Correlation between Coagulation Profile and Blood group among patients with Ischemic Heart Disease in Khartoum State

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ABSTRACT

Background: Coronary artery disease (CAD), also known as ischemic heart disease (IHD) is a group of diseases that includes stable angina, unstable angina, myocardial infarction, and sudden cardiac death. It's considered a major public health issue that affects an estimated 1 in 3 adults in the United States. The ABO blood group and coagulation profile exerts a profound influence on hemostasis, This study was aimed to correlate between ABO grouping & coagulation profile in Ischemic heart disease at Khartoum State.

Methods: This was case and control study conducted during the period from January to May 2021 at Ahmed gasim hospital. Study included hundred (100) sample, fifty (50) Ischemic heart disease (IHD) patients taken as cases and fifty (50) apparently healthy taken as controls. Blood samples were collected for the analysis of prothrombin time (PT), activated partial thromboplastin time (aPTT) using STart stago semi-automated instruments and for the determining the ABO blood group using direct slide agglutination method. Statistical analysis was performed using SPSS version 25.

Results: The results of study showed that the most frequent ABO blood type among all the participants among ischemic and healthy individuals was O. The mean level of APTT in Ischemic Heart Disease (IHD) showed that there was significantly decreased (27.06 ± 3.04) when compared to control group (29.45 ± 3.7) with p. value 0.001. However no significance differences in the mean level of PT between two groups (p value= 0.96).

Its also observed that among all study participants, in blood group A, the PT and aPTT levels were the least, while blood group O had the greatest PT and aPTT values. No association was found between ABO grouping and coagulation profile in ischemic heart disease in case and control group.

Conclusion: This study concluded that O blood group was more frequent among patients with IHD followed by A blood group and least frequent was AB. In addition, there was significant shorter aPTT in Ischemic Heart Disease cases when compared to control group.

No association was found between ABO grouping and coagulation profile in ischemic heart disease in case and control group.

KEY WORDS: Blood Group, Ischemic Heart Disease; Sudanese patients.

INTRODUCTION

Coronary artery disease (CAD), also known as ischemic heart disease (IHD) is a condition of an imbalance between myocardial oxygen supply and demand. And it is a group of diseases that includes stable angina, unstable angina, myocardial infarction, and sudden cardiac death. It Occurs when there's an inadequate supply of blood and oxygen and inadequate perfusion by one or more coronary arteries to a portion of the myocardium supplied by it [1]. Ischemic heart disease (IHD) which is the most common presentation of heart disease is the most important and largest single cause of premature death in many developed countries, but seen to be rare in most developing countries [2].The clinical manifestations of IHD can be divided into four syndromes .

Its considered a major public health issue that affects an estimated 1 in 3 adults in the United States. Approximately 71 million Americans have some form of cardio- vascular disease, including more than 13 million with coronary artery disease and more than 9 million with angina pectoris. The prevalence of IHD increases with age; approximately 23% of men and 15% of women aged 60 to 79 years in the United States have IHD [3].

- the most important form of IHD is **MI** (myocardial ifraction), in which the duration and severity of ischemia is sufficient to cause death of heart muscle.

-Angina pectoris, in which the ischemia is less severe and does not cause death of cardiac muscle, has three variants; stable angina, Prinzmetal angina, and unstable angina ,The latter is the most threatening as a frequent harbinger of MI, Chronic stable angina is generally caused by fixed, obstructive at heromatous plaque in one or more coronary arteries. Unstable angina and acute MI are also known as acute coronary syndromes and result from distinct pathophysiologic mechanisms, most commonly rupture of an unstable atherosclerotic plaque with subsequent platelet aggregation and Thrombosis. In Prinzmetal angina atherosclerotic plaques are absent and the with from ischemia intense vasospasm that reduces myocardial oxygen supply Then cause Chronic IHD with heart failure and the fourth is Sudden cardiac death defined as unexpected cardiac death within 1hour of symptom onset [4].

Coronary heart disease is the most common cause of death in the United Kingdom. In total, 220,000 deaths were attributable to ischaemic heart disease in 2007. It is estimated that the incidence of acute coronary syndrome (ACS) is over 250 000 per year. Sudden death remains a frequent complication of ACS: approximately 50 per cent of patients with ST elevation myocardial infarction (STEMI) do not survive, with around two-thirds of the deaths occurring shortly after the onset of symptoms and before admission to hospital. Prior to the development of modern drug regimes and reperfusion strategies, hospital mortality after admission with ACS was 30–40 per cent. After the introduction of coronary care units in the 1960s, outcome was improved, predominantly reflecting better treatment of arrhythmias. Current therapy has improved outcome further for younger patients who present early in the course of their ACS. The last decade has seen a significant fall in the overall 30-day mortality rate. Most patients who die before discharge do so in the first 48 hours after admission, usually due to cardiogenic shock consequent upon extensive left ventricular damage. Most patients who survive to hospital discharge do well, with 90 per cent surviving at least one year. Surviving patients who are at increased risk of early death can be identified by a series of adverse clinical and investigational features, and their prognosis improved by intervention [4] .Since the discovery of the ABO system in 1900, a multitude of blood group, antigens have been identified and many different styles of terminology have been used. The International Society of blood transfusion (ISBT) recognizes 285 blood group antigens; 245 of these are classified into one of 29 blood group system [5]. The A and B alleles of the ABO locus encode A and B glycosyltransferase activities, which convert precursor H antigen into either A or B determinants, the A and B antigens having an extra saccharide unit to the O unit (N-acetylgalactosamine and galactose, respectively). Group O individuals lack such transferase enzymes and express basic, unchanged H-antigen (3). Therefore, it is reasonable to hypothesize that such carbohydrate moieties are of importance not only for transfusion and transplantation medicine, but also for the pathogenesis of various systemic diseases (5-9). Among these pathologies, the best clinical evidence emerged from the association between ABO antigens and cardiovascular disorders [6].

It has been reported that ABO blood group system and coagulation is associated with cognitive impairment [7], preeclampsia [8], bleeding, neoplastic diseases [9], and even longevity [10]. Among all of those studies, the mechanism of relationship between ABO blood group and venous thrombosis is elucidated [11], This interesting finding makes a theoretical hypothesis that ABO blood group may also be related to risk of coronary artery disease (CAD) and myocardial infarction (MI). Unfortunately, results of previous relevant studies are currently not convincing due to inconsistent conclusions. And previous studies including original observations and meta-analysis [11,12,13].mainly paid attention to the blood group non-O and O, ignoring the blood group A and other blood types. Moreover, in those studies, links of ABO blood group with MI was often focused on; however, the relation between ABO blood group and coagulation profile in CAD and was carelessly overlooked. Therefore, this study aimed to correlate between ABO blood groups and coagulation profile of Ischemic heart disease patients. Results of this study may be useful in determines which blood group system is more susceptible to cardiovascular diseases [14].

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discharge do so in the first 48 hours after admission, usually due to cardiogenic shock consequent upon extensive left ventricular damage. Most patients who survive to hospital discharge do well, with 90 per cent surviving at least one year. Surviving patients who are at increased risk of early death can be identified by a series of adverse clinical and investigational features, and their prognosis improved by intervention [4].

There were several risk factors of IHD, some are modifiable risk factors which are smoking, hypertension, diabetes mellitus obesity medical history, alcoholism, lack of exercise, stress and hyperlipidemia. Other non-modifiable risk factors, which are age, sex and family history of IHD [1].

Many reports have appeared in recent years showing an association between blood groups and cardiovascular diseases. [15] investigated association between blood group B and myocardial infarction in Malaysia. In Bangladesh, Biswas J et al., (2008) showed the prevalence of coronary Artery Disease (CAD) was higher in blood group O than other blood groups. Allen and Dawson (1968) [16], [17], Rosenberg L, et al (1983)[18] and Wazirali H, et al (2005) all reported higher risk of Ischemic heart disease with blood group A as compared to group O.

The present study was aimed to coagulation profile, ABO blood group in patient with Ischemic Heart Disease.

METHODS

This study was descriptive, analytical, case control study.

A total of one hundred (100) participants were enrolled in the study, fifty (50) in each case group and control group.

Test method

Venous blood samples were collected without stasis, the container contained (0.20) ml of (0.38) % tri-sodium citrate to which (1.8) ml of blood was added slowly, gently mixed and then separated immediately at (3000) rpm for (15) min, after which platelet poor plasma (PPP) was collected in plain containers for performing PT, APTT assays. **PT test used:** 0.1ml of PPP were applied into reaction tubes and incubated for 3 minutes. 0.2ml of pre-warmed PT reagent were applied and clotting time were detected. **APTT used** 0.1ml of PPP were applied into reaction tubes and incubated for 1 minute. 0.1ml of pre-warmed [37-temperature] APTT reagent were applied and incubated for 3 minutes. 0.1ml of pre-warmed calcium chloride were applied and clotting time were detected And, **ABO blood group** use antisera by slid agglutination method, Any agglutination occurred on the slides containing cells positive (possessing the antigen) for the corresponding antigen.

The study was approved by the Ethical Committee of Medical Laboratory Sciences College, National University.

Data was analyzed to obtain the mean .standard deviation for patients with IHD and normal control using statistical package for social science program version25, Independent T test and one way ANOVA was used to calculate the p. value of mean differences between different groups the level of significant was set p. value less than (0.05).

RESULTS

The study included hundred (100) persons, fifty (50) were IHD patients, comprising 30 (30.0%) males and 20 (20.0%) females and 50 controls comprising 26 (26.0%) males and 24 (24.0%) females. Most of the patients (67.5%) were aged (41-60) years and the mean age was 44.7 years, while the control mean age was 44.3, as seen in Table (4.1).

The results of study showed that the most frequent ABO blood type among case participants was O (27.0%), A (14%), B (5%) and AB (4%). Also among control the most frequent ABO blood type was O (26%), A was (12%), B (7%) and AB 5%) (Figure 4-1). Table (4.2) shows that there is no significant association between ABO and ischemic heart disease (P value = 0.8).

Also the study showed that there was significantly decreased in the mean level of APTT in IHD patients (27.06 ± 3.04) when compared to control group (29.45 ± 3.7) with p. value 0.001. However, no significance difference in the mean level of PT between two groups (p value= 0.96) (table 4.3).

shows that among the cases(IHD), in blood group A (Table 4.4), the mean level of PT and aPTT were least, while blood group O had the greatest PT and aPTT values.

Table 4.5 shows that among the controls, the difference in various coagulation parameters of the different blood groups is not statistically significant. However, it should be noted that individuals with A blood group have shorter PT and aPTT values than the other blood groups.

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Table 4.1: Distribution of study group according to gender and age group

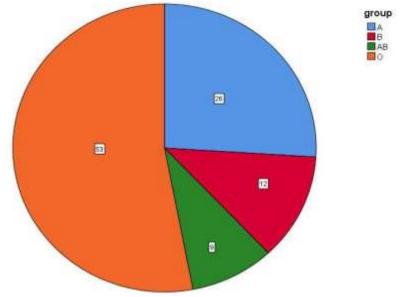|	Case	Control
Gender Male Female	30 (30.0%) 20 (20.0%)	26 (26.0%) 24 (24.0%)
Age (29_40 years) (41-60 years)	19 (19%) 31 (31%)	16 (16%) 34 (34%)

Figure 4.1: ABO grouping of study participants

Table 4.2: ABO grouping of study participants

Group	Case	Control	P value
A	14 (14.0%)	12 (12.0%)	0.8
B	5 (5.0%)	7 (7.0%)	
AB	4 (4.0%)	5 (5.0%)	
O	27 (27.0%)	26 (26.0%)	

Table 4.3: mean levels of coagulation profile of study participants

	Case	Control	P value
PT	14.2 ± 1.4	14.21 ± 1.07	0.96
APTT	27.06 ± 3.04	29.45 ± 3.7	0.001

Table 4.4: Correlation of ABO grouping with coagulation profile in case group

	PT	APTT	Frequency	P value
A	13.1 ± 1.3	25.95 ± 1.5	14	0. 23
B	14.06 ± 0.87	26.88 ± 2.17	5	
AB	14.98 ± 0.36	26.6 ± 3.15	4	
O	15.46 ± 2.2	30.2 ± 3.7	27	

Table 4.5: Correlation of ABO grouping with coagulation profile in control group

	PT	APTT	Frequency	P value
A	14.2 ± 1.12	24.3 ± 1.7	12	0.78
B	14.3 ± .98	31.8 ± 4.5	7	
AB	14.3 ± 1.46	29.5 ± 3.9	5	
O	14.3 ± 0.95	29 ± 3.7	26	

DISCUSSION

This is a descriptive analytical study was conducted in Khartoum State during the period from January to May 2021 to determine frequency of ABO and coagulation profile in Sudanese patients and to correlate their association with ischemic heart diseases.

Hundred (100) samples were collected fifty (50) healthy individuals for control, and fifty (50) from patients with cardiovascular diseases 30 (30%) males and 20 (20%) females. Most common blood group in males and females was O followed by A and least frequent was AB.

The results obtained in this study showed that the prevalence of ischemic heart disease (IHD) in blood group O is higher than in all other ABO blood groups, that may be due to the majority of Sudanese population were blood group O. This finding agree with the study Frequency of ABO, sub group ABO and Rh(D) blood in Major Sudanese Ethnic Groups [19], who found that blood group O was the predominant (52.7%) followed by A (23.3%), B (13.2%), while AB was the least frequent (10.8%) [19] .

The study also showed that there was shorter level of PT and aPTT in case than control group with more decreases seen in individuals with blood group A and more increases seen in Blood group O, these findings agreed with study conducted by (Aiesha & Ashwini, 2018) [20], who found that the possible cause of cardiovascular accidents that are overtly presented in blood group A.

CONCLUSION

This study concluded that O blood group was more frequent among patients with ischemic heart diseases followed by A blood group and least frequent was AB. In addition, there was significant shorter aPTT in case when compared to control group.

with the study [19] , who found that blood group O was the predominant.

No association was found between ABO grouping and coagulation profile in ischemic heart disease in case and control group.

Conflict of Interest: There is no conflict of interest.

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