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ORIGINAL ARTICLE

Association of Acute Coronary Syndromes with Blood Groups: A Single-Center, Observational Study

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ABSTRACT

Background: Evidence suggests an association between ABO blood groups and cardiovascular diseases; particularly acute coronary syndromes, a major reason for hospitalization and mortality.
Aim: To investigate the association between ABO blood groups and acute coronary syndrome (ACS) frequency.
Study design: Cross-sectional study.
Place and duration of study: United Hospital, Karachi from 1st June 2022 to 31st December 2022.
Methods: Two hundred and five participants with a diagnosis of ACS were enrolled in this study. A structured questionnaire was used to gather the data regarding the demographics and clinical characteristics of the patients. By utilizing specific antibodies and the agglutination approach, blood types were identified. ECG, coronary angiography, echocardiography and troponin-I were performed on these patients.
Results: Blood groups B+ and O+ among ACS patients had the largest prevalence (35.1 and 28.8%, respectively) and there was a significant association between blood groups and the type of MI (p=0.008). The most frequently diagnosed MI was anterior wall myocardial infarction (AWMI), which is highly prevalent among patients with the type A (+ve) blood group. Moreover, the risk factors were equally prevalent among patients of different blood groups.
Conclusions: The frequency of ACS and ABO blood type were significantly correlated and there was no statistically significant correlation between any risk factors under study and blood type.
Keywords: Acute coronary syndrome, ABO blood type, Risk factors

INTRODUCTION

Hospitalized cardiovascular disease patients comprise a sizeable section of the population, and some studies suggest that coronary artery disease, particularly ACS, remains the main cause of death mostly. Additionally, its incidence rate and ensuing adverse effects are growing in poorer countries[1]. Even though numerous studies in the literature outline various treatment options for patients with CAD[2-6], the World Health Organization reports that 17.9 million individuals worldwide die from CVDs each year, accounting for 32% of all casualties and >75% of these are contributed from low and middle-income countries.

ACS is one of the most expensive medical illnesses, with high mortality and morbidity rates.[7] Some ACS subsets include unstable angina, STEMI, and NSTEMI[8]. The atherosclerotic plaque formation in the arteries supplying the heart results in ACS, which causes ischemia of the heart muscle as well as a gradual lumen narrowing or obstruction, a decrease in blood flow and hypoxia, and other symptoms[9].

Advancing age, male gender, and a family history of coronary heart disease are non-modifiable risk factors associated with ACS. However, smoking, high blood pressure, diabetes mellitus, a high BMI, stress, emotional upheavals, an inadequate diet, a lack of vitamin D, and birth control use are all modifiable risk factors[1,9,10].

Endothelial cells, platelets, monocytes, macrophages, and vascular wall cells combine to cause atherosclerosis, a chronic inflammatory disorder[10]. In addition to red blood cells, blood-type antigens are expressed on the surfaces of endothelial cells, platelets, and the major receptors that control cell migration, adhesion, and proliferation in artery walls[11]. Therefore, it would seem that blood types have an impact on the occurrence of cardiovascular illnesses and the development of atherosclerosis, both directly through these inflammatory cells and indirectly through the alteration of various risk factors for these diseases, such as lipid profiles[12].

The relationship between ABO blood groups and CAD prevalence is still debatable and has only sometimes been studied in the Pakistani community. This cross-sectional study studied the relationship between the prevalence of ACS and ABO blood groups.

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MATERIALS AND METHODS

This cross-sectional, descriptive study comprised 205 patients diagnosed with ACS attended the Karachi Institute of Heart Diseases, Karachi, during June to December 2022. Open Epi sample size calculator was used for sample size calculation, keeping power at 60, confidence interval at 95% and risk/prevalence ratio of 1.3. Patients were well-informed of the study objectives and that all information would be kept private to adhere to the ethical guidelines. Informed consent was obtained before inclusion. All patients presenting with ACS, aged 35 years and onwards, were considered eligible for enrolment while patients refusing to be part of the study process were excluded.

The data was collected using a structured questionnaire inquiring about patients' demographics and clinical characteristics. By utilizing specific antibodies and the agglutination approach, blood types were identified.ECG, coronary angiography, echocardiography and troponin-I were performed on these patients. The data were analyzed using SPSS-25.0. P<0.05 was regarded as significant when comparing the variables concerning the blood group using independent t-tests and Fisher Exact tests.

RESULTS

The highest prevalence rate of ACS was related to the age range of 41 to 55 years (42.9%). The mean age of patients was 56.72±11.40 years. Seventy patients (34.1%) were diagnosed with AWMI, followed by IWMI (32.2%). It was discovered that among ACS patients, blood groups B+ and O+ had the largest prevalence (35.1 and 28.8% respectively).

There was a significant association between the blood group and the type of MI (p=0.008). The most frequently diagnosed MI was AWMI, which is highly prevalent among patients with the type A (+ve) blood group (Table 2). The blood type O patients were the oldest, whereas the type B patients were the youngest. Table 3 displays the frequency of risk variables in each blood group. Hypertension (56.2%) was the most common risk factor, and

individuals with type A- and O- blood (66.7% each) were more likely to experience it (Table 3).

Table 1: Patient's baseline characteristics (n=205)

Variable		No.
Age (years)		56.72±11.40
Gender	Male	161 (78.5%)
	Female	44 (21.5%)
Smoking status	Smoker	50 (24.4%)
	Non-smoker	155 (75.6%)
Blood group	A+	45 (22%)
	A-	3 (1.5%)
	B+	72 (35.1%)
	B-	3 (1.5%)
	AB+	20 (9.8%)
	O+	59 (28.8%)
	O-	3 (1.5%)
Type of MI	AWMI	70 (34.1%)
	IWMI	66 (32.2%)
	LWMI	2 (1%)
	NSTEMI	65 (31.7%)
	IPWMI	1 (0.5%)
	AIWMI	1 (0.5%)

Table 2: Distribution of type of MI according to blood group

Type of MI	Blood Group						
	A+	A-	B+	B-	AB+	O+	O-
AWMI	21 (46.7%)	1 (33.3%)	23 (31.9%)	1 (33.3%)	7 (35%)	17 (28.8%)	-
IWMI	11 (24.4%)	2 (66.7%)	22 (30.6%)	1 (33.3%)	8 (40%)	21 (35.6%)	1 (33.3%)
LWMI	-	-	-	1 (33.3%)	1 (5%)	-	-
NSTEMI	13 (28.9%)	-	25 (34.7%)	-	4 (20%)	21 (35.6%)	2 (66.7%)
IPWMI	-	-	1 (1.4%)	-	-	-	-
AIWMI	-	-	1 (1.4%)	-	-	-	-

Table 3: Association of ABO blood group with risk factors

Variables	Blood Group							Total
	A+	A-	B+	B-	AB+	O+	O-	
Smoker	20.0%	33.3%	25.4%	33.3%	25%	25.4%	33.3%	24.5%
DM	38.6%	33.3%	40.3%	33.3%	45%	28.8%	33.3%	36.8%
HTN	65.9%	66.7%	57.7%	33.3%	35%	54.2%	66.7%	56.2%
IHD	40.9%	-	28.2%	-	15%	22.0%	33.3%	27.1%
Asthma	-	-	1.4%	-	-	3.4%	-	1.5%
CKD	2.3%	-	1.4%	-	-	1.7%	-	1.5%
Dyslipidemia	2.3%	-	1.4%	-	-	-	33.3%	1.5%
Positive FH	2.3%	-	7.0%	--	-	3.4%	-	3.9%
CVA	-	-	1.4%		-	-	-	0.5%

*P<0.05 (Significant)

DISCUSSION

One of the difficulties for researchers and cardiologists in reducing cardiovascular diseases has been identifying the risk factors and regulating them. The connection between blood types and cardiovascular disorders has been done for a long time in this area. However, local literature is scarce, and the significance of the association is still uncertain[13,14].

Despite the justifications provided, the relationship between ABO blood types and CAD is still debatable, and the research findings are divided. According to other research, there is no connection between the various ABO blood types and coronary artery disease. Some people may develop early coronary artery disease regardless of their blood type.[13,15] The connection between ABO blood types and the prevalence of cardiovascular disorders have concluded that people with the type A blood group have a much higher prevalence of cardiovascular disease than those with other blood types[16].

We observed the highest prevalence of ACS among patients with type B blood group followed by O type. Few studies have concluded that people with type O blood have a greater risk of cardiovascular disorders[17] while a study in support of our outcomes also reported that the type B blood group had a higher incidence of cardiovascular disorders[18], it was suggested that one of the hereditary risk factors in the pathogenesis of atherosclerosis is blood type B.

Numerous factors, such as hypertension, dyslipidemia, reduced physical activity, age, gender, etc., are associated with an increased CAD risk[19]. Additionally there is no real connection between the risk factors for cardiovascular conditions and the ABO blood groups. The results of this study demonstrate that key risk factors are about equally prevalent among patients of different blood kinds. These findings concur with other research carried out in Europe, America and Asia[13,16]. However, other findings suggested that various risk factors for cardiovascular illnesses may be related to the blood group type[20].

In the McConnell trial, people with type A blood had a considerably greater prevalence of diabetes[21]. It is debatable whether blood type affects dyslipidemia and hypercholesterolemia in particular. According to certain research, people with type B blood had noticeably higher cholesterol levels[18]. According to other experts, the type A blood group has a higher prevalence of hypercholesterolemia[22]. In contrast, the type O blood group patients had the highest dyslipidemia frequency. The findings of several studies on the association between blood types and risk factors for cardiovascular illnesses have varied, and it appears that this is because of cultural, dietary, and lifestyle variations[23].

Our study's limitations are related to the lack of data on additional risk factors, including BMI and physical inactivity. Given that ACS is a complex spectrum of various clinical manifestations, additional research is required because it is expected that several factors of varying degrees may interact to influence the disease's progression.

CONCLUSION

The type of MI is linked to blood group types; additionally, the association seems unrelated to the studied risk factors. To fully understand the relationship of ABO blood groups with cardiovascular disorders and associated risks, as well as to identify the underlying biochemical pathways, it is advised that future research be conducted with a multi-center design and with a diverse population.

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