

To Investigate the Frequency of Non-O Blood Groups in Patients with Coronary Artery Disease; A Cross-Sectional Study

Muhammad Tahir Younas¹, Sabeeha Yousaf², Sana Younas³, Hira Niazi⁴, Asif Niaz⁵

^{1,4,5}Medical Specialist, PAF Hospital Islamabad

²Resident, Gynae and Obs, PAF Hospital Islamabad

³Ph.D research scholar, Department of Behavioral Sciences, NUST, Pakistan

Correspondence:

Dr. Muhammad Tahir Younas

Tahiryounas309@gmail.com

Abstract

Objective: To investigate the frequency of non-O blood groups among coronary artery disease patients.

Methodology: A cross-sectional study in the inpatient clinical areas of the Department of Medicine was conducted at a large tertiary care hospital in Islamabad, Pakistan, from June to November 2021. A non-probability sampling technique was employed and the inclusion criteria included patients aged from 25-60 years and patients of coronary artery disease with greater than or equal to 25% narrowing in any of the epicardial vessels on coronary angiography.

Results: The total sample size was 111 in the present study. 85.6% of the study population were aged between 41-60 years, while a family history of coronary artery disease was present in 45.1% of patients. The most common blood group in the study population was the O blood group (36%) followed by those with blood group B (31.5%). 64% patients had a non-O blood group. On stratification age, gender and family history of coronary artery disease was not significant.

Conclusion: von Willebrand factor had been found to be in a higher level among non -O blood groups providing a possible explanation for the increased burden of coronary artery disease in this group.

Keywords: Myocardial infarction, coronary artery disease, ABO blood group

Cite this article: Younas MT, Yousaf S, Younas S, Niazi H, Niaz A. To Investigate the Frequency of Non-O Blood Groups in Patients with Coronary Artery Disease; A Cross-Sectional Study. BMC J Med Sci. 2022. 3(2): 51-54.

Introduction

Research evidence found that ABO blood group system is linked with longevity, neoplastic diseases, bleeding, preeclampsia, and cognitive impairment. The relationship between venous thrombosis and ABO blood group is explained as well as the major determinants found have been found which are coagulation factor VIII and von Willebrand factor (vWF) that result in thrombosis.

Discovered in 1901, the ABO blood group system has been associated with various diseases and found to be associated with cognitive impairment¹, preeclampsia², neoplastic diseases³. It has also been found to be a significant genetic risk factor for venous thrombosis⁴. It has been postulated that there also may also be an association between atherosclerosis and an increased risk of coronary artery disease and myocardial infarction.

Von Willebrand Factor (vWF) plays an important role in arterial thrombus formation and genetic factors such as ABO blood group play an important role in determining plasma vWF levels.¹²

Globally, early studies have found the blood type O has shown a strong link with mumps, plague, tuberculosis infections, and cholera while blood type B is associated with increased incidence of tuberculosis, salmonella infections, and gonorrhoea and blood type A is linked with *Pseudomonas aeruginosa* infection, *Streptococcus pneumoniae*, and smallpox. Blood type AB is linked with incidence of *E coli*, salmonella infections, and smallpox.²

A study from Taiwan revealed blood group A to be associated with a higher risk of coronary artery disease and myocardial infarction⁵. These results are supported by results from Britain.⁶ Among 1,198 patients in the United States of America who underwent Percutaneous

Authorship Contribution: ^{1,4,5}Substantial contributions to the conception or design of the work; or the acquisition, Data analysis, Literature review, ^{2,3}Drafting the work or revising it critically for important intellectual content

Funding Source: none

Conflict of Interest: none

Received: July 29, 2022

Accepted: Nov 15, 2022

Coronary Intervention (PCI), non-O patients had a higher thrombus burden, though outcomes at one year were similar.⁷

In Pakistan, Sharif *et al.*, demonstrated that blood group A was associated with a higher risk of developing ischemic heart disease through a limitation of the study is that they did not mention how the diagnosis of ischemic heart disease was established.⁸ the ABO blood system has been linked with longevity¹, neoplastic diseases², bleeding³, preeclampsia⁴, and cognitive impairment⁵. In all these studies, the link between venous thrombosis and ABO blood group has been given much emphasis,⁶ and the significant determinants of this linkage are coagulation factor and von Willebrand factor (vWF) that result in thrombosis. These findings make a hypothesis that the risk of myocardial infarction (MI) and coronary artery disease (CAD) may also be found with ABO blood group. But the past research did not provide a consistent conclusion. Moreover, the past studies including the original and meta-analysis^{7,8}, and observational studies mainly put emphasis on the non-O and O blood group while ignoring the blood group A and other blood types. Further, the linkage between MI and ABO blood group was focused but the relationship between ABO blood group and risk of CAD was never explored before.⁹

Hence the present study aimed to further our understanding with regard to the relationship between ABO blood groups and coronary artery disease in the local population, we conducted this study to determine the frequency of non-O blood groups in patients with established coronary artery disease.

Material and Method

A cross-sectional study was conducted in the inpatient clinical areas of the Department of Medicine at a large tertiary care hospital (PAF Hospital E-9) in Islamabad, Pakistan. Ethical approval was obtained from the ethical review committee and the research department of the hospital. A non-probability consecutive sampling technique was employed and the inclusion criteria included patients aged from 25-60 years, both genders, and patients of coronary artery disease with greater or equal to 25% narrowing in any of the epicardial vessels on coronary angiography whereas the exclusion criteria consisted of any history of asthma, diabetes mellitus, dyslipidemia or arthritis.

Patients were recruited from June 2021 to November 2021, according to the inclusion and exclusion criteria. To ensure confidentiality, no identifiable information was collected, and all participants provided informed consent before blood samples were collected and sent to the laboratory, where the ABO blood group was determined by standard agglutination technique through a tube test because it is more reliable and sensitive; thus, we used it conveniently for blood transfusion, and results were confirmed by a consultant pathologist. Data regarding baseline characteristics and blood groups were collected using a premade proforma.

IBM SPSS version 20.0 was used to analyse the data. Percentages and frequencies were calculated for qualitative variables like Non O blood groups, blood group type, family history of CAD, gender, and age. Mean \pm Standard Deviation was determined for quantitative variables like age. Stratification was used to control the effect of modifiers like family history of CAD, gender, and age. The statistically significant value of p was found by applying the post-stratification chi-square test.

Results

The current study enrolled a total of 111 participants. 85.6% of the study population were aged between 41-60 years. 83.8% of patients were male, while 16.2% were female. Overall, 45.1% of patients were found to have a history of coronary artery disease in the family.

The details regarding blood types and their frequency in the present study has been shown in Table I.

The table shows the most common blood group among the population is the O blood group (36%). Afterward, the second common group is blood group B (31.5%). 64% of patients had a non O blood group. Further results are displayed in table I.

Blood group type	N	%
O	40	36%
A	22	19.8%
B	35	31.5%
AB	14	12.6%
Total	111	100%

Table II shows that the patients were then divided into those with O blood groups and those without. They were stratified by age, gender and family history of coronary artery disease. The p value shows the significant

difference in age group, as the maximum number of participants were between 41 to 60 years.

Family history of CAD	NON-O blood groups		p-value
	Yes	No	
Yes	33(64.7%)	18(35.3%)	0.881
No	38(63.3%)	22(36.7%)	
Total	71(64%)	40(36%)	
Gender	NON-O blood groups		p-value
	Yes	No	
Male	59(63.4%)	34(36.6%)	0.794
Female	12(66.7%)	6(33.3%)	
Total	71(64%)	40(36%)	
Age (years)	NON-O blood groups		p-value
	Yes	No	
25-40	12(75%)	4(25%)	0.320
41-60	59(62.1%)	36(37.9%)	
Total	71(64%)	40(36%)	

Discussion

The O blood group (36%) was found among the study sample, while the non-O was 64 among the participants. Age, gender, and the history of coronary artery disease in the family were not significant, as shown in table II.

Sharif *et al.* conducted a study that found the A blood group as the most common blood group identified, whereas the non-O blood group was found in 77% of the patients.⁸ Another study by Whincup PH *et al.* revealed the incidence of CAD and discovered that blood group A had the highest percentage compared to non-A blood group 15. A study by Ramakrishnan *et al.*, reported a significant relationship between blood group B and CAD whereas a study by Rout *et al.*, indicated the highest rate of CAD among the blood group A.^{16,17} Both studies demonstrated the higher burden of ischemic heart disease in non-O blood groups.

When comparing our results to those conducted in our region, a study from Bangladesh demonstrated the frequency of non-O blood group undergoing coronary angiography to be 82.1%, whereas the most common type was found to be blood group B.⁹

Dentali *et al.*, concluded, after a meta-analysis and systematic reviews of 28 studies, that an association exists between myocardial infarction and non-O blood.¹⁰ Similar conclusions were drawn by Tagaki *et al.*, among 174,945 patients in a meta-analysis study where non-O

blood group was found across myocardial infarction as an independent risk factor.¹¹ Non-O blood group has the highest levels of vWF¹³ providing a possible explanation for the increased burden of coronary artery disease.

Conclusion

In the present study, the most common blood group was found to be blood group O (36%). Then blood group B was shown as the second most common among the participants at 31.5%. The non-O blood group was found as 64%. Age, gender, and history of coronary artery disease in the family were non-significant. The highest levels of vWF was found among non O blood group providing a possible explanation for the increased burden of coronary artery disease in this group.

References

- Alexander KS. ABO blood type, factor VIII, and incident cognitive impairment in the REGARDS cohort. *Neurology*. 2014; 83:1271–6.
- Abegaz SB. Human ABO blood groups and their associations with different diseases. *BioMed research international*. 2021 Jan 23;2021.
- Alpoim PN. Preeclampsia and ABO blood groups: a systematic review and meta-analysis. *Mol Biol Rep*. 2013; 40:2253–61.
- Liumbruno GM, Franchini M. Hemostasis, cancer, and ABO blood group: the most recent evidence of association. *J Thromb Thrombolysis*. 2014; 38:160–6
- Dentali F. Non-O blood type is the commonest genetic risk factor for VTE: results from a meta-analysis of the literature. *Semin Thromb Hemost*. 2012; 38:535–48.
- Lee HF, Lin YC, Lin CP, Wang CL, Chang CJ, Hsu LA. Association of blood group A with coronary artery disease in young adults in Taiwan. *Intern Med*. 2012; 51(14):1815-20.
- Whincup PH, Cook DG, Phillips AN, Shaper AG. ABO blood group and ischaemic heart disease in British men. *Br Med J*. 1990; 300:1679-82.
- Ketch TR, Turner SJ, Sacrinty MT, Lingle KC, Applegate RJ, Kutcher MA, Sane DC. ABO blood types: influence on infarct size, procedural characteristics and prognosis. *Thrombosis research*. 2008 Dec 1;123(2):200-5.
- Sharif S, Anwar N, Farasat T, Naz S. ABO blood group frequency in ischemic heart disease heart disease in Pakistani population. *Pak J Med Sci*. 2014; 30:593-95.
- Hasan N, Chowdhury AW, Islam T, Safiuddin M, Haque M, Hoque H. Association of ABO blood group with CAD in patients undergoing CAG in cardiology department of Dhaka medical college and hospital. *Univ Heart J*. 2014; 10(2):81-4.
- Dentali F, Sironi AP, Ageno W, Crestani S, Franchini M. ABO blood group and vascular disease: an update. *In Seminars in thrombosis and hemostasis 2014 Feb (Vol. 40, No. 01, pp. 049-059)*. Thieme Medical Publishers.

12. Takagi H, Umemoto T. Meta-analysis of non-O blood group as an independent risk factor for coronary artery disease. *Am J Cardiol.* 2015; 116:699–704.
13. Vischer UM. von Willebrand factor, endothelial dysfunction, and cardiovascular disease. *Journal of thrombosis and haemostasis.* 2006 Jun;4(6):1186-93.
14. Franchini M, Capra F, Targher G, Montagnana M, Lippi G. Relationship between ABO blood group and von Willebrand factor levels: from biology to clinical implications. *Thrombosis journal.* 2007 Dec;5(1):1-5.
15. Ye Z, Wu Y, Tu Y, Chen M, Gao Y, Shi L, Li P, Xie E, Guo Z, Li Q, Yu X. Blood Group O Protect End-Stage Renal Disease Patients With Dialysis From Coronary Artery Disease. *Frontiers in Cardiovascular Medicine.* 2021;8.
16. Ramakrishnan S, Zachariah G, Gupta K, Rao JS, Mohanan PP, Venugopal K, Sateesh S, Sethi R, Jain D, Bardolei N, Mani K. Prevalence of hypertension among Indian adults: results from the great India blood pressure survey. *Indian heart journal.* 2019 Jul 1;71(4):309-13.
17. Rout G, Gunjan D, Mahapatra SJ, Kedia S, Garg PK, Nayak B. Thromboelastography-guided blood product transfusion in cirrhosis patients with variceal bleeding: a randomized controlled trial. *Journal of Clinical Gastroenterology.* 2020 Mar 1;54(3):255-62.