-ve, 28.8%(n=72) had O+ve, 3.2%(n=8) had O-ve. (Table 1).

**Table 1: Distribution of ABO Blood Groups among patients with acute Myocardial Infarction in Pakistani population Statistics**

ABO Blood group	No. of patient	%
A-ve	14	5.6
A+ve	46	18.4
AB-ve	1	0.4
AB+ve	33	13.2
B-ve	11	4.4
B+ve	65	26.0
O-ve	8	3.2
O+ve	72	28.8
<b>Total</b>	<b>250</b>	<b>100.0</b>

The stratification for age based on blood group for myocardial infarction is seen in Table 2.

**Table 2: Stratification For Age For ABO Blood Groups Among Patients With Acute Myocardial Infarction With Regard To Age**

ABO Blood group		18 - 50 years	51 - 80 years	P-value
A-ve	Yes	5	9	0.056
	No	80	156	
A+ve	Yes	10	36	0.739
	No	84	120	
AB-ve	Yes	1	0	0.216
	No	137	112	
AB+ve	Yes	7	26	0.057
	No	83	134	

B-ve	Yes	9	2	0.001
	No	81	158	
B+ve	Yes	25	40	0.631
	No	65	120	
O-ve	Yes	1	7	0.159
	No	89	153	
O+ve	Yes	34	38	0.077
	No	58	120	

## Discussion

The first thing that was shown in our study was that the B blood group was the most prevalent in our study population. Similar results were seen in studies conducted in India<sup>7</sup> but that was different from studies done in Africa where O blood group was the most prevalent<sup>8</sup>. There have been quite a few studies showing an association between ABO blood group and the development of coronary atherosclerosis. Some of these studies have shown the association between ABO blood groups and the occurrence of acute coronary syndrome including MI and sudden cardiac death.<sup>3</sup>

We planned this study with the view to find the frequency of acute myocardial infarction (AMI) in different ABO blood groups in the Pakistani population and to manage patients with a blood group with frequent acute myocardial infarctions more aggressively.

In our study, 36.4%(n=91) were between 18-50 years of age while 63.6%(n=159) were between 51-80 years of age, mean±SD was calculated as 57.32±12.14 years, 79.2%(n=198) were male and 20.8%(n=52) were females. Frequency of ABO blood groups among patients with acute myocardial infarction in Pakistani population was recorded as 18.4%(n=46) with A+ve, 13.2%(n=33) had AB+ve, 0.4%(n=1) had AB-ve, 5.6%(n=14) had A-ve, 26%(n=65) had B+ve, 4.4%(n=11) had B-ve, 28.8%(n=72) had O+ve, 3.2%(n=8) had O-ve.

We compared our results with a Malaysian study by Sheikh et al who found an increased incidence of myocardial infarction in patients with B allele blood group,<sup>6</sup> which is in agreement with our study as we recorded 26% of the acute myocardial infarction suffering with this blood group. Similarly in India similar trend of association of myocardial infarction with the B blood group has been found.<sup>7</sup> It was observed that 39% of the population under study with myocardial infarction had blood group B while 33.9% of patients had blood group O. 21% of the patients had blood group A while only 7% of the myocardial

infarction patients had AB blood groups.<sup>9</sup> Similarly a study conducted by Akhund et al<sup>10</sup> conducted a study in Pakistan showing close association of myocardial infarction and angina with people with blood group A, These findings are also in agreement with our study.

Another study conducted by Zera et al.<sup>11</sup> recorded that 32.6% (78) had blood group O, 38.1% (91) had blood group A, 17.2%(41) had blood group B and 12.1%(29) had AB. Of the total of 239, 52.3% (125) were smoker, 66.9% (160) were hypertensive, 30.5% (73) had diabetes mellitus (DM). AMI was less frequent in the AB blood group.

Abdollahi et al<sup>12</sup> investigated whether there was an association between ABO blood groups and cardiovascular risk factors in a healthy population and recorded that amongst 5000 subjects, 2920 had blood laboratory tests and their types of blood groups were known. Of the total of 2920, 57.4% were male, 70% were inactive, 14% were smokers, 25% were hypertensive, 23% obese, 21% had a family history of CAD, and the mean age was 41.52±12.317. Blood group O(32.9%), A(30.1%), B(23.3%) and AB(13.7%), respectively had most frequency. Amongst cardiac risk factors, only frequency of family history of CAD in an individual with different blood groups was different (P< 0.01) and individual with A blood group reported more family history of CVD versus other blood groups and concluded that amongst cardiovascular risk factors, only family history of CAD had a significant relation with ABO.

Results of many studies<sup>13,14</sup> have shown MI occurring more frequently in the non-O blood group compared to the O blood group. The Framingham Heart Study, and others, suggested A blood group to be related to the early occurrence of coronary artery disease and is more prevalent in patients with MI<sup>15</sup>. Other studies noted groups B<sup>16</sup> or AB<sup>17</sup> have a higher incidence of CAD. Conversely, an Indian study with a moderate sample size also showed O blood group is more frequent in CAD and increased the risk of CAD<sup>18</sup>.

Several recent studies have refuted the argument that specific ABO blood group alleles alter the synthesis of von Willebrand Factor (vWF) which has a role in the atherosclerotic process.<sup>19</sup> In contrast, it has been demonstrated that the activity of enzyme ADAMTS13 differs against VWF of different blood groups. It was found that in patients with blood group O had higher levels of ADAMTS13 activity and the subsequent rate of VWF proteolysis by ADAMTS13.<sup>20</sup>

In summary, the frequency of acute myocardial infarction in different ABO blood groups in the Pakistani population should be evaluated in further

trials at different regions; it may be helpful to manage patients with different blood groups with frequent acute myocardial infarctions more aggressively.

## Conclusion

In summary, the frequency of acute myocardial infarction in different ABO blood groups in the Pakistani population should be evaluated in further trials in different regions. We concluded that the frequency of acute myocardial infarction in our population is higher among patients having O+ve followed by A+ve, it may be helpful to manage patients with blood groups with frequent acute myocardial infarctions more aggressively, however, some other trials are required to validate our findings.

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