

Distribution of ABO Blood Groups among Aggressive Periodontitis Patients

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Abstract

The distribution of ABO blood groups may vary among nations and races. ABO blood group is associated with its susceptibility to several diseases. Aggressive periodontitis (AP) is a multifactorial disease, influenced by several risk factors, such as microbiology, immunology, genetic, and environmental. Microbiology is the main etiology of AP, but genetic factor also has a big role in periodontal disease, especially AP. As a genetic factor, the ABO blood group may have a role in periodontal disease.

The study aimed to find out the distribution of ABO blood groups among patients with AP. This study used a descriptive method with a retrospective approach. The data was taken from the medical record of AP patients from January 2015 to December 2018. The data were taken by the total sampling technique.

The results showed that from 40 patients with AP in the department of Periodontology, University of Padjadjaran Dental Hospital, Bandung, Indonesia. 11 people were A blood type (27.5%), 15 people were B blood type (37.5%), 3 people were AB blood type (7, 5%), and 11 people were O blood type (27.5%). Most aggressive periodontitis patients had B blood type.

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Introduction

The ABO blood group system was discovered by Karl Landsteiner in 1990—and classified as the A, B, AB, and O blood type.¹ The classification is based on the presence or absence of a specific antigen on the membrane of a red blood cell.¹ The distribution of the ABO blood group may vary among nations and races.² The annual report of the Indonesian Red Cross Blood Transfusion Unit in 2013 found that the distribution of blood donation from 2.480.352 blood bags had 38,04% of O blood type, 28,43% of B blood type 25,02% of A blood type, and 8,51% of AB blood type.³

In 2020, Silamlak discussed the association between ABO blood with several infectious and noninfectious diseases.⁴ The non-

O blood type is associated with an increased incidence of plague, cholera, mumps, and tuberculosis infections; A blood type is associated with an increased incidence of smallpox and *Pseudomonas aeruginosa* infection; B blood type is associated with an increased incidence of gonorrhoea, tuberculosis, *Streptococcus pneumoniae*, *E. coli*, and *salmonella* infections; and AB blood type is associated with an increased incidence of smallpox, *E. coli*, and *salmonella* infections.^{4,5}

The prevalence of aggressive periodontitis (AP) varies depending on continents and differences in race/ethnicity.⁶ AP is most prevalent among Africans, and is least prevalent in Europe and North America. Estimates of the disease prevalence are 1-5% in African population, 2,6% in African-Americans, 0.3-2.0% in South America, and 0.2-1.0% in Asia.^{7,8} Another study showed that the prevalence of AP in the department of Periodontology, University of Padjadjaran Dental Hospital, West Java, Indonesia for 3 months in 2010 was 3.13%.⁹ AP is a multifactorial disease influenced by several risk factors, such as microbiology, immunology, genetic, and environmental.⁹ The main etiology

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of a periodontal disease is bacteria. However, genetic factor such as the ABO blood group may play a crucial role in periodontal diseases, especially AP.¹⁰

In 2016, Moradi et al stated that the distribution of ABO blood groups in AP patients in Iran added up to 10 A blood type, 3 B blood type, 6 AB blood type, and 2 O blood type.¹¹ Guttiganur et al (2018) claimed in his study in Karnataka, India that the distribution of ABO blood groups among 50 AP patients as many as 27 A blood type, 13 O blood type, and 10 B blood type.¹² Kundu et al (2014) did research in India on 45 people, from 15 people who suffered from AP, 9 people were AB blood type and 6 people were O blood type.¹³

Based on the description above, there are no studies in Bandung, West Java, Indonesia that provide an information about ABO blood group distribution in AP patients. Therefore, this study was conducted to find out the distribution of ABO blood group among AP patients in the department of Periodontology, University of Padjadjaran Dental Hospital, West Java, Indonesia.

Materials and methods

This was a descriptive study with a retrospective approach conducted by evaluating patient medical records in the department of Periodontology, University of Padjadjaran Dental Hospital, West Java, Indonesia from January 2015 to December 2018. The total sampling method was chosen by taking AP patients' medical records. The inclusion criteria were complete data of AP patients, including name, sex, age, diagnosis, and blood type. The exclusion criteria were medical record data of AP patients with systemic disease in the department of Periodontology, University of Padjadjaran Dental Hospital.

The number of samples are determined based on the study period, inclusion, and exclusion criteria. The tools and materials needed were complete medical records of AP patients, data forms, stationery, laptops, and Excel software.

The research permission and ethical approval were institutionally approved by the research ethics commission. The data on the medical record of AP patients from January 2015 to December 2018 were collected and then

classified. Following data were listed: name, age, sex, diagnosis, and blood type. The data was presented using a distribution table and were calculated for the percentage.

Results

Gender	Amount	Percentage (%)
Male	19	48
Female	21	53
Total	40	100

Table 1. The distribution based on gender.

Age	Amount	Percentage (%)
18 - 27	8	20
28 - 37	10	25
38 - 47	17	43
48 -57	4	10
58 - 67	1	3
Total	40	100

Table 2. The distribution based on age group.

ABO Blood Group	Gender					
	Male		Female		Total	
	Amount	%	Amount	%	Amount	%
A	4	10	7	17,5	11	27,5
B	8	20	7	17,5	15	37,5
AB	2	5	1	2,5	3	7,5
O	5	12,5	6	15	11	27,5
Total	19	47,5	21	52,5	40	100

Table 3. The distribution ABO blood Group.

Based on the inclusion criteria, the overall subject were 40 patients with AP, including 19 men (48%) and 21 women (53%) (Table 1). The average age of study subjects was 36.9 years with an age range of 18-67 years (Table 2). Characteristics of all study subjects based on ABO blood groups were 11 people of A blood type (27.5%), 15 people B blood type (37.5%), 3 people AB blood type (7.5%), and 11 people of O blood type (27.5%)(Table 3).

Discussion

This study showed that men who experienced aggressive periodontitis were less

than women with a ratio of 1 : 1.1. Another study by Nariratih (2011) in a dental hospital in West Java, Indonesia showed that more females (9 people) than male (4 people) had an AP with a ratio of 2.25 : 1.12.⁹ The results of this study are not in accordance with a study from Korea by Cho et al (2011), who found that the sex ratio of men : women were 1.65 : 1. However, in this study there is no significant difference between men and women who experienced AP ($P > 0.05$).¹⁴ Moreover, the results found on two study conducted by Nariratih et al (2011) and Cho et al (2011) appeared to be not consistent regarding the AP sex ratio.^{9,14} Adolescent girls with circumpubertal may have AP more than men and decrease by age. This is related to the sex hormones that influence the inflammatory process during puberty.^{15,16} The level of female hormone changes throughout puberty, pregnancy, menstruation, and menopause.^{15,16} The growth of oral microflora along with increasing progesterone and estrogen female sex hormone which is commonly found in women during puberty can be beneficial for the bacterial colonization, especially at high concentration of these hormones¹⁷ In contrary, another study did not find that gender as a risk factor of increasing AP.^{15,16}

This study showed the age of subjects ranging between 18 and 67 years old with an average of 36.9 years old. Another study by Nariratih et al (2011) reported that the prevalence of AP in a dental hospital in West Java, Indonesia for 3 months in 2010 was 3.13% with a range of subjects age between 10 and 49 years old.⁹ A study by Cho et al in 2011 reported that the prevalence of aggressive periodontitis in Korea was 1.65% where the age of subjects were under 40 years old. The mean of these subjects was 34.45 years.¹⁴ The age of AP patients was not a criteria for diagnosing an AP.^{6,18} In this study, the sample was taken from AP patients who came to dental hospital and had some complaints due to the progression of the disease. The study sample was not age-restricted because AP can occur in all ages and the ABO blood group is inherited and is not influenced by environmental factors.^{2,6} Aggressive periodontitis progresses with age and this may lead to significant periodontal tissue loss (18), and therefore the characteristic of periodontal lesions that are typically found in this disease can be more easily identified in the older

age groups.¹⁹ In terms of age, the prevalence were 0.6%, 0.8%, and 1.6% for the age groups 2-12, 20-25, and 13-20, respectively. There was no significant difference noted between males and females. The earliest age diagnosed with periodontitis was 3 years 7 months.²⁰

ABO blood group is associated with its susceptibility to several diseases.²¹ ABO antigens are oligosaccharide chains bound to glycolipids or glycoproteins on the surface of red blood cells and are inherited.⁴ ABO antigens have different structures, between blood groups A, B, AB and O. The expression of ABO antigens is not only limited to red blood cells but also spreads in body fluids and tissues.²² ABO antigens can have a direct role in pathogen infections as a receptor or coreceptor for microorganisms, parasites, and viruses. Differences in the antigen structure can affect changes in the host cell membrane morphology and physiology to pathogens. Differences in the blood group antigen structure may have an important role in the host susceptibility to the pathogenic infections.²²

The distribution of the ABO blood group in this study showed that the percentage of B blood type was higher than other blood types in patients with AP. Only three of the reviewed studies by Al-Askar investigated the relationship between AP and ABO blood groups.¹ Kaslick et al. found a significant association between increased incidence of AP in B blood group, while there was a reduction of AP incidence in O blood group. Arowojolu et al. examined the association between ABO blood group and juvenile periodontitis (JP) among 40 adolescents in Nigeria. All 20 patients with JP had Rhesus-positive blood from group B or AB. The remaining non-JP patients had Rhesus-positive or -negative blood from group B, O, or AB.^{1,23} In a study of 45 patients, Kundu et al. found that patients with AP ($n = 15$) most frequently had group AB (60%) or group O (40%) blood type.¹³ Overall, the findings from these studies suggest a possible genetic basis in the association of group AB blood type with incidence of AP, although the small sample sizes of the studies preclude the ability to make definitive conclusions on the relationship.

This study was not in accordance with the study of Kundu et al, in 2013 which reported that in India AP patients had a higher AB blood group.¹³ The study of Moradi et al, in 2016 found that the distribution of ABO blood group at

Kermanshah School Iran who suffers from AP added up to 10 male students with A blood type, 3 students with B blood type, 6 students with AB blood type, and 2 students with O blood type.¹¹

The increasing number of individuals with B blood type in AP patients can occur because ABO antigens may act as receptors for specific bacteria that cause AP and may facilitate the colonization and invasion, or prevent host damage.²² Another study reported that the variety in ABO blood groups showed significant differences in the level of colonization of periodontal pathogens. The research also reported an increase replacement of *F. nucleatum*; *P. Gingivalis*; *T. Forsythensis*; *B. Oralis*; *A. Naeslundii*; *P. micros* and *B. Fragilis* in A and B blood type, meanwhile low growth of pathogens found in blood type AB and O.²⁴ Another consideration that can affect the distribution of the ABO groups in AP patients is the distribution of ABO blood groups which varied by nation and race.⁸ Reid in 2004 determined the frequency of blood groups in the caucasoid race; O blood type 44%, A blood type 43%, B blood type 9%, and AB blood type 4%.²⁵ In addition, O Blood type in Asian race is 43%; A blood type 27%; B blood type 25%; and AB blood type 5%.²⁵ If the distribution of ABO blood groups and periodontitis are proven to be related, this variable is useful as additional data in determining the diagnosis. However, the ABO blood group cannot be used as a criteria in diagnosing aggressive periodontitis.²⁶

Conclusion

In conclusion, most aggressive periodontitis patients were B blood type. It is recommended that further research need to be carried out in order to determine the correlation between aggressive periodontitis and ABO blood groups.

Declaration of Interest

The authors report no conflict of interest.

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