Research Article ISSN: 2771-9073

Insights in Blood Disorders

Association between ABO Blood Groups and Risk of Coronary Heart Disease: A Case-Control Study

Abdulbari Bener[1,2*], Zülfiye Kuzu[3], Hajira Karim[4], Lima Oria[4], Muhammad Hamza Sadiq[5] and Zekeriya Nurkalem[6]

[1]*Department of Biostatistics and Public Health, School of Medicine, Istanbul Medipol University, İstanbul, Turkey.*

[2]*Department of Evidence for Population Health Unit, School of Epidemiology and Health Sciences, The University of Manchester, Manchester, UK.*

[3]*Department of Cardiology, School of Medicine, Health Sciences University, Kayseri State Hospital, Kayseri, Turkey.*

[4]*Department of Biostatistics & Medical Informatics, International School of Medicine, Istanbul Medipol University, İstanbul, Turkey.*

[5]*Department of Internal Medicine, Crestwood Medical Center, Alabama, United States.*

[6]*Department of Cardiology, School of Medicine, Istanbul Medipol University, İstanbul, Turkey.*

***Correspondence:**

Abdul bari Bener, Professor of Public Health, Department of Biostatistics & Medical Informatics, Istanbul Medipol University, Schools of Medicine, Dendistry and Pharmacy, Kavacık Güney Yerleşkesi, Göztepe Mahallesi, Istanbul, Turkey, Mobile: +90-535 663 9090.

Received: 10 Jun 2025; **Accepted:** 30 Jul 2025; **Published:** 09 Aug 2025

Citation: Abdul bari Bener, Zülfiye Kuzu, Hajira Karim, et al. Association between ABO Blood Groups and Risk of Coronary Heart Disease: A Case-Control Study . Insights Blood Disord. 2025; 4(1): 1-6.

ABSTRACT

Aim: *The primary targeted aim of this study was to elucidate, investigate and determine whether there is a potential correlation between ABO blood groups and the risk of Coronary Heart Disease (CHD).*

Subjects and Methods: *The study based case-control study design, included 1.191 CHD patients and 1,191 healthy individuals as controls, aged above 35 years males and females.*

Results: *Statistically notable differences were found between CHD and healthy control groups in terms of age (p = 0.025) , income (p = 0.003) BMI (p = 0.007) cigarette smoking (p = 0.014) water-pipe hookah-nargileh (p = 0.008) physical exercise (n = 0.003). metabolic syndrome-ATPIII (p < 0.001) and metabolic syndrome-IDF (p = 0.003) The blood group O was substantially significantly more prevalent in CHD patients as opposed to healthy population (36.6% vs 41.1%; p = 0.024). followed by A blood group common in CHD cases (34.4% vs 29.7%) further similarly in B blood group. Another similar distribution is seen in blood group AB in both groups (7.3% vs. 5.6%). The spread of ABO blood groups amid male CHD patients in contrast to healthy men, were more widespread and common in O (35.5% vs 42.9%, p = 0.012) and blood group A (34.1% vs 29.9%; p = 0.013) and B (24.1% vs 22.4; p = 0.05). Furthermore, Blood group AB was less common in male CHD patients (4.7% vs 6.8%) than in healthy men. More number of women with CHD had blood group O (37.6% vs 39.7%) and A (33.9% vs 29.5%) and B. (20.1% vs 24.5%).*

Prominent and notable statistical differences in the biochemical parameters between CHD and healthy included: haemoglobin (p<0.001), vitamin D (p = 0.003) HbAic, (p < 0.001) FBG (p < 0.001) potassium (overline p < 0.001). calcium (p < 0.001) , Lymphocyte (p = 0.001) haematocrit (p<0.001), potassium (p = 0.026) Na (p < 0.001) creatinine (p < 0.001) cholesterol (p < 0.011) HDL (p = 0.002) LDL(p<0.001), bilirubin (p < 0.001) ferritin (p 0.007), triglyceride (p < 0.001) uric acid (0.001). C-reactive protein, (p < 0.001) SBP (p < 0.001) n and DBP (p<0.001).. A multivariate regression analysis identified the risk factors for CHD as diabetic (p < 0.001) sleep quality (p < 0.001) CRP (p < 0.001) triglyceride (p < 0.001) calcium (p < 0.001) cholesterol (p = 0.002)

creatine kinase (p = 0.006) mean corpuscular volume (p = 0.007) mean platelet volume (overline p = 0.021) uric asid (p = 0.026) and cigarette smoking (p = 0.027) were predictors as significant determinants for CHD.

Conclusion: *The study found a correlation between blood groups and coronary heart disease (CHD). Blood groups O and A were more prevalent among CHD patients compared to healthy individuals. The distribution of blood groups varied as O and B being more common in men and A and B being more frequent in women with CHD compared to healthy subjects.*

Keywords
ABO blood, CHD, Risk, Case-control, Co-morbidity, COVID-19, Lorenz Curve, Gini index.

Background
The primary targeted aim of this study was to elucidate, investigate and determine whether there is a potential correlation between ABO blood groups and the risk of Coronary Heart Disease (CHD). The study based case-control study design, included 1,191 CHD patients and 1,191 healthy individuals as controls, aged above 35 years males and females.

The blood group O was substantially significantly more prevalent in CHD patients as opposed to healthy population (36.6% vs 41.1%; p=0.024), followed by A blood group common in CHD cases (34.4% vs 29.7%). The spread of ABO blood groups with CHD compared healthy men, were common in O (35.5% vs 42.9%, p = 0.012) and blood group A (34.1% vs 29.9%; p=0.013) and B (24.1% vs 22.4; p=0.050). More number of women with CHD had blood group O (37.6% vs 39.7%) and A (33.9% vs 29.5%) and B. (20.1% vs 24.5%). Statistical differences (p<0.001), between CHD and healthy: haemoglobin, Vitamin-D, HbA1c, FBG, potassium, calcium, Lymphocyte, haematocrit, potassium, Na, creatinine, cholesterol, HDL, LDL, bilirubin, ferritin, triglyceride, uric-acid, CRP, SBP, and DBP. A multivariate-regression identified the risk factors for CHD as diabetic, sleep quality, CRP, triglyceride, calcium, cholesterol, creatine-kinase, MCV, mean platelet volume (p=0.021), uric-acid (p=0.026), and cigarette-smoking (p=0.027), were predictors as risk for CHD.

The study confirmed correlation ABO blood groups and CHD and O and B being more common in men and A and B being more frequent in women with CHD compared to healthy subjects.

In the year 1901, Karl Landsteiner uncovered the ABO blood group system, the first human blood classification [1]. Since then, research on its connection to various diseases has persisted for over a century, remaining prevalent even in the modern era of gene detection, due to its inherent nature and ease of testing [2,3]. It has been reported that ABO blood group system is associated with coronary heart disease (CHD) [4-7]. Unfortunately, the findings and data from previous studies lack reliability, as their conclusions have been both inconsistent and often contradictory. This inconsistency has made it difficult to draw clear, evidence-based connections or to establish definitive risk factors, thereby limiting their practicality in guiding clinical decisions or informing public health strategies.

Coronary heart disease (CHD) is influenced by dietary, genetic, and environmental factors. The ABO blood group system, which varies across different populations and socio-economic groups, plays a role in genetic expression and disease susceptibility [3]. Blood group antigens are hereditary and are crucial for transfusion safety, genetics, and disease risk. Studies have shown associations between specific ABO blood types and increased susceptibility to certain diseases [8].

In some studies, ABO blood group system has been demonstrated to contribute to the development of cardiovascular, diabetic [9-12], oncologic, and other diseases [13]. The study focuses on understanding the susceptibility to coronary heart disease (CHD) in the Turkish population and the potential for preventive measures. Recent research has explored the link between ABO blood groups and disease susceptibility [13-16]. The study aims to investigate this association by comparing CHD patients with healthy individuals from the general population.

Despite some associations between ABO blood groups and disease susceptibility, there is little to no well-documented data on their impact on CHD risk. To address this gap, a prospective case-control study was conducted to explore a possible connection between ABO blood groups and CHD risk.

Methods
Study Population and Design
The case and control study design was conducted at the outpatient clinics of the CHD at Istanbul Medipol University Hospitals. With a prevalence of 20% [15,16], 99% confidence interval, and a 3% margin of error, the calculated sample size was 1,354 subjects, of which 1,002 age above 35 males and females agreed to participate (response rate = 74%).

We prospectively obtained 1002 consecutive healthy patients from out-patients clinics at the Medipol University Hospitals at the aged between 35-75 years old males and females during the study period. The study followed the ethical guidelines set forth in the 1964 Declaration of Helsinki and received ethical approval from the designated Ethics Committee of Istanbul Medipol University Faculty of Medicine, Institutional Review Board (IRB# 10840098-604.01.01-E.14180 and IRB# E-10840098-772.02-1411).

The study included socio-demographic variables, including gender, age, smoking and alcohol habits, BMI, physical activity clinical data, and measurements with the presence of CHD, comorbidities, clinical biochemistry tests and clinical microbiology tests. Elimination criteria involved significant co-morbidities such as unstable or severe hepatic/renal disease, elderly patients with alertness problems, newly diagnosed CHD, recent hospitalization,

with severe mental health problem. Metabolic syndrome (MetS) were identified according to the National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III) and International Diabetic Federation (IDF) criteria [15,16].

Patient evaluation was conducted through magnetic resonance angiography (MRA), Electroencephalography (EEG) and electrocardiography (ECG) are widely used clinical diagnostic tools to monitor for cardiac rhythms in patients, magnetic resonance imaging (MRI), and utility of chest radiographs (CXRs),

The Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) is a commonly used self-reported tool that evaluates sleep quality and disturbances (17-18). It categorizes individuals into three groups based on their PSQI scores: "Good sleepers" (score ≤ 5), "Average sleepers" (score 6–8), and "Poor sleepers" (score ≥ 9).

Statistical Analysis

The dataset was examined using IBM SPSS Statistics for Windows, (Version 26.0; IBM Corp., Armonk, NY, USA). To evaluate the statistical significance of differences between the means of two continuous variables, the student's t-test was applied. For comparing the distribution of categorical variables across groups, chi-square tests were utilized. Multivariate regression analysis was conducted to identify Variables that may confound the results and prioritize the significance of predictor factors for *CHD* and $p<0.05$ considered statistically remarkable.

Results

Table 1 shows Socio-demographic and clinical characteristics comparisons of risk factors between CHD and control subjects. Statistical analysis revealed a notable difference between the CHD group and the healthy control groups with respect to age (p=0.025), income (p=0.003), BMI (p=0.007), cigarette smoking (p=0.014), water-pipe hookah-nargileh (p=0.008), physical exercise (p=0.003), metabolic syndrome-ATPIII (p<0.001), and metabolic syndrome-IDF (p=0.003).

As shown in Table 2, the distribution pattern of ABO blood groups differed between CHD patients and healthy individuals. The blood group O was substantially significantly more prevalent in CHD patients as opposed to healthy population (36.6% vs 41.1%;

Table 1: Socio-demographic characteristics of CHD cases with healthy (N = 2382).

Variable	CHD Cases (N = 1,191), n (%)	Healthy Controls (N = 1,191), n (%)	p-value
Age group (years)			0.025
<50	270 (22.7)	292 (24.5)	
50–64	333 (28.0)	321 (27.0)	
65–69	246 (20.7)	290 (24.3)	
≥70	342 (28.7)	288 (24.2)	
Gender			0.109
Male	580 (48.7)	541 (45.4)	
Female	611 (51.3)	650 (54.6)	
Income level			0.003
Low	496 (41.6)	415 (34.8)	
Middle	469 (39.4)	524 (44.0)	
High	226 (19.0)	252 (21.2)	
BMI (kg/m²)			0.007
Normal (<25)	301 (25.3)	367 (30.8)	
Overweight (25–29.9)	522 (43.8)	500 (42.0)	
Obese (≥30)	368 (30.9)	324 (27.2)	
Cigarette smoking			0.014
Yes	247 (20.7)	200 (16.8)	
No	944 (79.3)	991 (83.2)	
Water-pipe use			0.008
Yes	178 (14.9)	134 (11.3)	
No	1,013 (85.1)	1,057 (88.7)	
Physical activity			0.003
Yes	334 (28.0)	401 (33.7)	
No	857 (72.0)	790 (66.3)	
Metabolic Syndrome (ATP III)			<0.001
Yes	279 (23.4)	211 (17.7)	
No	912 (76.6)	980 (82.3)	
Metabolic Syndrome (IDF)			0.003
Yes	297 (24.9)	237 (19.9)	
No	894 (75.1)	954 (80.1)	

p=0.024), followed by A blood group common in CHD cases (34.4% vs 29.7%) further similarly in B blood group. Another similar distribution is seen in blood group AB in both groups (7.3% vs 5.6%). The spread of ABO blood groups amid male CHD patients in contrast to healthy men, were more widespread and common in O (35.5% vs 42.9%, p = 0.012) and blood group A (34.1% vs 29.9%; p=0.013) and B (24.1% vs 22.4; p=0.050). Furthermore, Blood group AB was less common in male CHD patients (4.7% vs 6.8%;) than in healthy men. More number of women with CHD had blood group O (37.6% vs 39.7%) and A (33.9% vs 29.5%) and B. (20.1% vs 24.5%). Sleepiness was notably higher among CHD patients compared to healthy subjects (p<0.001).

Table 2: Distribution of ABO blood groups among CHD patients and healthy population by gender (N = 2382).

Blood Group	**CHD patients n=1,191 (%)**	**Healthy subjects n=1,191 (%)**	**P value**
A	405 (34.0)	354 (29.7)	0.0243
B	263 (22.1)	280 (23.51)	0.415
AB	87 (7.3)	67 (5.6)	0.091
O	436 (36.6)	490 (41.1)	0.024
Blood Groups	**CHD men n= 580 (%)**	**Healthy men n= 541 (%)**	**P value**
A	198 (34.1)	162 (29.9)	0.0132
B	140(24.0)	121 (22.4)	0.050
AB	36 (6.2)	26 (4.8)	0.305
O	206 (35.5)	232 (42.9)	0.011
Blood Groups	**CHD women n= 575 (%)**	**Healthy women n= 519 (%)**	**P value**
A	207 (33.9)	192 (29.5)	0.118
B	123 (20.1)	159 (24.5)	0.080
AB	51 (8.3)	41 (6.3)	0.171
O	230 (37.6)	258 (39.7)	0.476
Pittsburgh Sleep Quality Index (PSQI)	**CHD patients n=1,191 (%)**	**Healthy subjects n=1,191 (%)**	**P value**
Good sleep	546 (45.8)	6321 (53.1)	0.004
Average sleep	374 (31.4)	339 (28.5)	0.122
Poor sleep	271 (22.8)	220 (18.5)	0.009

Table 3 summarizes the differences in clinical biochemistry profiles between individuals with CHD and those without the condition. Several parameters showed significant variation between the two groups, including: haemoglobin (p<0.001), vitamin D (p=0.002), HbA1c, (p<0.001), FBG (p<0.001), potassium (p<0.001), calcium (p<0.001), lymphocyte (p=0.001), haematocrit (p<0.001), neutrophil (p=0.018), potassium (p=0.036), Na (p<0.001), creatinine (p<0.001), cholesterol (p<0.011), HDL (p=0.002), LDL(p<0.001), bilirubin (p<0.001), Ferritin (p_0.007), triglyceride (p<0.001), uric acid (p<0.001), C-Reactive protein , (p<0.001), SBP (p<0.001),, and DBP (p<0.001).

Table 3: Clinical biochemistry baseline value among CRC and control subjects (N =2382).

Variables	**CHD N = 1002 Mean ± SD**	**Healthy N = 1002 Mean ± SD**	**P value**
Hemoglobin (g/dL)	12.65 ± 1.93	13.01 ± 1.51	0.001
HbA1c (%)	6.79 ± 1.01	6.37 ± 0.89	0.001
Fasting Blood Glucose (mmol/L)	7.30 ± 2.53	6.01 ± 1.00	0.001
Vitamin D (nmol/L)	18.37 ± 6.83	19.77 ± 7.14	0.003
Vitamin B12 (pmol/L)	254.11 ± 123.65	267.91 ± 29.66	0.008
Neutrophil count (×10^9/L)	6.14 ± 3.23	5.72 ± 3.01	0.001
RBC (×10^{12}/L)	4.27 ± 0.49	4.23 ± 0.46	0.441
WBC (×10^9/L)	7579.7 ± 1530	7657.9 ± 1465	0.207
Lymphocyte count (×10^3/µL)	2.37 ± 1.88	1.93 ± 1.14	0.001
Platelet count (×10^9/L)	227.10 ± 110.84	224.62 ± 106.64	0.885
Hematocrit (%)	37.40 ± 6.30	36.31 ± 5.86	0.507
AST (U/L)	25.65 ± 15.10	25.67 ± 14.10	0.973
ALT (U/L)	21.87 ± 12.09	20.52 ± 9.16	0.002
Albumin (g/L)	39.60 ± 11.34	40.54 ± 8.79	0.026
Potassium (mmol/L)	4.10 ± 0.78	4.17 ± 0.69	0.022
Sodium (mmol/L)	129.54 ± 28.19	132.96 ± 18.51	0.001
Calcium (mg/dL)	2.12 ± 1.63	1.97 ± 1.12	0.001
Creatinine (µmol/L)	77.64 ± 19.54	73.42 ± 18.91	0.009
Total Cholesterol (mmol/L)	4.30 ± 1.31	3.54 ± 1.63	0.011
HDL (mmol/L)	3.73 ± 0.25	2.64 ± 0.83	0.002
LDL (mmol/L)			
Bilirubin (µmol/L)	8.97 ± 3.23	8.21 ± 3.18	0.010
Triglycerides (mmol/L)	2.18 ± 1.19	1.72 ± 0.77	0.001
Uric Acid (mg/dL)	5.61 ± 1.88	5.521 ± 1. 19	0.208
Ferritin (µg/L)	56.80 ± 29.11	58.86 ± 30.03	0.090
Fe (µg/L)	281.12 ± 8.67	337.20 ± 14.90	0.001
C-Reactive Protein CRP (µg/L)	24.49 ± 0.09	14.09 ± 0.10	0.001
Total Protein (µg/dL)	6.48 ± 0.76	6.52 ± 0.76	0.255
Systolic BP (mmHg)	136.03 ± 13.45	128.07 ± 9.65	0.001
Diastolic BP (mmHg)	79.90 ± 8.53	77.64 ± 9.83	0.001

Table 4: Multivariate stepwise regression analysis for predictors of coronary heart diseases risk factors (N=2,382).

Independent Variable	**Regression Coefficient**	**Standard Error**	**Beta**	**t-test**	**p-value**
Diabetes (Yes)	0.960	0.060	0.957	16.790	0.001
Sleep quality	0.152	0.019	0.048	7.851	0.001
C-reaktif protein CRP (µg/L)	-0.185	0.037	0.385	4.767	0.001
Triglyceride(mmol/L)	-0.120	0.030	-0.025	-4.250	0.001
Calcium (mg/dL)	-0.170	0.050	-0.051	3.493	0.001
Cholesterol (mmol/L)	0.092	0.028	0.016	3.073	0.002
Creatine kinase (mmol/µL)	-0.088	0.034	-0.024	-2.751	0.006
Mean corpuscular volume	0.039	0.015	0.031	2.689	0.007
Mean Platelet Volume (x10^9/L)	-0.092	0.039	-0.017	-2.312	0.021
Uric asit (mg/dL)	-0.686	0.295	-0.052	-2.325	0.026
Cigarette smoking (Yes)	-0.150	0.071	-0.012	-2.208	0.027

Table 4 presents multivariate stepwise regression analysis for predictors of CHD risk factors included: diabetic (Yes) (p<0.001), sleep quality (p<0.001), C-reaktif protein (p<0.001), triglyceride (p<0.001), calcium (p<0.001), cholesterol (p= 0.002), creatine kinase (p=0.006), mean corpuscular volume (p=0.007), mean platelet volume (p=0.021), uric asid (p=0.026), cigarette smoking

(Yes) (p=0.027), were identified as significant determinants risk for CHD.

Discussion

Coronary heart disease (CHD) is a complex condition influenced by both genetic and environmental factors (1). Blood, which serves as an individual's unique identity, contains various antigens, with the ABO and Rh systems being the most clinically significant. Research on the ABO blood group system has been of particular interest in understanding its potential link to CHD [3,19,20]. This study examined the distribution of blood group frequencies among individuals with CHD and healthy controls. The findings provide evidence supporting an association between ABO blood groups and the occurrence of CHD. In the present study, it was found that blood group O was significantly more frequent in CHD patients (36.6%) compared to healthy population (41.1%).

Although some studies have failed to confirm an association between ABO blood groups and CHD or cardiovascular risk factors, none have conclusively demonstrated this link [11,12]. The current study was specifically designed to provide evidence on whether there is a correlation between ABO blood groups and the risk of CHD.

With regard to ABO blood group distribution in the current study according to gender, blood group O was more dominant in Healthy men compared to CHD patients (42.9% vs 35.5%). Similarly, more number of women with CHD had blood group O (37.6% vs 39.7%; p=0.021) and A (33.9% vs 29.5%) and B. (20.5% vs 24.5%).

This study examined the frequency of ABO blood antigens in CHD patients and healthy controls. The results indicate that the AB blood group is correlated with a decreased likelihood of CHD, while the O blood group is more prevalent among CHD patients, suggesting a higher risk. In the Bengali Asian Indian population studied, CHD was most common in individuals with blood group O. However, research from England by Whincup et al. [21], Europe, and the USA [22] has found a higher prevalence of CHD in individuals with blood group A.

The ABO blood group system is crucial for blood compatibility, but it may also influence other factors related to thrombosis risk, which could contribute to CHD. Further research is needed to clarify this link. The study's findings could help health planners address future health challenges.

Interestingly, while many international studies have reported a higher prevalence of CHD among individuals with non-O blood groups—especially type A—due to associations with elevated von Willebrand factor and coagulation factor VIII, our findings deviate from this trend of information. In our Turkish cohort, blood group O was more widespread among CHD patients, contrasting with prior research conducted in Western populations. This discrepancy may reflect unique genetic and environmental interactions in the Turkish population, such as differences in diet, physical activity levels, or healthcare access, which could influence how ABO-related risk factors manifest. Moreover, the possible influence of local epigenetic modifiers and ABO gene polymorphisms on endothelial function and inflammatory responses warrants further exploration.

Our study also conducted a gender-based subgroup analysis, revealing that blood group A was more common among women with CHD, while blood group B appeared more frequently in men. This pattern suggests the possibility of sex-based physiological or hormonal mechanisms influencing cardiovascular vulnerability, potentially interacting with blood group antigens. Furthermore, the inclusion of sleep quality assessment using the Pittsburgh Sleep Quality Index (PSQI) adds a valuable dimension to our analysis. CHD patients were more likely to experience poor sleep quality, which has been independently linked to cardiovascular morbidity in prior studies. By integrating genetic, biochemical, and behavioral data, our study contributes to a more nuanced understanding of CHD risk and reinforces the importance of multifactorial risk assessments in cardiovascular prevention strategies.

The interposed prevalence of blood group O among CHD patients in this study introduce a compelling contrast to some prior research, which has frequently implicated non-O blood groups especially group A as carrying a higher cardiovascular risk. One possible description for the higher predominance of blood group O in CHD cases could be population-specific genetic and environmental interactions unique to the studied Turkish cohort.

Genetic polymorphisms within the ABO locus have been associated with variations in von Willebrand factor and coagulation factor VIII levels, both of which are critical in thrombogenesis and may impact CHD risk regardless of blood group type. Furthermore, local lifestyle factors such as dietary patterns, physical activity levels, and access to preventive healthcare may modulate how blood group-associated risks manifest in this specific population.

The study found a correlation between blood groups and coronary heart disease (CHD). Blood groups O and A were more prevalent among CHD patients compared to healthy individuals, while blood group AB Had a lower prevalence in CHD cases. The distribution of blood groups varied as O and B being more common in men and A and B being more frequent in women with CHD compared to healthy subjects. These findings underscore the potential utility of ABO blood group profiling as an additional tool in cardiovascular risk assessment.

Limitation of Study

The study acknowledges several limitations. First, the case-control design used may restrict the ability to establish causal relationships. Second, the study's limitations are also influenced by the instruments used to assess the variables. Additionally, since the study relied on self-administered surveys for sleep disorder responses, there could be potential biases. However, a significant strength of the study is its large sample size, which adds to the reliability of the findings.

Acknowledgements

The authors would like to thank the Medipol International School of Medicine, Istanbul Medipol University for their support and ethical approval (IRB# 10840098-604.01.01-E.14180 and IRB# E-10840098-772.02-1411).

References

1. Lesky E. Viennese serological research about the year 1900: its contribution to the development of clinical medicine. Bull N Y Acad Med. 1973; 49: 100-111.
2. Daniels G. Human blood groups, 2nd ed. Oxford, Blackwell Science. 2002; 14-16.
3. Meade TW, Cooper JA, Stirling Y, et al. Factor VIII, ABO blood group and the incidence of ischaemic heart disease. Br J Haematol. 1994; 88: 601-607.
4. He M, Brian Wolpin, Kathy Rexrode, et al. ABO blood group and risk of coronary heart disease in two prospective cohort studies. Arterioscler Thromb Vasc Biol. 2012; 32: 2314-2320.
5. Ibrahim Sari, Orhan Ozer, Vedat Davutoglu, et al. ABO blood group distribution and major cardiovascular risk factors in patients with acute myocardial infarction. Blood Coagul Fibrinolysis. 2008; 19: 231-234.
6. Tanis B, Algra A, van der Graaf Y, et al. Procoagulant factors and the risk of myocardial infarction in young women. Eur J Haematol. 2006; 77: 67-73.
7. Amirzadegan A, Salarifar M, Sadeghian S, et al. Correlation between ABO blood groups, major risk factors, and coronary artery disease. Int J Cardiol. 2006; 16: 256-258.
8. Huston AM, Atmar RL, Graham DY, et al. Norwalk virus infection and disease is associated with ABO histo-blood group type. J Infect Dis. 2002; 185: 35-37.
9. Vasan SK, Rostgaard K, Majeed A, et al. ABO blood group and risk of thromboembolic and arterial disease: a study of 15 million blood donors. Circulation. 2016; 133: 1449-1457.
10. Bener A, Yousafzai MT. The distribution of the ABO blood groups among diabetes mellitus patients in Qatar. Niger J Clin Pract. 2014; 17: 565-568.
11. Biancari F, Satta J, Pokela R, et al. ABO blood group distribution and severity of coronary artery disease among patients undergoing coronary artery bypass surgery in Northern Finland. Thromb Res. 2002; 108: 195-196.
12. Franchini M, Favaloro EJ, Targher G, et al. ABO blood group, hypercoagulability, and cardiovascular and cancer risk. Crit Rev Clin Lab Sci. 2012; 49: 137-149.
13. Solmaz I, Araç S. ABO blood groups in COVID-19 patients; Cross-sectional study. Int J Clin Pract. 2021; 75: e13927.
14. Göker H, Aladağ Karakulak E, Demiroğlu H, et al. The effects of blood group types on the risk of COVID-19 infection and its clinical outcome. Turk J Med Sci. 2020; 50: 679-683.
15. Naser A, Bener A, Atmaca M, et al. Lipoprotein-associated Phospholipase A2 Activity Contributes to the Coronary Artery Disease with Metabolic Syndrome. Cardiology and Angiology: An Int J. 2022; 11: 1-9.
16. Bener A, Al-Hamaq AOAA, Zughaier SM, et al. Assessment of the Role of Serum 25-Hydroxy Vitamin D Level on Coronary Heart Disease Risk with Stratification Among Patients With Type 2 Diabetes Mellitus. Angiology. 2021; 72: 86-92.
17. Buysse D J, Reynolds C F 3rd, Monk T H, et al. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989; 28: 193-213.
18. Bener A, Yildirim E, Torun P, et al. Internet Addiction, Fatigue, and Sleep Problems Among Adolescent Students: a Large-Scale Study. Int J Mental Health Addiction. 2018; 17: 959-969.
19. Morelli VM, De Visser MCH, Vos HL, et al. ABO blood group genotypes and the risk of venous thrombosis: effect of factor V Leiden. J Thromb Haemost. 2005; 3: 183-185.
20. Ohira T, Cushman M, Tsai MY, et al. ABO blood group, other risk factors and incidence of venous thromboembolism: the Longitudinal Investigation of Thromboembolism Etiology (LITE). J Thromb Haemost. 2007; 5: 1455-1461.
21. Whincup PH, Cook DG, Phillips AN, et al. ABO blood group and ischaemic heart disease in British men. BMJ. 1990; 300: 1679-1682.
22. Ellison RC, Zhang Y, Myers RH, et al. Lewis blood group phenotype as an independent risk factor for coronary heart disease (the NHLBI Family Heart Study). Am J Cardiol. 1999; 83: 345-348.