

Association of ABO Rh Blood Groups with Allergic Rhinitis and Distribution According to Allergen Types

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ABSTRACT

Objective: ABO antigens on the erythrocyte surface are known to be abundantly expressed in the digestive and respiratory tract. ABO antigens have been shown to be associated with certain diseases. Some studies have investigated the relationship of atopic diseases with blood groups. The aims of our study were to evaluate the relationship of ABO and Rhesus blood groups with allergic rhinitis and to determine the blood group distribution according to allergen types.

Materials and Methods: The study included 750 adult patients with allergic rhinitis and 750 blood donors. According to the skin prick test results, the patients were classified into three groups: patients with allergy to pollen, patients with allergy to house dust mite, and patients with allergy to pollen with house dust mite. The ABO Rh blood group was determined by the DiaClon ABO/D+Reverse Grouping (BIO-RAD) ID-card method.

Results: The ABO phenotype was found in 42.8%, 16.1%, 32.7%, and 8.4%, respectively, of the A, B, O, and AB group patients and 40%, 18.8%, 33.86%, and 7.33%, respectively, in the control group. There was no difference in the distribution of ABO blood types and Rh factor. The frequency of allergy to pollen, house dust mite, and pollen with house dust mite in patients were 495 (66%), 81 (10.8%) and 174 (23.2%), respectively. There was no significant difference in the distribution of ABO blood types and Rh factor by allergen type.

Conclusion: Similar to the normal population, the A blood group was most common in patients with allergic rhinitis. There was no relationship between the ABO blood group and allergen types in patients with allergic rhinitis.

Keywords: ABO blood group system, allergic, rh factor; rhinitis

INTRODUCTION

Allergic rhinitis (AR) is an immunoglobulin E (IgE)-mediated nasal mucosa inflammation. It is characterized by nasal itching, sneezing, rhinorrhea, and nasal congestion and is frequently accompanied by conjunctivitis findings such as redness, itching, tearing. Its prevalence ranges from 17% to 28.5% in Europe in adult patients and it is considered a risk factor for asthma (1-3).

It is known that genetic and environmental factors predispose to allergic rhinitis and asthma, which have similar immunopathological mechanisms (4,5). It is also known that ABO antigens on the erythrocyte surface are abundant in the digestive and respiratory systems

(6). Blood group antigens play a role in the formation of mucopolysaccharides in the epithelial and mucosal secretion (7,8).

There are some studies investigating the relationship of atopic diseases with blood groups. The relationship of atopic diseases with blood groups has been demonstrated in some of these studies but not in others (5,9-15). Studies have revealed that the O blood group may be associated with AR (9,10).

The aim of our study was to investigate the relationship between the ABO and Rhesus (Rh) blood groups and AR, and the ABO blood groups distribution according to allergen types in our region.

MATERIAL and METHODS

All patients with ABO Rh blood data who were followed up at the Allergy-Immunology clinic with a diagnosis of AR between January 2017 and December 2017 were included in the study. The total number of patients was 750. Age, gender, types of allergen according to the skin prick test (Allergopharma GmbH&Co.KG, Germany), and the ABO Rh blood groups were recorded. According to the skin prick test results, the patients were classified into three groups as pollen allergy (at least one specific IgE to pollens), house dust mite allergy (at least one specific IgE to house dust mites), and pollen with house dust mite allergy (at least one specific IgE to pollens and house dust mites together). The control group included 750 blood donors. The ABO Rh blood group was determined by the DiaClon ABO/D+Reverse Grouping (BIO-RAD) ID-card method. Ethics Committee approval was obtained for the study (No: 2017/1272). As this study was retrospectively designed, there was no requirement for informed consent forms.

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) 18.0 statistical software for Windows (SPSS Inc., Chicago, IL, USA). Data are presented as mean±standard deviation and percentage. The Chi-Square test was performed to determine if there was a statistically significant difference between the expected frequencies and the observed frequencies in one or more variables. The Pearson Chi-square test was used if the smallest theoretical frequency was found to be > 25. The Yates' Chi-square Test was used if this value was 5-25, and the Fisher Exact Test was used if the lowest theoretical frequency was < 5. The Bonferroni method was used to determine the differences between columns for multiple variables. A p value < 0.05 was considered statistically significant.

RESULTS

In the study, the distribution of the ABO phenotype was 42.8%, 16.1%, 32.7%, and 8.4%, respectively, in group A, B, O, and AB patients, and 40%, 18.8%, 33.86%, and 7.33% in the control group, respectively (Table I). In addition, 90.7% of the patients were Rh positive and 9.3% of the patients were Rh negative while 88.8% of the controls were Rh positive and 11.2% of the controls were Rh negative (Table II).

A total of 750 patients with AR, consisting of 398 (53.1%) females and 352 (46.9%) males, were included in the study. The mean age was 30.74±10.21 years (females: 30.18±9.86 years; males: 31.36±10.56 years). There was no significant difference in the distribution of ABO blood types and Rh factor by gender (p=0.176, p= 0.195, respectively).

The frequency of allergy to pollen, house dust mite, and pollen with house dust mite in patients were 495 (66%), 81 (10.8%) and 174 (23.2%), respectively. There was no difference in the distribution of ABO blood types by allergen type (p= 0.659) (Table III). There was also no difference in the distribution of Rh factor by allergen type (p= 0.494) (Table IV).

DISCUSSION

The distribution of ABO, which is the major human blood group system and located on chromosome 9 in q34.1-q34.2, differs between countries (16,17). The ABO blood system, which has a complex carbohydrate structure acting as a surface marker of red blood cells, is also found in various tissues, cells and body fluids, and it can act as receptors for allergens or toxins and microorganisms (18-20). The interactions between the ABO and secretory

Table I: Distribution of ABO blood group in patients with allergic rhinitis and controls.

	Allergic rhinitis Frequency (%)	Controls Frequency (%)	Total Frequency (%)	p-value
A	321 (42.8)	300 (40.0)	621 (41.4)	0.271
B	121 (16.1)	141 (18.8)	262 (17.5)	0.174
O	245 (32.7)	254 (33.9)	499 (33.3)	0.622
AB	63 (8.4)	55 (7.3)	118 (7.9)	0.443

Table II: Distribution of Rh factor in patients with allergic rhinitis and controls.

	Allergic rhinitis Frequency (%)	Controls Frequency (%)	p-value
Rh (+)	680 (90.7)	666 (88.8)	0.234
Rh (-)	70 (9.3)	84 (11.2)	

Table III: Distribution of ABO blood groups according to allergen type

	Pollen Frequency (%)	House dust mite Frequency (%)	Pollen-house dust mite Frequency (%)	Total Frequency (%)
A	219 (44.2)	33 (40.7)	69 (39.7)	321 (42.8)
B	78 (15.8)	11 (13.6)	32 (18.4)	121 (16.1)
O	155 (31.3)	28 (34.6)	62 (35.6)	245 (32.7)
AB	43 (8.7)	9 (11.1)	11 (6.3)	63 (8.4)

*a subset of allergen types whose column proportions do not differ significantly from each other (p=0.659)

Table IV: Distribution of Rh factor according to allergen type.

	Pollen Frequency (%)	House dust mites Frequency (%)	Pollen-house dust mites Frequency (%)	Total Frequency (%)
Rh (+)	453 (91.5)	73 (90.1)	154 (88.5)	680 (90.7)
Rh (-)	42 (8.5)	8 (9.9)	20 (11.5)	70 (9.3)

*a subset of allergen types whose column proportions do not differ significantly from each other (p=0.494)

genes partially control the glycoconjugate profile of the respiratory epithelium and exocrine secretions (21,22).

There are some studies investigating the relationship between blood groups and AR. In our study, we investigated the relationship between allergic rhinitis and ABO Rh blood groups, and we found that the distribution of blood groups in AR was the same as the normal population. There was no difference in the distribution of ABO blood types and Rh factor. Similar to the normal population in our region and general blood group distribution in Turkey, we found the blood group distribution as A>O>B>AB in allergic rhinitis (23-25). Although it has been stated in some publications that allergic rhinitis is seen more frequently in the O blood group, the A blood group was found to be more frequent in our study (5,9-11). In asthma, with an immunopathogenesis similar to allergic rhinitis, the O blood group has been identified more frequently, but it has also been reported that the A blood group has been identified more frequently (12,26).

A total of 750 patients with AR, consisting of 398 (53.1%) females and 352 (46.9%) males, were enrolled in this study. There was no significant difference in the distribution of ABO blood types and Rh factor by gender. Falsarella et al. have shown that the A blood group was associated with protection and the O blood group was associated with susceptibility to AR in men (5). In the study of Topno et al., the O and B groups were found more frequently in men (10).

The secretion of ABO blood group antigens in fluids is defined as ABH secretory and approximately 80% of people are ABH secretors (27). In our study, the secretory

status was not evaluated in patients with allergic rhinitis. However, different results are available in the literature. Ronchetti et al. have shown that the ABO phenotype frequencies in children with asthma do not differ significantly from controls but O/nonSecretor in asthmatic male children was higher than in controls (28). Another study showed that asthma was significantly related to the nonsecretor phenotype. Significantly lower lung function and higher prevalence of wheezing and asthma were observed in Lewis-negative or nonsecretor subjects of blood group O (29). In contrast, Chen et al. showed that blood group O/Secretors were associated with childhood asthma and there was no association with dust mite (13).

In our study, there was no significant difference in blood group distribution according to allergen types. We did not find a detailed study on this subject in the literature. In the study of Abid, skin allergy in the A blood group and pollen and house dust allergy in the B blood group were more common, but the number of patients in the study was limited (14).

Similar to the normal population, A blood group was most common in patients with allergic rhinitis. And there is no relationship between ABO blood group and allergen types in patients with allergic rhinitis.

The importance of the ABO blood group system for allergic rhinitis remains unknown. Allergic rhinitis is a complex multifactorial disease with not only genetic components but also environmental components.

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Conflict of Interest

There is no conflict of interest in this study.

Authorship Contributions

Conception and design, acquisition of data, or analysis and interpretation of data: **Songül Çildağ, Ömür Karaman, Gökhan Sargın, İrfan Yavaşoğlu, Taşkın Şentürk**, Drafted the article or reviewed it critically for important intellectual content: **Songül Çildağ, Ömür Karaman, Gökhan Sargın, İrfan Yavaşoğlu, Taşkın Şentürk**, Gave final approval of the version to be published: **Songül Çildağ, Ömür Karaman, Gökhan Sargın, İrfan Yavaşoğlu, Taşkın Şentürk**.

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