

ORIGINAL ARTICLE

Acute Myocardial Infarction and its Association with ABO Blood Groups: A Study in Tertiary Care Hospital in Bangladesh

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Abstract

Background: Acute myocardial infarction (AMI), commonly known as a heart attack, remains a leading cause of morbidity and mortality worldwide. Among the various potential risk factors, the association between ABO blood groups and the incidence of acute myocardial infarction has garnered significant interest. This study aimed to assess the relationship between ABO blood group and acute myocardial infarction. **Methods:** This prospective observational study was conducted in the Department of Cardiology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from March 2021 to July 2022. This study purposively enrolled 187 patients with acute myocardial infarction. After conducting thorough clinical examinations on all subjects, the information was documented in a data schedule. The data were then analyzed using SPSS version 23.0. **Results:** In this study, most participants were aged 46-65 years (51.3%) and from rural areas (57%). The male-female ratio was 2:1. The most prevalent ABO blood group was O+ve (30.5%), followed by B+ (27.8%), A+ (23.0%), and AB+ (12.8%). There was a significant correlation between ABO blood groups and gender of participants regarding AMI ($p=0.002$) but no significant correlation between ABO blood groups and or residency ($p=0.179$) regarding AMI. **Conclusion:** The rural male population aged 46-65 years is mostly prone to acute myocardial infarction. Among AMI patients, the most prevalent ABO blood group is O+ve, followed by B+ve. There is a significant correlation between ABO blood groups and gender of acute myocardial infarction patients.

Keywords: Acute myocardial infarction, ABO blood groups, Coronary artery disease.

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Introduction

Myocardial infarction, primarily resulting from coronary artery disease, has high rates of morbidity and mortality.¹ Coronary artery disease primarily arises from atherosclerosis, where arteries become narrowed due to the buildup of cholesterol-rich plaques in their walls.²

Reports suggest a link between blood groups, particularly the ABO blood groups, and myocardial infarction.³

Specifically, an association has been shown between the B allele and myocardial infarction, with one study indicating that myocardial infarctions occur 2.5 times more frequently in patients with the B allele blood group.⁴ Numerous studies have indicated that individuals with blood groups O and B have higher levels of intestinal alkaline phosphatase, an enzyme produced in the small intestine. This enzyme allows those with blood groups O

and B to benefit from higher protein levels, whereas blood groups A and AB have lower levels of this enzyme⁵

Recent research suggests that the absence of this enzyme in blood groups A and AB predisposes them to the deposition of cholesterol plaques in the coronary artery walls, due to their reduced ability to break down dietary fat. Conversely, the presence of this enzyme provides a kind of protective effect in individuals with blood groups O and B.⁵ In a study conducted in Pakistan, an association between blood group A and ischemic heart disease was found, but a study specifically demonstrating the link between ABO blood groups and myocardial infarction is lacking.⁶ Similarly, in India, a trend showing an association between myocardial infarction and the B blood group has been observed.⁷ In contrast, research in Egypt indicated that the A blood group was associated with an increased incidence of myocardial infarction.⁸

It was observed that among the population studied with myocardial infarction, 39% had blood group B, 33.9% had blood group O, 21% had blood group A, and only 7% had blood group AB.⁸ The objective of this current study was to assess the relationship between ABO blood group and acute myocardial infarction.

Materials and Methods:

This was a prospective observational study that was conducted in the Department of Cardiology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from March 2021 to July 2022. Using the purposive sampling technique, a total of 187 patients with acute myocardial infarction were enrolled as study subjects.

Written consent was obtained from all participants before data collection. The entire intervention was conducted following the principles of human research specified in the Helsinki Declaration and was executed in compliance with current regulations and the provisions of the General Data Protection Regulation.^{9,10}

The exclusion criteria included individuals with unstable angina and other cardiac diseases, those with active psychiatric illness or CNS disorders, and subjects who were not willing to participate. Following a thorough clinical examination of each subject, the information was recorded in a data schedule. The standard tube method was used to determine the ABO blood groups of all subjects.

The collected data were analyzed statistically to determine any association between myocardial infarction and

different ABO blood groups. Data were expressed as percentages and absolute frequencies. Categorical variables were analyzed using the Chi-square test or Fisher's exact test. SPSS version 22 was used for statistical analysis, with a 95% confidence interval and a significance level of $p < 0.05$.

Results:

In this study, most participants were 46-65 years old, followed by the >65 age group (33%). Most participants (65%) were male, resulting in a male-female ratio of 2:1. Most participants (57%) were from rural areas, while 43% were from urban areas.

In analyzing the ABO blood groups among participants, O+ was the most prevalent blood group (30.5%), followed by B+ (27.8%), A+ (23.0%), and AB+ (12.8%).

Among the male participants, the highest number of AMI patients (32.8%) had blood group O positive, whereas among female patients, it was blood group A positive (30.8%). We found a significant correlation between ABO blood groups and the gender of participants regarding AMI ($p=0.002$).

Among rural participants, the majority of AMI patients (44.3%) had blood group O positive, while among urban participants, the highest number of AMI patients (32.1%) had blood group AB positive. However, there was no significant correlation between ABO blood groups and participants' residency concerning AMI ($p=0.179$).

Table-I

Age distribution of participants (N=187)

Age (Year)	n	%
≤35 Yrs.	7	3.7%
36-45 Yrs.	23	12.3%
46-65 Yrs.	96	51.3%
> 65 Yrs.	61	32.6%

Table-II

Distribution of ABO blood groups among participants (N=187)

ABO groups	n	%
A-ve	2	1.1%
A+ve	43	23.0%
AB-ve	3	1.6%
AB+ve	24	12.8%
B-ve	3	1.6%
B+ve	52	27.8%
O-ve	3	1.6%
O+ve	57	30.5%
Total	187	100%

Table-III
Association of AMI between ABO blood groups and gender of participants (N=187)

ABO	Male (n=122)		Female (n=65)		p-value
	n	%	n	%	
A -ve	1	0.8%	1	1.5%	0.002*
A +ve	23	18.9%	20	30.8%	
AB -ve	2	1.6%	1	1.5%	
AB +ve	16	13.1%	8	12.3%	
B -ve	2	1.6%	1	1.5%	
B +ve	36	29.5%	16	24.6%	
O -ve	2	1.6%	1	1.5%	
O +ve	40	32.8%	17	26.2%	
Total	122	100%	65	100%	

*: Significant p-value

Table-IV
Association of AMI between ABO blood groups and residence of participants (N=187)

ABO	Rural (n=106)		Urban (n=81)		p-value
	n	%	n	%	
A -ve	1	0.9%	1	1.2%	0.179
A +ve	21	19.8%	22	27.2%	
AB -ve	2	1.9%	1	1.2%	
AB +ve	26	24.5%	26	32.1%	
B -ve	1	0.9%	2	2.5%	
B +ve	6	5.7%	18	22.2%	
O -ve	2	1.9%	1	1.2%	
O +ve	47	44.3%	10	12.3%	
Total	106	100%	81	100%	

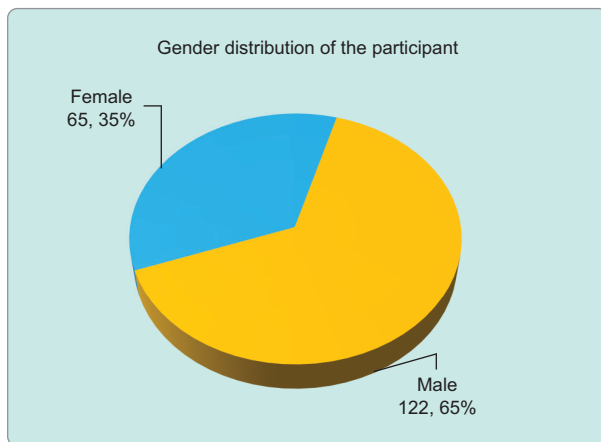


Figure 1: Pie chart showed gender wise participant (N=187)

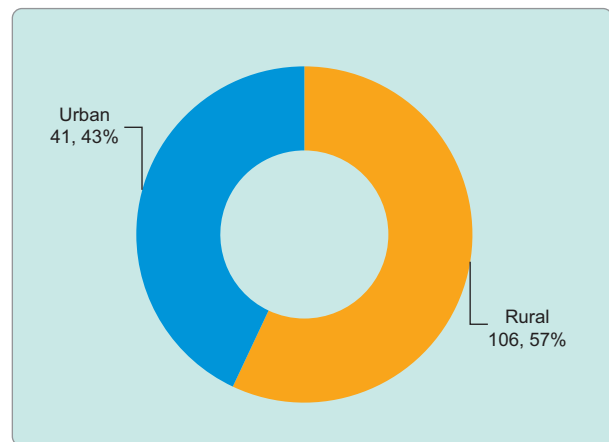


Figure 2: Chart showed living area distribution (N=187)

Discussion:

A total of 187 patients with acute myocardial infarction (AMI) were selected for the study using purposive sampling. The main goal was to investigate the relationship

between the ABO blood group and AMI. Commonly known as a heart attack, AMI is a major cause of morbidity and mortality worldwide.

In this study, the majority of participants were aged 46-65 years, followed by those over 65 years. A similar age distribution was noted in another study conducted in Bangladesh.¹¹ Most of our participants were male and the male-to-female ratio was 2.1. Male predominance was also observed in other studies.^{11,12} Similarly, in a study by Anvari et al it was reported that 28.1% of female patients had a mean age of 60.5±8.63 years, while 71.9% were male with a mean age of 58.17±9.88 years.¹³

Most participants in our study were from rural areas, which aligns with the findings of a previous study conducted in Bangladesh.¹¹ In analyzing the ABO blood groups among participants, we found that O+ was the most prevalent blood group (30.5%), followed by B+ (27.8%), A+ (23.0%), and AB+ (12.8%). Similar results were found by Iftikhar et al. in their 2020 study.¹⁴ Sheikh et al. also noted an increased incidence of myocardial infarction in patients with the B allele blood group, which aligns with our findings, as 26% of the acute myocardial infarction cases in our study had this blood group.⁶ In male participants, blood group O positive was the most prevalent among AMI patients (32.8%), while in female participants, blood group A positive was most common (30.8%).

A significant association was identified between ABO blood groups and gender concerning AMI occurrence ($p=0.002$). Conversely, among rural participants, the majority of AMI cases (44.3%) were observed in those with blood group O positive, whereas in urban participants, blood group AB positive had the highest prevalence (32.1%) among AMI patients. However, no significant association was found between ABO blood groups and residency concerning AMI ($p=0.179$). These results align with the findings of Islam et al.¹¹ Furthermore, Biswas et al in Bangladesh reported a higher prevalence of coronary artery disease (CAD) among individuals with blood group O, despite blood group B being the predominant phenotype in the Bangladeshi population.¹⁵

Conclusion:

The rural male population aged 46-65 years is particularly prone to acute myocardial infarction. Within this group, the most prevalent ABO blood group among AMI patients is O+ve, followed by B+ve. Studies indicate that there is no significant correlation between ABO blood groups and the gender or residency of AMI patients. This suggests that while blood group distribution may vary, the likelihood of AMI is not influenced by these factors. Understanding these demographic trends can help in targeting preventive measures and improving cardiovascular health outcomes in vulnerable populations.

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