

Association between ABO blood groups and mortality in upper gastrointestinal bleeding

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SUMMARY

OBJECTIVE: Gastrointestinal bleeding is an important part of gastrointestinal emergencies. This study aimed to examine the association between ABO blood groups and mortality in patients who were admitted to the emergency department and diagnosed with upper gastrointestinal bleeding.

METHODS: The patients with upper gastrointestinal bleeding in the emergency department of a tertiary hospital in Turkey and the data of healthy blood donors were studied. The data of these patients were analyzed, and it was determined that the primary outcome was in-hospital mortality.

RESULTS: The study was completed with 274 patients and 274 control group. The mean age of these patients was 65.1±18.2 years, and 64.2% of patients were males. It was found that the in-hospital mortality rate of patients with O blood group (16.2%) was statistically significantly higher than non-O blood group (7.5%) (p:0.032).

CONCLUSION: The study concluded that the mortality rate of gastrointestinal bleeding patients with O blood group was higher compared to patients with other blood groups. Physicians can use ABO blood groups to predict mortality risk in gastrointestinal bleeding.

KEYWORDS: ABO blood-group system. Gastrointestinal hemorrhage. Mortality.

INTRODUCTION

Upper gastrointestinal (GI) bleeding occurs with bleeding from anywhere between the proximal esophagus and the ligament of Treitz into the lumen. This disease is a serious cause of mortality and morbidity, and therefore, early diagnosis and appropriate treatment are necessary¹⁻³. In the United States, more than half a million patients are hospitalized annually due to GI bleeding, and 80% of patients diagnosed with GI bleeding who visit emergency departments (EDs) are admitted to the hospital^{4,5}.

International guidelines for the management of patients with GI bleeding recommend assessing the risk using prognostic tools that can be obtained early in the course of the disease⁶. To achieve this, various risk-scoring systems and patient-related factors have been investigated. ABO blood group is one of these factors because the relationship between some blood groups and diseases is a known fact. For instance, O blood group is known to have a risk factor for peptic ulcer disease, which is one of the significant causes of upper GI bleeding. Similarly, A blood group is known to have a risk factor for gastric cancer, which is another cause of upper GI bleeding⁷. Previous studies have shown that patients with O blood group experience longer time bleeding and have lower plasma levels of factor VIII or von Willebrand factor (vWF) than patients

with non-O blood group. Therefore, it has been concluded that patients with O blood group bleed more easily^{8,9}. Additionally, it is known that platelet function is more limited in patients with O blood group than in patients with other blood groups, which increases the potential for bleeding¹⁰. In the literature, studies have reported that patients with O blood group have more bleeding complications than those with other blood groups in various diseases such as variceal GI bleeding, postpartum hemorrhage, and severe traumatic bleeding¹¹⁻¹³.

This study aimed to determine the association between blood groups and mortality in Turkish patients diagnosed with upper GI bleeding who were admitted to the ED.

METHODS

The study was carried out in the ED of a tertiary hospital located on the European side of Istanbul, Turkey, with a bed capacity of 650 and an annual ED visit of 223,069. This examination was held as a retrospective observational study. The scientific and ethical suitability of the study has been confirmed by the local ethics committee with decision number 2,235 (date: 22.02.2023). Due to the retrospective nature of the study, informed consent forms from patients were not required.

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The study included patients aged 18 years and older who visited the ED and were hospitalized with a diagnosis of upper GI bleeding between January 1, 2022, and January 1, 2023. The medical records of patients were obtained through the hospital-based electronic automation system using ICD (International Statistical Classification of Diseases) codes. Only the first ED visit of patients with multiple ED visits due to GI bleeding was included in the study. Patients with diagnoses other than GI bleeding, those for whom blood group data could not be obtained, those who left the hospital without permission, and foreign patients were not included in the study. The demographic information, vital signs, comorbidities, blood groups, and mortality status of the included patients were recorded in a data set. The analysis of ABO blood groups was performed using the gel centrifugation method with Erytra Eflexis (Eflexis, Grifols, Barcelona, Spain). The data of healthy blood donors in the same region where the study was conducted were used as the control group. The study revealed a primary outcome as all-cause in-hospital mortality.

Statistical analysis

For the statistical analyses, the SPSS 22.0 (SPSS Inc., IL, Chicago) software was used. The p-value of <0.05 was used as the level of significance. All patients included in the study

were categorized into two groups for analysis, namely, O blood group and non-O blood group. Descriptive statistics were presented as mean and standard deviation and percentage distribution. The normal distribution of the data was monitored using the Kolmogorov-Smirnov test. To compare the distribution of sociodemographic, clinical, and vital signs characteristics between O blood group and other blood groups, Pearson's chi-square analysis was operated. To compare continuous variables, Student's t-test was operated.

RESULTS

Overall, 4 patients with foreign nationality, 12 patients whose blood group data could not be reached, and 1 patient who left the hospital without permission were excluded from the study. A total of 274 patients and 274 control group and their data were analyzed. The mean age of these patients was 65.1 ± 18.2 years, and 64.2% of them were males. It was found that the in-hospital mortality rate of patients with O blood group (16.2%) was statistically significantly higher than those with non-O blood group (7.5%) ($p=0.032$) (Table 1).

The distribution of blood groups in patients with GI bleeding was analyzed, 24.5% of patients had A blood group, 26.3%

Table 1. Comparison of patient characteristics and mortality status between O and non-O blood groups.

	Non-O blood group n (%) Mean±SD	O blood group n (%) Mean±SD	Total n (%) Mean±SD	p-value
Gender				
Female	73 (36.5)	25 (33.8)	98 (35.8)	0.677
Male	127 (63.5)	49 (66.2)	176 (64.2)	
Age (years)	65.3±17.1	64.6±20.9	65.1±18.2	0.759
Systolic blood pressure (mmHg)	120.2±19.1	125.7±18.0	121.7±18.9	0.031
Diastolic blood pressure (mmHg)	73.5±14.1	76.3±13.5	74.2±13.9	0.139
Heart rate (bpm)	98.6±17.3	96.1±11.9	97.9±16.0	0.263
Congestive heart failure	25 (12.5)	8 (10.8)	33 (12.0)	0.703
Peripheral vascular disease	7 (3.5)	4 (5.4)	11 (4.0)	0.476
Cerebrovascular disease	15 (7.5)	8 (10.8)	23 (8.4)	0.380
Hypertension	15 (7.5)	7 (9.5)	22 (8.0)	0.596
Peptic ulcer disease	23 (11.5)	9 (12.2)	32 (11.7)	0.880
Diabetes mellitus	42 (21.0)	18 (24.3)	60 (21.9)	0.555
Chronic kidney disease	15 (7.5)	7 (9.5)	22 (8.0)	0.596
Length of the hospital stay (day)	6.2±2.8	6.3±2.7	6.2±2.8	0.689
In-hospital mortality	15 (7.5)	12 (16.2)	27 (9.9)	0.032

χ^2 /Student's t-test. Bold values indicate statistical significance at the $p<0.05$ level.

of patients had B blood group, 22.2% of patients had AB blood group, and 27.0% of patients had O blood group (Figure 1). In the control group, the distribution of blood groups was as follows: 35.8% of patients had A blood group, 23.8% of patients had B blood group, 19.4% of patients had AB blood group, and 21.0% of patients had O blood group.

Regarding the distribution of in-hospital mortality status by blood group, 10.4% of patients with A blood group, 3.3% of patients with B blood group, 8.3% of patients with AB blood group, and 16.2% of patients with O blood group had mortality (Figure 2).

DISCUSSION

Blood group distributions can vary across regions and races. This study found that in the Turkish population of patients with GI bleeding, patients with O blood group were found to be higher mortality rates compared to other blood groups.

GI bleeding is a disease with a wide clinical spectrum, ranging from a self-limiting condition to mortality. Many international guidelines recommend using scoring systems or prognostic

tools to predict poor outcomes and identify low- and high-risk patients in these patients¹⁴.

In 1900–1901, Karl Landsteiner discovered that some red blood cells agglutinated when mixed with serum samples from another patient. He recorded agglutination parameters and classified blood into different groups, creating the ABO blood group system. He was awarded the Nobel Prize for this study. Landsteiner identified three different groups, namely, A, B, and C (later renamed as O), and in 1902, De Castello and Sturli identified the fourth blood group, i.e., AB¹⁵. Since that time, the relationship between blood groups and diseases has attracted the attention of scientists, and numerous studies have been conducted. There are some studies in the literature stating an association between blood groups and diseases such as coronary heart disease, gastric cancer, pancreatic cancer, malaria, *Helicobacter pylori* infection, and Crimean-Congo hemorrhagic fever¹⁶.

In a study carried out in Iran, data from 513 patients with GI bleeding and 520 controls were analyzed. It was found that O blood group was more prevalent in Iranian patients with GI bleeding than in healthy blood donors. In addition, it was concluded that there was a higher rate of re-bleeding in patients with O blood group within the first 72 h of hospital admission¹⁷. In the study by Bayan et al., data from 364 patients with GI bleeding and 734 blood donors were examined. While emphasizing that O blood group was more prevalent in the patient group, it was reported that the rate of re-bleeding and mortality was similar among blood groups¹⁸.

As previously mentioned, although it is not clearly defined why O blood group is more prone to GI bleeding and has a worse prognosis, there are some views on that. One possibility is that patients with O blood group have a higher prevalence of duodenal ulcers and *H. pylori* infection. Additionally, it is believed that O blood group may be found to be more predisposed to bleeding, which could contribute to the higher rate of GI bleeding¹⁹. However, further research is needed to fully understand the mechanisms behind this relationship.

In our study, the most common was A blood group with a prevalence of 35.8%, which is compatible with studies in the literature. In a study carried out in Istanbul, the distribution of blood groups in 123,900 blood donors was determined, and it was conducted that A blood group was the most common blood group with a prevalence of 43.8%²⁰. In Turkey as a whole, it has been found that the most common is A blood group with a prevalence of 42.8%²¹.

One of the main limitations of this study is its retrospective and single-center design. Therefore, the results of the study

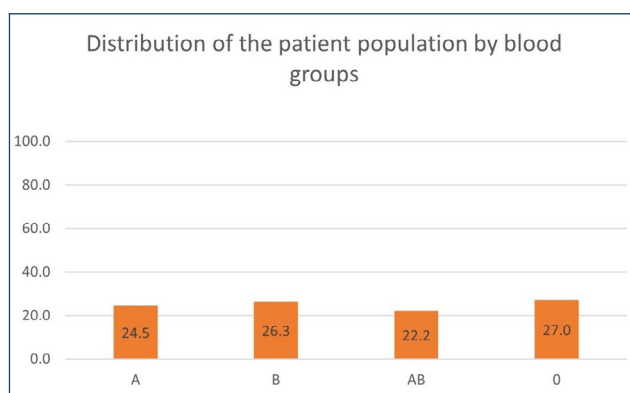


Figure 1. Distribution of ABO blood groups in the patient group.

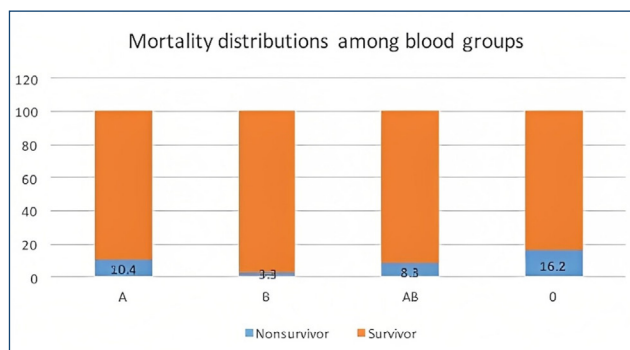


Figure 2. Distribution of in-hospital mortality of the patient group according to ABO blood groups.

cannot be generalized to the population. Thus, there is a need for multicenter and prospective studies.

CONCLUSION

GI bleeding is a significant causality of morbidity and mortality among patients visiting EDs. In this study, it was determined that patients with O blood group who had GI bleeding had a higher mortality rate than patients with other blood groups. Physicians can use ABO blood groups to predict mortality risk in patients with GI bleeding.

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ETHICAL APPROVAL

This study was approved by Şişli Hamidiye Etfal local ethics committee (ethics committee ruling number: 2,235, date: 22.02.2023).

AUTHORS' CONTRIBUTIONS

HA: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **MK:** Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Writing – original draft.

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